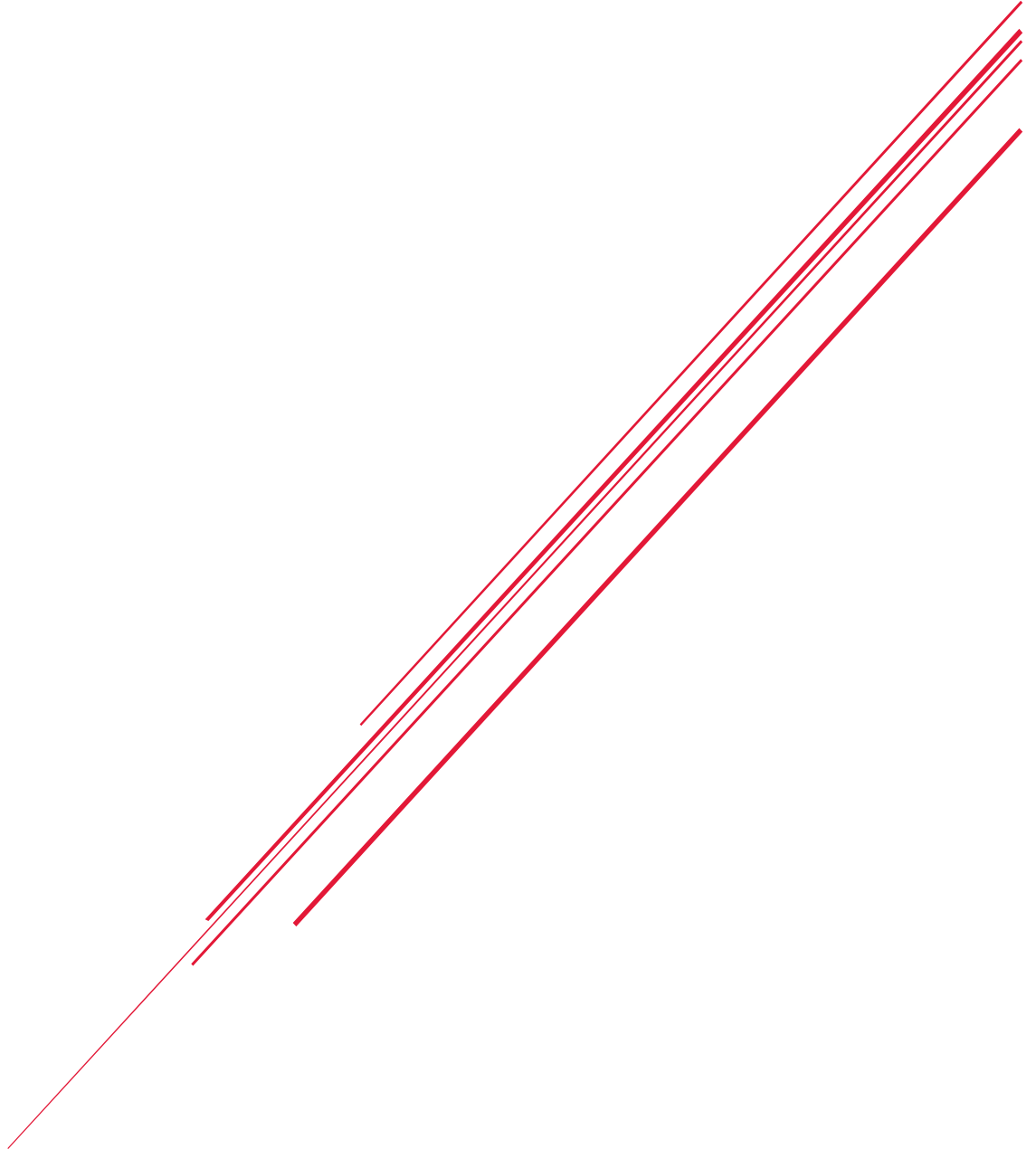




**ORTA DOĞU TEKNİK ÜNİVERSİTESİ**

**CENTER FOR SCIENCE, TECHNOLOGY, ENGINEERING, AND  
MATHEMATICS EDUCATION**

**2023 ANNUAL ACTIVITY REPORT**



**JANUARY 2024  
ANKARA**



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## ABBREVIATIONS

ABE	Amgen Biotechnology Experience
BILTEMM	Center for Science, Technology, Engineering, and Mathematics Education
ECE	Early Childhood Education
EDUSIMSTEAM	Fostering STEAM Education in Schools
ETKIM	Educational Technology Incubation and Innovation Center
EU	European Union
FLE	Foreign Language Education
LAB	Learn-Ask-Build
MaTeK	Enhancement of Research Excellence in Mathematics Teacher Knowledge
MEB & MoNE	Ministry of National Education
MEET	Mathematics Education Interaction Community
METU	Middle East Technical University
MIT	Massachusetts Institute of Technology
MSE	Mathematics and Science Education
NTNU	Norwegian University of Science and Technology
OYGM	Teacher Training and Development General Directorate
STEAM	Science, Technology, Engineering, Arts, Mathematics
STEM	Science, Technology, Engineering, Mathematics
TED	The Turkish Education Association
TUBITAK	The Scientific and Technological Research Council of Türkiye
YEGITEK	Innovation and Education Technologies General Directorate

## **FOREWORD**

We have completed education, research and community service activities conducted in 2023 as Middle East Technical University, Center for Science, Technology, Engineering and Mathematics Education.

This report presents all the activities conducted by the METU BILTEMM in the year of 2023.

I would like to express my gratitude to our staff who contributed with their dedicated efforts to the successful completion of 2023, to all partner institutions and their employees, and to the valuable participants who took part in our activities.

Sincerely,

Assoc. Prof. Dr. Gökür Kaplan  
METU BILTEM Director

## **1. GENERAL INFORMATION**

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

### **1.1. Mission and Vision**

#### **1.1.1. Mission**

METU BILTEMM, carries 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.

#### **1.1.2. Vision**

METU BILTEMM 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 METU BILTEMM**

#### **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. 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.

<b>Director</b>	Assoc. Prof. Dr. Göknur Kaplan, <i>Department of Computer Education and Instructional Technology</i> (Prof. Dr. Erdiñ Çakırođlu until the date of 01.11.2023)
<b>Deputy Director</b>	Assoc Prof. Dr. Engin Karahan, <i>Department of Mathematics and Science Education</i> (Assoc. Prof. Dr. Göknur Kaplan until the date of 01.11.2023)
<b>Board of Directors</b>	Prof. Dr. Akın Akdađ, <i>Department of Chemistry</i> Assoc. Prof. Dr. Hasibe Özlen Demircan, <i>Department of Elementary and Early Childhood Education</i> Assoc. Prof. Dr. Sezer Özeriñç, <i>Department of Mechanical Engineering</i> Asst. Prof. Dr. Nur Akkuş Çakır, <i>Department of Educational Sciences</i>
<b>Research Assistant</b>	Res. Asst. Elçin Erbasan
<b>Administrative Staff</b>	Emrah Demirsoy

## **2. OBJECTIVES AND GOALS**

This section presents information regarding 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 2023.

#### 3.1. Meeting

1. MEET '23 ((Matematik Eğitimi Etkileşim Topluluğu - National Sharing Event) – May 20, 2023 – Konya (The event took place in Konya Necmettin Erbakan University with the collaborations of METU BILTEMM, TED University Department of Mathematics and Science Education, TED University Maths-Up student society and Matematik Gazetesi)
2. Scenario Development Workshop (Technology-focused Learning Scenarios & ETKİM) – Assoc. Prof. Dr. Göknur Kaplan (Attended as a senior mentor) – November 29-December 1, 2023

#### 3.2. Conference

1. LEGO Education Teacher Conference (With the collaborations of LEGO Education, Teknokta, ETKİM and METU BILTEMM) – Participant(s): Assoc. Prof. Dr. Göknur Kaplan, Res. Asst. Elçin Erbasan

#### 3.3. Seminar

1. New Semester Opening Seminar of Digital Teachers (As part of Digital Teachers Project) – Assoc. Prof. Dr. Göknur Kaplan – January 19, 2023
2. Dijital Öğretmenler Travmaya Duyarlı Sınıflar için Buluşuyor (As part of Digital Teachers Project) – Prof. Dr. Özgür Erdur Baker – March 3, 2023
3. Eğitimde Dijital Dönüşüm ve Öğretmenin Rolü (As part of Digital Teachers Project) – Assoc. Prof. Dr. Göknur Kaplan – March 9, 2023
4. STEAM Learning Scenarios (Within the scope of EDUSIMSTEAM Project) – Prof. Dr. Erdiñ Çakırođlu – April 25, 2023
5. Etkili Öğretim için Yenilikçi Teknolojiler: Geçmiş, Bugün ve Gelecek (As part of Digital Teachers Project) – Prof. Dr. Kürşat Çağıltay – May 7, 2023
6. Dijital Vatandaşlık & Okul Temelli Mesleki Gelişim (As part of Ministry of National Education/In-service Teacher Training Protocol) – Assoc. Prof. Dr. Göknur Kaplan – May 22-26, 2023 – Turhan Dökmeci Primary School

7. Teknoloji Çağında Sağlık (As part of Digital Teachers Project) – Prof. Dr. Ayşe Bilge Selçuk – May 30, 2023
8. Sürdürülebilirlik için Yıkıcı Bir Teknoloji Nasıl Yaratıcı Olabilir? (As part of Digital Teachers Project) – Assoc. Prof. Dr. Dicle Yurdakul – June 18, 2023
9. “Oyunlaştırabildiklerimizden misiniz?” seminar (As part of ODTÜ GVO Ankara Schools Etathlon Competition) – Assoc. Prof. Dr. Göknur Kaplan – August 23-25, 2023
10. “Etkili Öğretim için Yenilikçi Teknolojiler: Geçmiş, Bugün ve Gelecek” seminar (As part of Digital Teachers Project) – Prof. Dr. Kürşat Çağiltay – October 8, 2023
11. “Yenilikçi Öğretmenlerle Eğitimin Geleceğine Doğru” seminar (As part of LEGO Education Teacher Conference and with the collaborations of LEGO Education, Teknokta, ETKİM and METU BILTEMM) – Assoc. Prof. Dr. Göknur Kaplan (invited speaker) – October 16, 2023
12. “Dijital Vatandaşlık Eğitici Eğitimi” seminar (As part of The European Union/Council of Europe joint program “Horizontal Facility for the Western Balkans and Turkey – Phase III”, Digital Citizenship Training Pilot Project conducted by MoNE) – Assoc. Prof. Dr. Göknur Kaplan – October 17-19, 2023
13. “Yarını Şekillendirmek: Yenilikçilik ve Yaratıcılığı Ateşlemek” seminar (OSTİM Technopolis MANTAR Cultivation and Technology Commercialization Center) – Assoc. Prof. Dr. Göknur Kaplan – November 3, 2023
14. “Yapay Zekanın Öğretmeni Kim?” seminar – (As part of Digital Teachers Project) – Dr. Mustafa Coşkun – November 12, 2023
15. “Yeni Yüzyılda Bilim ve Matematik Eğitimi: STEM/STEAM Yaklaşımı ve Geleceği” seminar (As part of Digital Teachers Project) – Prof. Dr. Erdiñ Çakırođlu – November 26, 2023
16. Scenario Developing Workshop – Prof. Dr. Erdiñ Çakırođlu (invited speaker) – November 29-December 1, 2023
17. TUBITAK Science Talks – Eskişehir Girls’ Anatolian Imam Hatip High School – Assoc. Prof. Dr. Göknur Kaplan – December 1, 2023
18. TUBITAK Science Talks – Şehit Aytakin Kuru Anatolian High School – Assoc. Prof. Dr. Göknur Kaplan – December 8, 2023
19. TUBITAK Science Talks – Trabzon 15 Temmuz Şehitleri Anatolian High School – Assoc. Prof. Dr. Göknur Kaplan – December 15, 2023
20. TUBITAK Science Talks – Kanuni Vocational and Technical Anatolian High School – Assoc. Prof. Dr. Göknur Kaplan – December 22, 2023

21. “Tasarım Odaklı Düşünme ve Oyunlaştırma” seminar (As part of ABE Türkiye Scholarship Program by Amgen Biotechnology Experience (ABE)) – Assoc. Prof. Dr. Göknur Kaplan – December 27, 2023

### **3.4. Course**

1. MIT App Inventor Activity (As part of EU Code Week / CEIT 319 course for FLE students) – Assoc. Prof. Dr. Göknur Kaplan – October 10-12, 2023

### **3.5. Project**

1. EDUSIMSTEAM (Erasmus+)
2. Digital Teachers Project

### **3.6. Collaboration**

1. Within the scope of EDUSIMSTEAM (Erasmus+)
  - a. Ministry of National Education, Innovation and Education Technologies General Directorate (MEB YEGITEK)
  - b. Robotsan
  - c. RidersAI
  - d. Kaunas Technology University (Lithuania)
  - e. Vilnius University (Lithuania)
  - f. Blackrock Education Center (Ireland)
  - g. H2 Learning (Ireland)
  - h. CTEM Academy (Portugal)
  - i. Both Social (the Netherlands)
  - j. Ministry of Education (Spain)
2. Within the scope of Digital Teachers Project
  - a. ING Türkiye
  - b. Habitat Association
3. Within the scope of Ministry of National Education/In-service Teacher Training Protocol:
  - a. Ministry of National Education, Teacher Training and Development General Directorate (MEB OYGM)
1. Within the scope of LEGO Education Teacher Conference:

- a. LEGO Education
- b. Teknokta
- c. Ministry of National Education, Educational Technology Incubation and Innovation Center (MEB ETKİM)

### **3.7. Conference Paper**

1. Başer-Kanbak, C., **Erbasan, E.**, Baran-Saraç, A. B., Akın, G. & Uzuntiryaki-Kondakçı, E. (2023, August 21-25). *Predicting pre-service teachers' attitudes towards STEM education through sustainability awareness*. [Conference presentation]. European Conference on Educational Research (ECER 2023), Glasgow, Scotland.

### **3.8. Workshop**

1. Robotics and Coding Workshop (For ECE department 3rd-year students) – Res. Asst. Elçin Erbasan – May 11, 2023
2. 10 Parmağında 10 Marifet (As part of LEGO Education Teacher Conference) – Assoc. Prof. Dr. Göknur Kaplan, Res. Asst. Elçin Erbasan – October 16, 2023 (Note: The same workshop was conducted with different participants all day long.)
3. LEGO Education Workshop (For ESE department 4th-year students as part of the course MSE 473) – Res. Asst. Elçin Erbasan – December 12, 2023

### **3.9. Other**

#### **3.9.1. Scientific Activity**

1. “STEAM Learning Scenarios” podcast (As part of EDUSIMSTEAM Project) – Prof. Dr. Erdinç Çakıroğlu, Dr. Michael Hallissy – May 9, 2023

#### **3.9.2. Seminar & Training (Received by the Center)**

1. Computational Thinking and Programming in Norway: Examples from Primary and Lower Secondary Schools (As part of MaTeK Project) – Assoc. Prof. Dr. Melih Turgut, NTNU – January 18, 2023 – Participant(s): Prof. Dr. Erdinç Çakıroğlu, Res. Asst. Elçin Erbasan
2. The Role of Frameworks in Mathematics Education Research (As part of MaTeK Project) – Prof. Dr. Birgit Pepin, NTNU – March 13, 2023 – Participant(s): Res. Asst.

Elçin Erbasan

3. STEAM Policy in Project Partner Countries (As part of EDUSIMSTEAM Project) – Dr. Michael Hallissy, H2 Learning – June 6, 2023 – Participant(s): Prof. Dr. Erdinç Çakıroğlu
4. STEAM-based Thematics for Deep Learning (As part of EDUSIMSTEAM Project) – Prof. Dr. Piet Kommers, Both Social – June 13, 2023 – Participant(s): Prof. Dr. Erdinç Çakıroğlu
5. The Development of 5-8 Years Old Children’s Maturation and the Communication Codes Used in Their Argumentation (As part of MaTeK Project) – Dr. Michaela Kaslová – October 15, 2023 – Participant(s): Res. Asst. Elçin Erbasan
6. One Topic, Two Lenses: How the Philosophy of Textbook Can Influence the Teaching/Learning Process (As part of MaTeK Project) – Dr. Mária Slavíčková – October 15, 2023 – Participant(s): Res. Asst. Elçin Erbasan
7. Concrete Manipulatives for Advanced Mathematics: An In-progress Example (As part of MaTeK Project) – Dr. Benedetto Di Paola, Dr. Pietro Milici – December 15, 2023 – Participant(s): Res. Asst. Elçin Erbasan

### **3.9.3. Meeting with Active Participation**

1. International EDUSIMSTEAM Innovative Practices and Policy Making STEAM Education Conference (As part of EDUSIMSTEAM Project) – Santiago de Compostela, Spain – May 23-24, 2023 – Participant(s): Prof. Dr. Erdinç Çakıroğlu
2. EDUSIMSTEAM Project Meeting – Online – June 11-13, 2023 – Participant(s): Prof. Dr. Erdinç Çakıroğlu

### **3.9.4. Master’s Thesis**

1. Paşalı, Y. (2023). *Measuring digital literacy: Development and validation of an instrument for teachers*. [Master’s thesis, Middle East Technical University].  
Advisor: Assoc. Prof. Dr. Göknur Kaplan
2. Orhak, S. (2023). *A Kirkpatrick model perspective on the transformative power of the digital teachers project*. [Master’s Thesis, Middle East Technical University].  
Advisor: Assoc. Prof. Dr. Göknur Kaplan
3. Özdemir, M. (2023). *Turkish teachers’ gamification user types and preferences of game elements for their instruction*. [Master’s Thesis, middle East Technical University].

Advisor: Assoc. Prof. Dr. Göknur Kaplan

### 3.9.5. Doctoral Dissertation

1. Piri, Z. (2023). *Measuring and improving mental rotation ability in three dimensions: A holistic investigation*. [Doctoral dissertation, Middle East Technical University].  
Advisor: Assoc. Prof. Dr. Göknur Kaplan
2. Şat, M. (2023). *Design and development of e-textile supported STEAM-based activities for the professional development of middle school science teachers*. [Doctoral dissertation, Middle East Technical University].  
Advisor: Assoc. Prof. Dr. Göknur Kaplan
3. Tunga, Y. (2023). *Instructors' gaze distribution in higher education classrooms: A multi case study*. [Doctoral dissertation, Middle East Technical University].  
Advisor: Assoc. Prof. 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 literacy 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. Thanks to collaborations made in EDUSIMSTEAM Project, a teacher training framework was developed with an innovative and multidisciplinary approach in STEAM education, learning scenarios containing real life problems were prepared and STEAM learning scenarios supported with simulations in innovative online platforms were communicated to stakeholders.
- e. 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 BİLTEMME.

METU BİLTEMME 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.