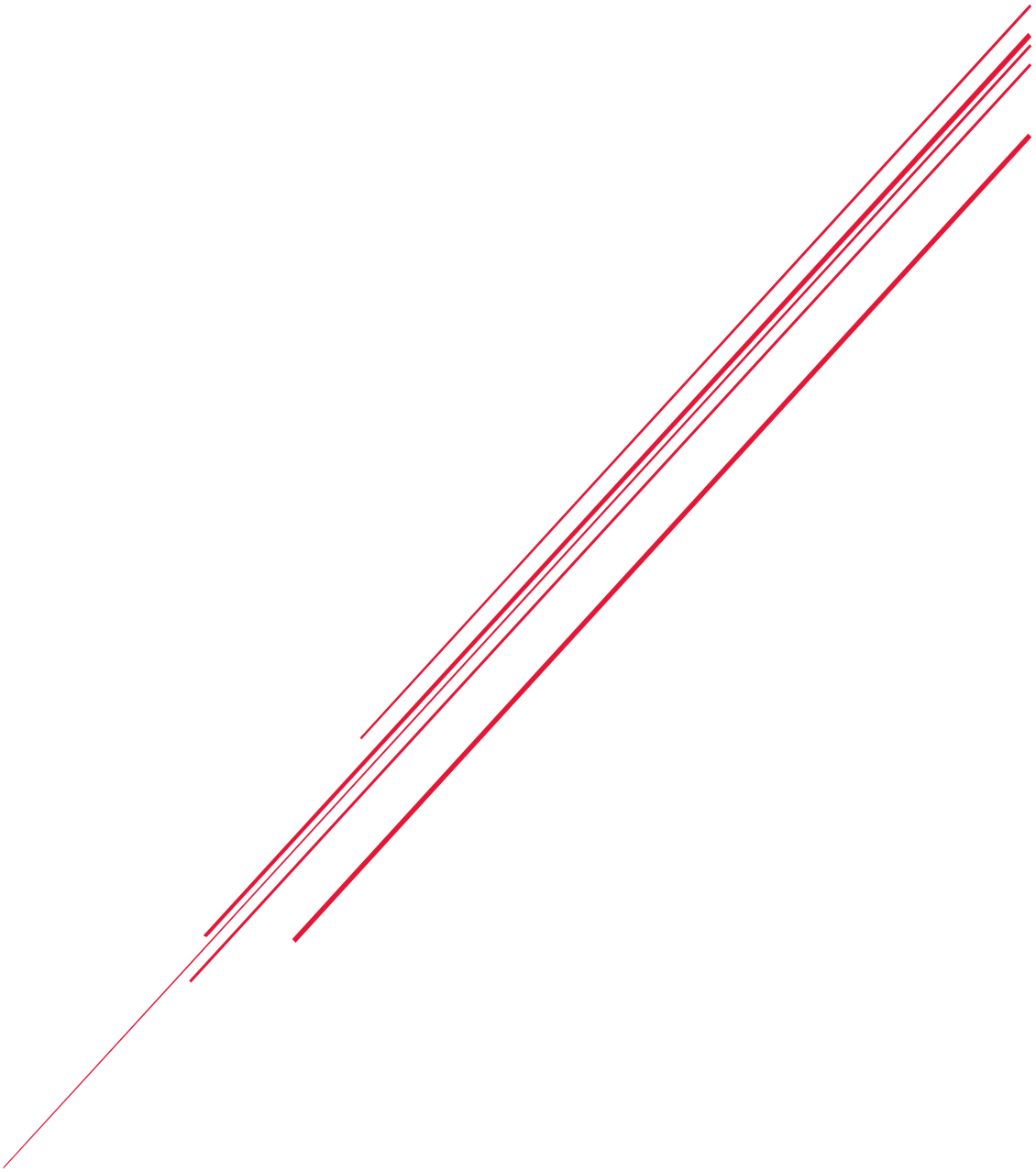
ORTA DOĞU TEKNİK ÜNİVERSİTESİ

CENTER FOR SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS EDUCATION

2024 ANNUAL ACTIVITY REPORT



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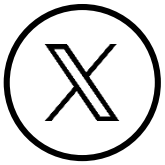

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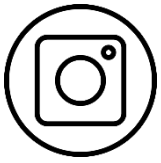

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LEGO education
INNOVATION STUDIO
Enter a world
of innovation
/bittemm

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ABBREVATIONS

ABE	Amgen Biotechnology Experience
AFEM	Association of Businesswomen of Morocco
AR	Augmented Reality
BILSEM	Science and Art Center
BILTEMM	Center for Science, Technology, Engineering, and Mathematics Education
CEIT	Computer Education and Instructional Technology
DataSETUP	Promoting Data Science Education for Teacher Education at the University Level
ECE	Early Childhood Education
EDS	Educational Sciences
EF	Faculty of Education
ETKIM	Educational Technology Incubation and Innovation Center
EU	European Union
FCL	Future Classroom Lab
FeTeMM	Science, Technology, Engineering, and Mathematics (Fen, Teknoloji, Mühendislik ve Matematik)
FLL	FIRST ® LEGO® League
LAB	Learn-Ask-Build
MEET	Mathematics Education Interaction Community
METU	Middle East Technical University
METU DFS	Middle East Technical University Development Foundation Schools
MoNE	Ministry of National Education
MSCA	Marie Sklodowska Curie Alanı (Marie Skłodowska-Curie Actions)
MSE	Mathematics and Science Education
PIAAC	Programme for the International Assessment of Adult Competencies
PISA	Programme for International Student Assessment
STEAM	Science, Technology, Engineering, Arts, and Mathematics
STEAMigPOWER	STEAM approaches at higher education for mIGrants, refugees and asylum seekers' emPOWERment
STEM	Science, Technology, Engineering, and Mathematics
STEM-A	Science, Technology, Engineering, Mathematics and Architecture

STEM-L	Science, Technology, Engineering, Mathematics and Literature
STREAM	Science, Technology, Research, Engineering, Arts and Mathematics
TED	The Turkish Education Association
TIMSS	Trends in International Mathematics and Science Study
TUBITAK	The Scientific and Technological Research Council of Türkiye
TUSIAD	Turkish Industry & Business Association
USA	United States of America
VR	Virtual Reality
WSIS	World Summit on the Information Society
YEGITEK	Innovation and Education Technologies General Directorate

FOREWORD

STEM emerged in the United States (USA) in 2001 as an interdisciplinary educational model. In the academic literature, STEM -Science, Technology, Engineering, and Mathematics- refers to an interdisciplinary approach that does not comply to traditional, subject-specific learning in which science, technology, engineering, and mathematics disciplines are addressed in isolation (Bybee, 2010; Sanders, 2009). By employing an interdisciplinary approach, STEM education aims to enhance students' literacy in science, technology, engineering, and mathematics at all levels of education, from preschool to higher education, while encouraging creativity, collaboration, problem-solving, and communication skills (Altunel, 2018), and equipping individuals with the skills necessary to keep pace with rapidly developing innovations and to succeed in the global economy (English, 2016).

According to Thomasian (2011), STEM education has two main objectives:

(i) To increase students' career preferences in STEM disciplines in higher education,

(ii) To improve students' foundational knowledge in STEM disciplines, thereby enabling them to develop innovative solutions to problems related to these disciplines in their daily lives.

Gaining significant momentum globally, the STEM approach was first introduced in Türkiye through a report published by TUSIAD (2014). The report emphasized the need for individuals educated in STEM fields and equipped with 21st-century skills. Therefore, it recommended creating employment opportunities in STEM fields, increasing the number of students receiving STEM education, and developing STEM skills at all levels of education (Akgündüz et al., 2015; TUSIAD, 2014). In addition, Türkiye's consistently low performance in international assessments such as PISA, TIMSS, and PIAAC has empirically revealed the need for innovative approaches in educational reform (Ministry of National Education [MoNE], 2016). As a result, in 2018, the STEM approach was incorporated into the Science curriculum as a separate component titled "Science, Engineering, and Entrepreneurship Practices" (MoNE, 2018). In parallel, programs such as TUBITAK's 4004 (Education in Nature and Science Camps/Schools Support Program), 4005 (Innovative Educational Applications Support Program), and 4006 (Science Fairs Support Program) have encouraged STEM-based activities and projects. In addition to national supports, within the scope of Türkiye's alignment process with the European Union, numerous project and grant programs such as Erasmus+ and Horizon 2020

have supported teacher education, school curricula, and infrastructure development in the field of STEM. This situation has been reflected in the adoption of strategic objectives related to STEM/STEAM practices in the Ministry of National Education's 2023 Education Vision (2019).

Similarly, many universities have established departments, certificate programs, and research centers focused on STEM education, and these centers have contributed to the dissemination of STEM culture through applied studies and academic publications carried out with a focus on teacher education (Akgündüz & Akpınar, 2018).

In Türkiye, STEM has gained importance as a pedagogical framework that transcends traditional course boundaries and aims to equip students with skills such as finding diverse and alternative solutions to real-life problems, creativity, critical thinking, and teamwork. In recent years, there has been an increasing emphasis on "STEAM" in order to include all branches of the arts and design skills, including "Arts" and "language and literary arts." Although there are localization initiatives such as FeTeMM or alternative usages such as STEM-A and STEM-L, STEM remains the most common and widely used term to refer to this framework in Türkiye.

In this report, this inclusive umbrella, which has evolved into STEAM and even into its more recent derivative STREAM through various additions and continues to evolve, will be referred to as "STEM," as this is the most well-known and widely used term in Türkiye.

Since its establishment in 2015, the Middle East Technical University Science, Technology, Engineering, and Mathematics Education Application and Research Center (BILTEMM) has carried out education, research, and community service activities in the field of STEM.

This report presents all education, research, and community service activities conducted by the METU BILTEMM in 2024.

I would like to express my gratitude to our staff who contributed with their dedicated efforts to the successful completion of 2024, to all partner institutions and their employees, and to the valuable participants who took part in our activities.

Sincerely,

Assoc. Prof. Dr. Göknur Kaplan
METU BILTEMM Director

1. GENERAL INFORMATION

This section presents information regarding the mission and vision of the METU BILTEMM, its physical structure, administrative structure, and human resources.

1.1. Mission and Vision

As the METU BILTEMM, our mission is defined as “carrying out education, research, and community service activities at both national and international levels - especially in the fields of science, technology, engineering, and mathematics education - in order to enhance and develop the knowledge and skills of individuals who are capable of coping with the rapidly changing conditions and problems of the 21st century.”

Our vision defined as “METU BİLTEMM Center will become one of the first application and research centers that come to mind in the field of science, technology, engineering and mathematics education, both nationally and internationally, primarily across the country, through the education, research, and community service activities it conducts.”

1.2. Information About BILTEMM Center

1.2.1. Physical Structure

The METU BILTEMM continues its activities in classroom EF-A 11 (BILTEMM LAB & LEGO Innovation Studio), located in Block A of METU Faculty of Education, which has been allocated to the Center with the contributions and support of the Dean’s Office of the METU Faculty of Education and the Department of Mathematics and Science Education of the METU Faculty of Education. In addition to this classroom, office space has been allocated for academic staff (research assistant) in office EF-A 39, also located in Block A of the METU Faculty of Education, with the contributions and support of the same units. For the use of administrative staff, office EF-A 31, located in Block A of the METU Faculty of Education, has been allocated with the support of the Dean’s Office of the METU Faculty of Education.

1.2.2. BILTEMM LAB (LEGO Education Innovation Studio)

Established in collaboration with LEGO Education, BILTEMM LAB (Learn, Ask, Build) was inaugurated on May 16, 2019, with the participation of the METU Rector Prof. Dr. Mustafa Verşan Kök, LEGO Education Head of East Markets (Middle East and Africa, Southeast Asia,

Pacific and Korea) Villy Outzen, and LEGO Education Türkiye Partner and Teknokta General Manager Fatma Bezek.

BILTEMM LAB houses materials that can be used with students from preschool to high school level and, as described by LEGO Education, for a wide age range "from 9 to 99." For individuals across this broad range, various LEGO Education products aimed at learning and developing different types of knowledge and skills are available. These products, along with their descriptions and applicable age ranges, are presented below:

Preschool	
Product	**Description**
1001 Games of Learning with the Odds and Ends Box	1. Raising awareness of how various everyday odds and ends can enrich the learning journey 2. Developing holistic skills 3. Producing many games with limited materials 4. Supporting the development of imagination
LEGO Education STEAM Park Set	1. Becoming familiar with STEAM concepts 2. Exploring how mechanisms work 3. Using engineering skills and redesigning 4. Developing cognitive, social and emotional skills
Primary School	
Product	**Description**
LEGO Education BricQ Motion Essential Set	1. Reinforcing learning outcomes of core courses 2. Understanding force, motion and energy transformations 3. Exploring how simple machines work 4. Discovering engineering design processes 5. Developing problem solving skills
LEGO Education SPIKE Essential Set	1. Developing problem solving and project creation skills 2. Developing robotic projects using Scratch 3. Enhancing computational thinking skills 4. Discovering engineering design processes 5. Reinforcing learning outcomes of core courses
Middle School & High School	

Product	Description
LEGO Education BricQ Motion Prime Set	1. Reinforcing learning outcomes of core courses 2. Understanding force, motion and energy transformations 3. Exploring how simple machines work 4. Discovering engineering design processes 5. Developing problem solving skills
LEGO Education SPIKE Prime Set	1. Developing critical thinking skills 2. Gaining technology design skills 3. Exploring how simple machines work 4. Experiencing science concepts through hands-on applications 5. Developing robotics projects using Python

The age ranges/levels defined by LEGO Education can be extended to include preservice teachers and in-service teachers. For example, depending on the intended use and the design of the activity to be conducted, the STEAM Park Set, which is used for preschool age groups, can also be used with preservice teachers or teachers. Similarly, depending on the readiness levels of the participants, sets designed for middle school age groups may also be used with primary school students (or vice versa).

In addition to LEGO Education products, BILTEMM LAB is equipped with a three-dimensional (3D) printer. This printer enables the printing of materials that have been designed using 3D modeling. Moreover, non-technological materials, as well as recycled and stationery materials, are available for "unplugged" activities and STEM activities.

BILTEMM LAB has physical facilities suitable for group work, including one competition table used in tournaments such as FIRST LEGO League (FLL), seven tables, and twenty chairs. Its maximum capacity is 21, while its optimal capacity is 18.

1.2.3. Administrative Structure and Human Resources

The administrative structure of the METU BILTEMM consists of the Center Director, the Deputy Director, and the Board of Directors. In order to indicate the human resources of the Center, this section also includes the research assistant and administrative staff who are not part of the administrative board.

At the METU BILTEMM Center, the terms of office for the Director, Deputy Director, and the Board of the Directors are three years. The members of the Board of the Directors serve as academic staff in various departments of METU. One research assistant and one administrative staff member work full-time on behalf of the Center.

Center Director	Assoc. Prof. Dr. Göknur Kaplan, *Department of Computer Education and Instructional Technologies*
Deputy Director	Assoc. Prof. Dr. Engin Karahan, *Department of Mathematics and Science Education*
Executive Board Members	Prof. Dr. Akın Akdağ, *Department of Chemistry* Prof. Dr. Y. Eren Kalay, *Department of Metallurgical and Materials Engineering* (Assoc. Prof. Dr. Sezer Özerinç until the date of 24.10.2024) Assoc. Prof. Dr. Sibel Kazak, *Department of Mathematics and Science Education* (Assoc. Prof. Dr. Hasibe Özlen Demircan until the date of 24.10.2024) Asst. Prof. Dr. Nur Akkuş Çakır, *Department of Educational Sciences*
Research Assistant	Res. Asst. Elçin Erbasan
Administrative Staff	Emrah Demirsoy

2. OBJECTIVES AND GOALS

This section presents information regarding the objectives and goals of the METU BILTEMM.

2.1. Objective

The objective of the METU BILTEMM is to (i) provide individuals from preschool to undergraduate level with the knowledge and skills that will enable them to cope with the changing conditions and problems of the twenty-first century in the fields of science, technology, engineering, and mathematics, (ii) conduct research and development activities in order to encourage students to orient toward these fields, and (iii) contribute to the training of qualified teachers.

2.2. Goal

The goals of the METU BILTEMM are listed below:

1. To organize activities and programs aimed at the education and professional development of teachers, educators, and educational administrators from preschool to undergraduate level in the fields on which the Center focuses.
2. To conduct research and development studies aimed at the development of innovative approaches and products in science, mathematics, technology, and engineering education, and to provide researchers with resources and infrastructural support.
3. To develop massive open online courses for science, mathematics, technology, and engineering education.
4. To carry out product development studies for science, mathematics, technology, and engineering education and to obtain patents.
5. To develop projects and programs to provide high-quality educational opportunities for students who are disadvantaged in terms of gender, socioeconomic status, access to resources, and similar factors.
6. To support excellence in science, mathematics, technology, and engineering education and to ensure the sharing of national and international best practices.

3. ACTIVITIES

This section presents information regarding the activities carried out by the METU BILTEMM throughout the year 2024.

3.1. Meeting

1. Meeting for Introduction and Collaboration with Teachers of Prof. Dr. Aziz Sancar Science and Art Center (BILSEM) – METU – January 9, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan – 8 participants
2. BILTEMM Center Activities Conducted/Planned Meeting (Internal Meeting #1) – METU – March 6, 2024 – Participant(s): Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan
3. BILTEMM Center Activities Conducted/Planned Meeting (Internal Meeting #2) – METU – March 13, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan
4. Meeting for Introduction, Collaboration, and Education Planning with Teachers of Prof. Dr. Aziz Sancar BILSEM – Prof. Dr. Aziz Sancar BILSEM – March 20, 2024 – Participant(s): Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan – 15 participants
5. BILTEMM Center Activities Conducted/Planned Meeting (Internal Meeting #3) – METU – March 26, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Res. Asst. Elçin Erbasan
6. BILTEMM Center Activities Conducted/Planned Meeting (Internal Meeting #4) – METU – March 27, 2024 – Participant(s): Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan
7. ABE Türkiye Teachers' Meeting (As part of Amgen Biotechnology Experience Project) – METU – May 12, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan – 30-35 participants
8. MEET-UP '24 (Matematik Eğitimi Etkileşim Topluluğu - National Sharing Event) – Ankara University – May 25, 2024 – Participant(s): Res. Asst. Elçin Erbasan – Approximately 250 participants

9. STEAMigPOWER Training of Trainees (As part of STEAMigPOWER Project) – Universitat de Barcelona – June 16-22, 2024 – Participant(s): Assoc. Prof. Dr. Engin Karahan – 30 participants
10. BILTEMM Center Activities Conducted/Planned Meeting (Internal Meeting #5) – METU – June 25, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan
11. Meeting for Introduction and Collaboration with the AFEM (Association of Businesswomen of Morocco) Delegation (As part of MSCA Studies - DIG Project) – METU – September 11, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan – 7 participants
12. Amgen Biotechnology Experience (ABE) Program – 1 Million Students Event – Gazi Vocational and Technical Anatolian High School – September 19, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Res. Asst. Elçin Erbasan – 25 participants
13. BILTEMM Center Activities Conducted/Planned Meeting (Internal Meeting #7) – METU – October 2, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan – 3 participants
14. Promotion and Collaboration Meeting for METU Faculty of Education Academic Staff – METU – October 10, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan, Emrah Demirsoy – 7 participants
15. Meeting for Introduction and Collaboration with FCL Ambassadors (organized by MoNE YEGITEK and MoNE ETKIM) – METU – October 22, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Res. Asst. Elçin Erbasan – 14 participants
16. Meeting for Introduction and Collaboration with the Delegation of Manisa Celal Bayar University (As part of STREAM It Up Project) – METU – November 4, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan – 5 participants
17. ABE Program Kars - Phase 1 Training - Introduction Meeting (As part of Amgen Biotechnology Experience Project of Kalkınma Atölyesi) – Online – November 13, 2024 – Participant: Res. Asst. Elçin Erbasan – 20 participants
18. BILTEMM Center Activities Conducted/Planned Meeting (Internal Meeting #8) – METU – December 6, 2024 – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Res. Asst. Elçin Erbasan, Emrah Demirsoy – 4 participants

3.2. Conference

1. Digital Teachers METU In-Person Meeting (As part of Digital Teachers Project) – METU Rector Prof. Dr. Ahmet Yozgatlıgil, ING Türkiye General Manager Alper Gökgöz, Habitat Association Executive Board Chair Bora Caldu, Assoc. Prof. Dr. Göknur Kaplan, Serdar Kuzuloğlu, Prof. Dr. Kürşat Çağıltay, Dr. Ayşe Gül Kara Aydemir, Dr. Funda Alptekin – METU – November 30, 2024 – 250 participants

3.3. Seminar

1. TUBITAK Science Talks – Karşıyaka Necip Demir Vocational and Technical Anatolian High School – Assoc. Prof. Dr. Göknur Kaplan – İzmir – March 7, 2024 – 50 participants
2. TUBITAK Science Talks – Gazeteci Çetin Altan Vocational and Technical Anatolian High School – Assoc. Prof. Dr. Göknur Kaplan – İzmir – March 7, 2024 – 70 participants
3. TUBITAK Science Talks – Alp Oğuz Anatolian High School – Assoc. Prof. Dr. Göknur Kaplan – İzmir – March 8, 2024 – 100 participants
4. Etkili Öğretim için Yenilikçi Teknolojiler: Geçmiş, Bugün ve Gelecek (As part of Digital Teachers Project) – Prof. Dr. Kürşat Çağıltay – Online – March 17, 2024 – 700–800 participants
5. Eğitimde Üretken Yapay Zekâ Nedir? Nasıl Kullanırım? (As part of Digital Teachers Project) – Assoc. Prof. Dr. Olgun Sadık – Online – April 28, 2024 – 600-700 participants
6. Öğrenme Serüveninde Oyunlaştırma Yolculuğu: Etkili Bileşenler ve Uygulama İpuçları (As part of Digital Teachers Project) – Assoc. Prof. Dr. Selay Arkün Kocadere – Online – May 22, 2024 – 500 participants
7. Türkiye'de STEAM Eğitimi: Kadının Güçlendirilmesi ve STEAM (As part of STEAMigPOWER Project) – Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Engin Karahan, Assoc. Prof. Dr. Sevinç Gelmez Burakgazi, Asst. Prof. Dr. Sultan Çıkrık – METU – May 29, 2024 – 50 participants
8. Oyunlaştırabildiklerimizden misiniz? – Assoc. Prof. Dr. Göknur Kaplan – Online – June 26, 2024 – 396 participants

9. Etkili Öğretim için Yenilikçi Teknolojiler: Geçmiş, Bugün ve Gelecek (As part of Digital Teachers Project) – Prof. Dr. Kürşat Çağıltay – Online – October 6, 2024 – 700 participants
10. Oyunlaştırabildiklerimizden misiniz? (As part of MoNE YEGITEK Teacher Seminars) – Assoc. Prof. Dr. Göknur Kaplan – Online – October 22, 2024 – 100 participants
11. Eğitimde Yapay Zekâ Araçlarının Kullanımı (As part of Digital Teachers Project) – Melih Özbek – Online – October 27, 2024 – 600 participants
12. Üretken Yapay Zekâ vs. Organik Yaratıcı Zekâ (As part of the 10th Intelligence and Talent Congress) –Assoc. Prof. Dr. Göknur Kaplan – METU – November 16–17, 2024 – 500 participants
13. STEM Eğitimi ve Uygulamaları (As part of collaboration with the METU Education Society) – Assoc. Prof. Dr. Engin Karahan – METU – November 28, 2024 – 25 participants
14. Bilim, Kurgu Ama Gerçek: Üretken YZ ve Eğitimde Yeni Paradigma (As part of Digital Teachers Project) – Assoc. Prof. Dr. Aras Bozkurt – Online – December 8, 2024 – 500 participants

3.4. Project

1. DataSETUP Project
2. Digital Teachers Project

3.5. Collaboration

1. Within the scope of DataSETUP Porject:
    a. The University of Münster
    b. The University of Paderborn
    c. Mary Immaculate College
    d. European University Cyprus
    e. The National and Kapodistrian University of Athens
2. Within the scope of Digital Teachers Project
    a. ING Türkiye
    b. Habitat Association

3.6. Workshop

1. Workshop on Current Approaches in Education and the BILTEMM Center (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Assoc. Prof. Dr. Göknur Kaplan – Prof. Dr. Aziz Sancar Science and Art Center – April 17, 2024 – 16 participants
2. LEGO Education Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Res. Asst. Elçin Erbasan – METU – April 26, 2024 – 13 participants
3. LEGO Education Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Res. Asst. Elçin Erbasan – METU – May 3, 2024 – 9 participants
4. LEGO Education Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Res. Asst. Elçin Erbasan – METU – May 10, 2024 – 10 participants
5. LEGO Education Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Res. Asst. Elçin Erbasan – METU – May 16, 2024 – 9 participants
6. LEGO Education Workshop (As part of the MSE702 course for master's and doctoral students) – Res. Asst. Elçin Erbasan – METU – May 20, 2024 – 9 participants
7. Coding Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Assoc. Prof. Dr. Göknur Kaplan – METU – May 22, 2024 – 9 participants
8. Köprü Kurma Etkinliği: Bir STEM Atölyesi (for students, preservice teachers, teachers, and academics within the scope of the III. National Classroom Teaching Student Conference) – Asst. Prof. Dr. Mehmet Şen, Res. Asst. Elçin Erbasan, Sena Çoğan, Ceren Öngüner, Berfin Bakır, Zehra Halavurt – TED University – May 22, 2024 – 25 participants
9. LEGO Education Workshop (As part of the ECE310 course for 3rd-year students in the Early Childhood Education Department) – Res. Asst. Elçin Erbasan – METU – May 28, 2024 – 19 participants
10. AR & VR Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Assoc. Prof. Dr. Göknur Kaplan – METU – May 29, 2024 – 7 participants
11. STEAM Education and Applications Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Assoc. Prof. Dr. Engin Karahan – METU – June 7, 2024 – 10 participants
12. Design Thinking Workshop (For teachers of Prof. Dr. Aziz Sancar BILSEM) – Assoc. Prof. Dr. Göknur Kaplan – METU – June 13, 2024 – 11 participants
13. METU DFS ETATHLON – Interdisciplinary, Technology-Enriched Gamification Design Workshop (For teachers of METU DFS Mersin, İzmir, Kayseri, and Denizli

Schools) – Assoc. Prof. Dr. Göknur Kaplan – Online – June 26–28, 2024 – 74 participants

14. AR & VR Workshop (For teachers who qualified for Phase 2 within the scope of the Digital Teachers Project) – Assoc. Prof. Dr. Göknur Kaplan – Online – June 2024 – 120 participants
15. Oyunlaştırabildiklerimizden misiniz? – Assoc. Prof. Dr. Göknur Kaplan – METU DFS Schools – July 26–28, 2024 – 450 participants
16. LEGO Education Workshop (As part of the EDS304 course for METU Faculty of Education students) – Res. Asst. Elçin Erbasan – METU – October 16, 2024 – 13 participants
17. Coding Workshop (Within the scope of EU Code Week, for students of Prof. Dr. Aziz Sancar BILSEM) – Res. Asst. Elçin Erbasan – METU – October 19, 2024 – 11 participants
18. Metaverse (VR/AR) Workshop (within the scope of EU Code Week, for METU FLE students) – Assoc. Prof. Dr. Göknur Kaplan – METU – October 21–24, 2024 – 130 participants
19. LEGO Education Workshop (As part of the MSE473 course, METU Faculty of Education students - Week 1) – Res. Asst. Elçin Erbasan – METU – December 3, 2024 – 17 participants
20. LEGO Education Workshop (As part of the ED450 course, TED University Faculty of Education students) – Res. Asst. Elçin Erbasan – METU – December 5, 2024 – 12 participants
21. Coding Workshop (As part of the MSE473 course, METU Faculty of Education students - Week 2) – Res. Asst. Elçin Erbasan – METU – December 10, 2024 – 16 participants
22. LEGO Education Workshop ("Discovering the Science of Sports," organized in collaboration with the METU Education Student Society) – Res. Asst. Elçin Erbasan – METU – December 26, 2024 – 12 participants
23. LEGO Education Workshop (As part of the CEIT319 course, METU Faculty of Education students) – Res. Asst. Elçin Erbasan – METU – December 31, 2024 – 4 participants

3.7. Article

1. Piri, Z., **Kaplan, G.,** & Çağıltay, K. (2024). Enhancing Cognitive Fit: Exploring the Potential of Mixed Reality for Developing Mental Rotation Skills. *International Journal of Human–Computer Interaction*, 1-16.

3.8. Conference Paper

1. Piri, Z., **Kaplan, G**., Çağıltay, B., & Çağıltay, K. (2024, June). Holomental: Improving Mental Rotation Ability with Mixed Reality. In Proceedings of the *2024 International Conference on Advanced Visual Interfaces* (pp. 1-3).
2. Tunga, Y., **Kaplan, G.**, & Çağıltay, K. (2024). Exploring Faculty Members' Gaze Distribution in Higher Education Classrooms. In Proceedings of *EDULEARN24* (p. 3529).

3.9. Book/Book Chapter

1. Namdar, B., & **Karahan, E.** (Eds.). (2024). Socioscientific Issues Focused Teacher Education: Place-Based Practices from Türkiye. Springer Nature.
2. Namdar, B., & **Karahan, E.** (2024). New Directions for Place-Based Socioscientific Issue Instruction and Research. In *Socioscientific Issues Focused Teacher Education: Place-Based Practices from Türkiye* (pp. 215-220). Cham: Springer Nature Switzerland.
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3.10. Poster Presentation

1. Mathematics Education Platform: Advanced Training Supported by Mathematical Modeling – Poster presented at METU Undergraduate Research Day by undergraduate students Beyza Özcan, Belgin Ersoy, Berk Ersoy, and Çağla Güven under the

supervision of Assoc. Prof. Dr. Göknur Kaplan, Assoc. Prof. Dr. Bülent Çetinkaya, and Prof. Dr. Ayhan Kürşat Erbaş – METU – December 25, 2024 – 290 participants

3.11. Master's Thesis

1. Altınsoy, Z. (2024). Exploring user experience and perceptions of a location-based augmented reality game: the case of METU Discover [Master's thesis, Middle East Technical University].
   Thesis Advisor: Doç. Dr. Göknur Kaplan

3.12. Award

1. World Summit on the Information Society (WSIS) Awards – First Prize in the Capacity Building category – Digital Teachers Project

3.13. Consultancy

1. Kalkınma Atölyesi – Doç. Dr. Göknur Kaplan

4. ASSESSMENT OF INSTITUTIONAL CAPACITY

This section presents information regarding the general assessment of the METU BILTEMM by addressing its strengths and weaknesses.

4.1. Strengths

1. Operating as an application and research center in the field of education under the well-known and respectable name of METU, which is an important brand of Türkiye.
2. Carrying out education, research, and community service activities in the fields of STEAM education and approaches simultaneously with developments abroad.
3. Becoming one of the pioneering institutions in Türkiye in these fields by starting its operations in 2015, at a time when STEAM education and approaches were on the global agenda.
4. Having an institutional culture despite limited human resources (one actively working director, one deputy director, one research assistant, and one administrative staff member).
5. Having highly motivated, determined, and hardworking staff to achieve the Center's goals, realize its potential, and carry out education, research, and community service activities.
6. Establishing collaborations with competent institutions, organizations, and individuals at national and international levels.
    a. BILTEMM LAB is one of the limited numbers of LEGO Education Innovation Studios in Türkiye. The lesson plans designed by LEGO Education have been translated into Turkish by the Center staff, and learning outcome alignment has been conducted with the curricula used in our country. Collaboration with LEGO Education continues.
    b. In collaboration with the Amgen Foundation and Kalkınma Atölyesi, the Amgen Biotechnology Experience, an innovative educational program that provides professional development activities, curriculum materials, equipment, and supplies to teachers working in secondary education schools, has been designed.
    c. Primary and secondary school teachers were able to step into the digitalizing world, gain digital literary skills they can use in face-to face and distance education and contribute in Türkiye's digital transformation process with

collaborations made in Digital Teachers Project.

d. Collaborations with Ministry of National Education especially about teacher training are continued.

4.2. Weaknesses

1. Since BILTEMM LAB has been allocated to the Center with the contributions and support of the METU Faculty of Education Dean's Office and the METU Faculty of Education Department of Mathematics and Science Education, this classroom is not the permanent location of the METU BILTEMM Center. Similarly, the research assistant and administrative staff are located in shared offices with the Faculty of Education staff. The Center needs permanent offices for academic and administrative staff within the Center, a meeting room, and a larger classroom for BILTEMM LAB.
2. There is a need for more personnel in order to reach a greater number of students, pre-service teachers, and teachers through the education, research, and community service activities carried out within the Center.
3. Due to the decrease in visibility during the distance education period of the increased recognition within METU (especially the Faculty of Education) and outside METU that had been achieved through education, research, and community service activities conducted before the COVID-19 closures, there is a need for greater sharing and dissemination of the Center's activities.

4.3. Assessment

The strengths of the METU BILTEMM should be preserved and efforts should be made to further strengthen them. The Center, which has very high potential in terms of education, research, and community service activities, needs to improve its weaknesses. In this way, it will be able to realize its potential. Providing an environment suitable for multidisciplinary work, the Center conducts workshops, seminars, projects, research, and community service activities.

5. RECOMMENDATIONS AND MEASURES

This section presents information regarding the recommendations and measures related to the activities of the METU BILTEMM.

METU BİLTEMM Center has the opportunity of being one of the active factors in new structuring, in instances of change and innovation efforts directed at every level of education, even at the instance of a dynamic and unpredictable context, in which it can turn these uncertainties into opportunity.

In order to make the most effective use of this opportunity, first and foremost, the problems related to physical space and personnel need to be resolved. When collaborations are established to carry out and strengthen education, research, and community service activities, the absence of a place to host the individuals/institutional representatives involved in these collaborations may primarily harm the visibility and ultimately the reputation of the Center and the University. Similar to the issue related to physical space, the lack of personnel causes some of the tasks that need to be carried out simultaneously in different areas to be disrupted or, when prioritization is required, to be unintentionally abandoned. This situation reduces the efficiency of the activities carried out and leads to the Center's inability to fully realize its potential.

It is recommended that weaknesses be addressed, and strengths be further strengthened.

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