

2nd International STEM Education Conference

Abstract Book

August 28-29, 2021
Nevşehir - Turkey

Editor: Assoc. Prof. Hasan Özcan



Co-funded by the
Erasmus+ Programme
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PUSULA 20 TEKNOLOJİ VE YAYINCILIK A.Ş

2nd International STEM Education Conference Abstract Book

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Conference Program

Time	August 28, 2021	August 29, 2021	Time
08.00-08.30	Registration		
08.30-09.00	Opening Ceremony		
09.00-09.15	Coffee Break	Parallel Sessions 3	09.00-10.00
09.15-10.15	Parallel Sessions 1	Coffee Break	10.00-10.15
10.15-10.30	Coffee Break	Parallel Sessions 4	10.15-11.15
10.30-11.30	Parallel Workshops 2	Coffee Break	11.15-11.30
11.30-12.30	Lunch	Lunch	11.30-12.30
12.30-13.30	Paralel Workshoplar 1	Parallel Workshops 3	12.30-13.30
13.30-13.45	Coffee Break	Coffee Break	13.30-13.45
13.45-14.45	Parallel Sessions 2	Authors Meeting	13.45-15.00
14.45-16.45	STEM Show Time / Playground-STEM Expo	Closing Ceremony	15.00-15.30

28 August 2021
Açılış Töreni
Sunucu: Sibel Ünlü

Time	Author(s)	Title	Room
08:30-09:00	Hasan Özcan	STEM PD	1
	Gültekin Çakmakçı	Sosyobilimsel Konular ve STEM Eğitimi	
	Mustafa Hilmi Çolakoğlu	STEM Eğitimi Politikaları	
	Nagif Hamzayev	Azerbaycan'da STEM Eğitimi Politikaları	

Plenary Sessions 1

(August 28, 2021, 09.15-10.15)

August 28, 2021 Plenary Session - 1 Chair: Hakkı İlker Koştur			
Time	Author(s)	Title	Room
09.15-10.15	Emine Şahin Topalcengiz	STEM PD	1
	Burçin Acar Şeşen	Development of Toothpaste Formulation Designed as STEM Module	
	Iqrar Nazarov	Integrating STEAM approaches in Azerbaijan public schools: Outcomes of the "STEAM Azerbaijan" project	

28 August 2021 Plenary Session - 2 Chair: Davut Sarıtaş			
Time	Author(s)	Title	Room
09.15-10.15	Selin Külegel Ünsal Umdu Topsakal	Astronomi Eğitiminde STEM Etkinliğinin Geliştirilmesi: "Uzay Çöpleri Bizden Uzaklaşsın"	2
	Mirvari Şükürova	Sürdürülebilir Kalkınma: Doğaya Geri Dönüşüm Projesi	
	Davut Sarıtaş	Mühendislik Tasarıma Dayalı STEM Eğitiminde Hümanistik Bağlam; Sosyobilimsel ve Sosyokültürel Boyutların Entegrasyonu	

August 28, 2021 Plenary Session - 3 Chair: Özdemir Tiflis			
Time	Author(s)	Title	Room
09.15-10.15	Ülkü Kale Karaaslan	Erken Çocuklukta Matematiksel Modelleme	3
	Yegana Ramazanova	STEM Gönüllüleri	
	Ebru Büşra Yılmaz Özdemir Tiflis	Erken Çocukluk Döneminde STEM Eğitiminin Sayı Hissinin Gelişimine Etkisi	

August 28, 2021
Plenary Session - 4
Chair: Celal Karaca

Time	Author(s)	Title	Room
09.15-10.15	Selçuk Yusuf Arslan	Sürdürülebilir Kalkınma Amaçlarının Gerçekleştirilmesinde STEM Yaklaşımının Kullanılmasına Yönelik Öğretmen Görüş ve Önerileri	4
	Orhan Yılmaz	Disiplinlerarası STEM Eğitimi ile Kimyasal Bağ Kavramının Öğretiminde Materyal Tasarımına Yönelik Öğrenci Görüşlerinin İncelenmesi	
	Celal Karaca	Ters Yüz Öğrenme Modelinin Öğrenme Kalıcılığına Etkisi	

Plenary Workshops 1

(August 28, 2021, 10.30-11.30)

August 28, 2021 Workshop 1			
Time	Author(s)	Title	Room
10.30-11.30	Tuncay Tunç	Yeni Nesil Sorular: Önemi ve Özellikler	1

August 28, 2021 Workshop 2			
Time	Author(s)	Title	Room
10.30-11.30	Burcu Güngör Cabbar	Farklı Disiplinlerden SU'ya Bakmak	2

August 28, 2021 Workshop 3			
Time	Author(s)	Title	Room
10.30-11.30	Kaan Ergün	Roboo Eğitim Robotu ve Yazılım Geliştirme Ortamının Tanıtılması	3

August 28, 2021 Workshop 4			
Time	Author(s)	Title	Room
10.30-11.30	Yahya Ebrahimi Sadr Osman Dursun Başak Yavuz Kısacık	Tüpteki Genler ve Elektroforez Atölyeleri	4

August 28, 2021 Workshop 5			
Time	Author(s)	Title	Room
10.30-11.30	Pınar Arısoy	Sürdürülebilir Kalkınma İçin STEM Etkinlikleri Atölyesi	5

Plenary Workshops 2

(August 28, 2021, 12.30-13.30)

August 28, 2021 Workshop 1			
Time	Author(s)	Title	Room
12.30-13.30	Algorithmics İstanbul Ekibi	Algorithmics: Uluslararası Matematik ve Kodlama Okulu	1

August 28, 2021 Workshop 2			
Time	Author(s)	Title	Room
12.30-13.30	Selçuk Yusuf Arslan	BBC micro: bit ile STEM Atölyesi	2

August 28, 2021 Workshop 3			
Time	Author(s)	Title	Room
12.30-13.30	Davut Sarıtaş	STEM Eğitime Bilim Tarihinin Entegrasyonu; İmkânı Olası Katkıları ve Sınırları	3

August 28, 2021 Workshop 4			
Time	Author(s)	Title	Room
12.30-13.30	Hakkı İlker Koştur	Ahşap Oyuncak Tasarım Atölyesi	4

August 28, 2021 Workshop 5			
Time	Author(s)	Title	Room
12.30-13.30	Ülkü Kale Karaaslan	Okul Öncesinde Su ile İlgili STEM Etkinlikleri	5

Plenary Sessions 2

(August 28, 2021, 13.45-14.45)

August 28, 2021 Plenary Session - 1 Chair: Hakkı İlker Koştur			
Time	Yazar	Title	Room
13.45-14.45	Sevinç Güngör	A study on the relationship between problem writing skills and problem solving processes (7th grade example)	1
	Ramazan Çeken	Middle School Students Approaches to the STEM/STEAM Disciplines	
	Gülây Yazman Mehmet Karabulut Ersen Abalı	Participating In The International Competition For High School Students Organised By Cern (BL4S) Using Project Based Learning Method as An Sample of A STEM Study	

August 28, 2021 Plenary Session - 2 Chair: Davut Sarıtaş			
Time	Yazar	Title	Room
13.45-14.45	Pınar Arısoy	Sürdürülebilir Kalkınma Farkındalığına Yönelik STEM Eğitim Uygulamaları	2
	Nejmettin Yıldırım	Ortaokulda STEM Ders Planı ve Uygulamaları	
	Yasemin Eren	Yaratıcı Drama ve STEM	

August 28, 2021 Plenary Session - 3 Chair: Fatih Aykurt			
Time	Yazar	Title	Room
13.45-14.45	Betül Şen Gümüş Ayşenur Aytekin	Çevrimiçi Fen ve Matematik Eğitiminde STEM Uygulama Örneği	3
	Aynura Orucova	STEM öğretmeni ve sınıfları nasıl olmalıdır?	
	Fatih Aykurt	Tasarım Odaklı Düşünme Yaklaşımı ile STEM Etkinlikleri Geliştirme	

August 28, 2021
Plenary Session - 4
Chair: Zülfü Genç

Time	Yazar	Title	Room
13.45-14.45	Ömer Sukenarı	Hidro Böcekten Roboböceğe	4
	Semih Esendemir Zafer Balbağ	Fen Bilimleri Öğretmenlerinin STEM Etkinliklerini Uygulama Sürecinde Karşılaştıkları Sorunlar ve Çözüm Önerileri	
	Atilla Bingöl Zülfü Genç Merve Gülmüş	Türkiye'deki Üniversitelerin STEM Araştırma Yönelimleri	

STEM Show Time / Playground-STEM Expo

(August 28, 2021, 14.45-16.45)

August 28, 2021

14.45-16.45

STEM Show Time / Playground- STEM Expo

Chair: Mustafa Hilmi Çolakoğlu

Time	Author(s)	Title	Room
1	Hasan Özcan Tuncay Tunç	Kaosun Ritmi	Ground Floor & Garden
2	Burcu Türkkân	Yapay Zekâ Araçlarının Fizik Dersinde Kullanılması: STEAM Senaryosuna Entegre Edilen Eğitim Robotu Örneği	
3	Orhan Yılmaz	UV Disinfection Robot and Friends	
4	Ayhan Apaydın	Uygulamalı Doğa Bilimleri Eğitiminin Çocuklar Üzerinde Etkisi	
5	Ömer Sukenarı	Muş STEM-Bilim Merkezi STEM Çalışmaları	
6	Mehmet Ali Küpeli Kayahan İnce	Uzay Canlının Genetiğini Oluşturuyorum	
7	Dora Toy Ekibi	Leonardon'nun Makineleri	
8	Orhan Yılmaz	Kimyasal Bağ Kavramının Öğretiminde 3B Kimyasal Bağ Modeli Tasarlama	
9	Arzu Erçin	3D Yazıcı ile Eğitim Öğretim Materyalleri Tasarlayabilirim	
10	Havva Geylan	Anadolu'nun İmzaları: Tahta Baskı Uygulamaları	
11	Mehmet Söğüt	Kendi Konsolum Kendi Oyunum	
12	Gulnare İslamova	21. Yüzyılın Masalları	
13	Tuncay Tunç Hasan Özcan	Yerçekimine Karşı Koyalım	
14	Zeki Bayram	Esnek Soruşturma Temelli Fen Öğretimi (ESTFÖ)	
15	Nihal Demir Metin Şardağ	Okul Toplum Proje Uygulaması: Atık Yağlar	
16	Zeynep Özgül	Ses Konusunun Öğretimine İlişkin Tasarlanan STEM Eğitimi Materyalleri	
17	Onur Can İlkyaz Metin Şardağ	Toprak ve İçilebilir Su Kalitesi Okul Toplum Projeleri	
18	Gültekin Çakmakçı Elif Uzun	Çevresel Sosyo-Bilimsel Konular ile İlgili Medya Haberlerinin STEM Eğitiminde Kullanımı	
19	Yıldız Çokçoşkun (DJ Negma)	Müziğin Disiplinlerarası Yolculuğu	
20	Stemist Box Ekibi	Stemist Box ile Çocuklarda Üretim Becerileri Geliştirme	

21	Algorithmics İstanbul Ekibi	Algorithmics: Uluslararası Matematik ve Kodlama Okulu
22	Aynurə Orucova Yegane Ramazanova Mirvari Shukurova Gulnare İslamova Gulnaz Zeynalova Shirin Mammadova İqrar Nazarov	Azərbaycanda STEM Eğitimi Uygulamaları
23	Davut Sarıtaş Ersay Çarkıt Muhammet Talha Özalp	NEVEMM
24	Fatma Taşkın Ekici	Pamukkale Çocuk Üniversitesi

Plenary Sessions 3

(August 29, 2021, 09.00-10.00)

August 29, 2021
Plenary Session - 1
Chair: Tuncay Tunç

Time	Author(s)	Çalışmanın İsmi	Room
09:00 – 10:00	Gülümser Şentürk Akkoyun	STEM Yaklaşımının eTwinning Projelerine Etkileri	1
	Hasan Düzgünoğlu Hasan Özcan	Proje Tabanlı STEM Eğitimi Uygulama Örneği: Domateste Görülen Hastalıklar	
	Kayahan İnce Mehmet Ali Küpeli	TÜBİTAK 4004 Projesinin Öğrencilerin STEM Eğitimine Yönelik Umut ve Hedeflerine Etkisinin İncelemesi	

August 29, 2021
Plenary Session - 2
Chair: Erhan Ekici

Time	Author(s)	Çalışmanın İsmi	Room
09:00 – 10:00	Zülfü Genç Bahar Gürevin	First LEGO Lig (FLL) Robotik Yarışmalarının Öğrencilerin STEM Alanlarına İlgisine Yönelik Etkisinin İncelenmesi	2
	Zeynep Ağyan	Uzay Araştırmaları Konusunun Öğretiminde Artırılmış Gerçeklik Uygulamaları	
	Erhan Ekici Fatma Taşkın Ekici	Hayat Boyu Öğrenme Becerileri Bağlamında STEM Eğitimi	

August 29, 2021
Plenary Session - 3
Chair: Gültekin Çakmakçı

Time	Author(s)	Çalışmanın İsmi	Room
09:00 – 10:00	Beyza Alpaslan İlknur Güven	Disiplinlerarası Öğretim Yaklaşımında Beceri Etki- leşim Temelli Bilim Atölyeleri	3
	Sibel Ünlü	Akıllı Kalori Kontrol Sistemi ile Sürdürülebilir Beslenme	
	Adem Bozkurt Mete Kızılkaya Ali Palabıyık Ece Kızılkaya	Okulları Topluma Yakınlaştıran Anlamli Açık Okullaşma	

Plenary Sessions 4

(August 29, 2021, 10.15-11.15)

August 29, 2021
Plenary Session - 1
Chair: Burçin Gökkurt Özdemir

Time	Author(s)	Çalışmanın İsmi	Room
10.15-11.15	Ebru Kükey Habibe Güneş Zülfü Genç	Matematik Öğretiminde Sınıf Öğretmenlerinin Hikâ- yeleştirme Deneyimleri ve STEM İlişkisi	1
	Ayşenur AYTEKİN Betül Şen Gümüş	Hibrit Fen ve Matematik Eğitiminde STEM Uygulama Örneği	
	Hayrun Nisa Ceylan Burçin Gökkurt Özdemir	Matematik Öğretmenlerinin Gözünden Öğretmen Adaylarının Tasarladıkları 5E Öğrenme Modeline Da- yalı STEM Ders Planları	

August 29, 2021
Plenary Session - 2
Chair: İlknur Güven

Time	Author(s)	Çalışmanın İsmi	Room
10.15-11.15	Havva Geylan	Bilim-Toplum İletişiminde Aile Atölyeleri: Anado- lu'nun İmzaları	2
	Elif Uzun Metin Şardağ Gültekin Çakmakçı	Sosyo-Bilimsel Konuların Medya Haberleri Aracılığı ile İncelenmesi	
	Cansu Nas İlknur Güven	Otantik Öğrenme Yaklaşımına Dayalı Araştırma ve Sorgulama Temelli Etkinlikler ve Otantik Değerlendir- me	

August 29, 2021
Plenary Session - 3
Chair: Fatma Taşkın Ekici

Time	Author(s)	Çalışmanın İsmi	Room
10.15-11.15	Cennet Elmas	STEM Ders Planı Örneği: Yoğunluk Konusunda French Press Tasarlama	3
	Aynura Orucova	Geleceğin Bilimleri ve Meslekleri	
	Fatma Taşkın Ekici Erhan Ekici	Atık Malzemelerin Gizemi STEM-A ile Buluşuyor	

August 29, 2021
Plenary Session - 4
Chair: Orhan Curaođlu

Time	Author(s)	Çalıřmanın İsmi	Room
10.15-11.15	Gülümser řentürk Akkoyun	STEM Yaklařımı Temelinde Teknoloji ve Tasarım Dersi Öğretim Planının Hazırlanması	4
	Ali Murat Çivi řerife Özge Yıldız	Üstün Yetenekli Öğrencilere Yönelik STEM Etkinliklerinin Geliřtirilmesi	
	Orhan Curaođlu Gültekin Çakmakcı	İklim Deđiřikliđi Konusunda Öğretmenlerin Mesleki Yeterlilik Geliřimine Yönelik Uygulamalar (ClimaTePD)	

Plenary Workshops 3

(August 29, 2021, 12.30-13.30)

August 29, 2021 Workshop 1			
Time	Author(s)	Title	Room
12.30-13.30	Celal Karaca	Harmanlanmış Öğrenme ve Uygulaması	1

August 29, 2021 Workshop 2			
Time	Author(s)	Title	Room
12.30-13.30	Dora Toy	Ahşap Atıklar Sanata Dönüşüyor	2

August 29, 2021 Workshop 3			
Time	Author(s)	Title	Room
12.30-13.30	Aysun Yeşilgül	Yapay Zekâ Robotu Atölyesi	3

August 29, 2021 Workshop 4			
Time	Author(s)	Title	Room
12.30-13.30	Mustafa Palancı Barış Alkan Fatih Kaplaner Furkan Çatalbaş Okan Coşkun	Stemist Box ile STEM Eğitimi Atölyesi	4

August 29, 2021 Workshop 5			
Time	Author(s)	Title	Room
12.30-13.30	Yıldız Çokcoşkun	İnformal Ortamlarda STEM Eğitimi Uygulamaları	5

Development of Toothpaste Formulation Designed as STEM Module

Emine Şahin-Topalcengiz¹, Burçin Acar-Şeşen²

Abstract

Science, Technology, Engineering, and Mathematics (STEM) education integrates two or more disciplines within a class, unit, or lesson. The connection between daily-life problems and the engineering design process are covered as cornerstones of STEM education. STEM lessons revolve around solving an ill-defined engineering-based problem utilizing the engineering design process. Excessive consumption of tea and coffee may cause stains on teeth, tooth decay, sensitivity, enamel erosion, and bad breath. STEM education is suitable for solving problems that coffee and tea drinkers face in daily life. During the module, preservice teachers first determined the possible dental health and oral hygiene problems for coffee and tea drinkers, formulated hypotheses, and found a solution using the engineering design cycle. The module content was validated by one chemistry education professor, one dentist, and one science educator. Afterwards, the module was assigned to 17 preservice science teachers. Nine steps engineering design cycle for the module was used in the grand design challenge with two mini science investigation activities. The grand design challenge named as “Toothpaste Formulation for Coffee and Tea Drinkers” was introduced to preservice science teachers. Then, participants were requested to complete two mini science investigations called as “Teeth Structure and Teeth Health” and “Let`s Discover the Effect of Acid Beverages on Dental Health.” Mini science investigations were intended to teach the necessary knowledge and skills for the best solution of the grand design challenge. During the first mini-investigation activity, preservice science teachers were assigned to learn the parts of the tooth, the cause of tooth decay, and the ways of protecting dental health. The second mini science investigation activity required the determination of pH, sugar content, and type of organic acids in different beverages and development of a science experiment to show the effects of acidic and sugary beverages on tooth enamel after exposure. After mini-investigation challenges were completed, preservice teachers were required to design a toothpaste formulation as a

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prototype for the grand engineering challenge. The grand design problem was given as the development of a natural whitening toothpaste formulation for coffee and tea drinkers with acceptable taste and affordable price. Different factors should be considered when designing toothpaste formulations to combat stains on tooth enamel as possible solutions. Preservice teachers were expected to discuss what they already know and to identify what they need to learn about toothpaste development including determination of the criteria and constraints for the successful solution as step two. The next step of the engineering design process is to develop possible solutions. Preservice teachers completed all tasks as out of the class activities. Toothpaste formulations designed by the preservice teacher were evaluated based on chemical properties (pH), physical properties (taste, smell, texture), and vita scale for possible revisions. The design process and scientific investigation activities were recorded as three to six min summarized videos and presented to classmates online for discussion by each preservice teacher. As a final step, participants were encouraged to market their products through product video, advertisement, or product advertisement posters.

Keywords: STEM, STEM module, toothpaste formulation

Application and development of STEAM project in Azerbaijan

Iqrar Nazarov¹

Abstract

The main goal of the STEAM (Science, Technology, Engineering, Art and Math) project is to develop students' critical, creative thinking, collaboration and ability to use modern ICT equipment. In the process of teaching STEAM Azerbaijan project "3D printing", "Micro:bit programming", "Electrical engineering", "Biotechnology", "Nanotechnology", "Robotics", "Gen engineering", "CNC laser cutters", "Unmanned aerial vehicles (training drones)" knowledge and skills are formed on the curriculum program developed for. The STEAM project has partnerships with many different countries. The activities carried out by the project are regularly communicated to the followers via the official Facebook, YouTube, Instagram, Twitter social networks of the STEAM Azerbaijan project through videos and photos. From 2019 The STEAM (Science, Technology, Engineering, Art and Math) project implemented by the Ministry of Education focuses on basic education, creative thinking, development, etc. The 21st century is not about shaping individual skills, creating creative procedural learning opportunities, teaching subjects to develop, but combining them into a single learning model based on real-world applications, and increasing the ability to use modern ICT equipment to apply different programming languages. In the 2021-2022 academic year, the project will cover 302 secondary schools in 50 cities and districts across the country, as well as more than 100,000 students from 15 STEAM Centers. In the 6th, 7th and 8th grade students of STEAM secondary schools, STEAM teaching process includes "3D printing", "Micro:bit programming", "Electrical engineering", "Biotechnology", "Nanotechnology", "Robotics", "Gen engineering", "CNC laser cutters", "Unmanned aerial vehicles (training drones)" curriculum knowledge and skills are formed. According to the mentioned modules, the teacher's manual and assessment methodical manual reflecting the topics corresponding to the class levels of the STEAM teaching process were prepared and made available to the educators. Along with the educational process, various festivals, competitions and contests are held within the project in order to increase the interest of students in STEAM, to exclude talented students. In order to ensure the accessibility of the project to every citizen, along with its implementation in secondary schools, 6 STEAM Centers were established and put into operation across the country, and 9 more Centers were opened to increase the total number of STEAM Centers to 15. Both secondary schools and STEAM Centers are equipped with the necessary innovative technologies and equipment. International cooperation with various countries is carried out within the STEAM project. Within the framework of

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this cooperation, international trainings on “STEAM education, application of innovative technologies in the teaching process, as well as projects” are organized for secondary school teachers across the country in Turkey and Israel. More than 200 teachers were involved in the international trainings organized by the project, and more than 3,000 teachers were involved in the local trainings. A Unified Electronic System (VES) has been developed and put into operation, which monitors the activities of teachers and students involved in the STEAM teaching process, collects teaching materials, as well as various resources in this area. The activities carried out by the project are regularly communicated to the audience through videos on STEAM’s official Facebook, YouTube, Instagram, Twitter pages.

Keywords: STEAM Project; creative thinking; cooperation; robotics; innovative technologies

An Introduction to Meccano-Like Construction Kits from STEM Education Perspective

Hakkı İlker Koştur¹

Abstract

STEM education approach aims to develop skills which are needed in the 21st century business world and it is considered to be one of the most important developments in education field (Bybee, 2010; Land, 2013). This study aims to introduce a toy trend in the history which was back then called construction kits (German: baukasten) and discuss and compare the aims and outcomes with current education trend, STEM approach.

According to historian Tim Lambert, Meccano was the first invented construction kit toy (Lambert, 2021). Meccano construction toys system was created in 1898 by Frank Hornby in the United Kingdom. The motto of the company was mechanics made easy and toys were described as adaptable mechanical toys. This system included reusable metal strips, plates, wheels, axles, gears, girders, nuts, and bolts to encourage children build various structures and working models of mechanical devices. After the patenting process and release, Meccano toys gained attention and popularity quickly, both paving the way to the birth of competitor brands and inspiring already existing toy companies which began to produce similar construction toys. Moreover, there appeared many construction toys under the brands of many currently known or unknown companies such as American Erector in 1913, German Trix in 1930. Fischertechnik, Marklin, Arcano, Stabil, Dux Universal, Structator, Meweka, Mechanikus, Möwe, Mignon, Stokys, Technokid, Baufix, Matador, Armator, and Arcano brands are some of the examples some of which used very similar system with Meccano and some others created their unique connection mechanisms. These brands are compiled based on the technical toys permanent collection of the Deutches Museum [DM] in Munich, Germany. Samples of each brand can be viewed in the museum (DM, n.d.).

Technical toys collection can be viewed in Deutches Museum's level 2 since 1984 and its reported that there are 249 exhibits in this collection. In the web page of the collection, the explanation contains details which are familiar to science educators (DM, 2021):

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“Playing, building and using imagination to create something new are all part of a child’s development. Construction sets –standardised parts with limitless possibilities- have been used to recreate objects from the modern world for over 200 years.”

The explanation presented can be related quickly with current science education aims. With the launch of STEM approach, such topics of engineering, problem solving, imagination and creativity, recreating daily life events at school and much more of those aims of the construction kits have been mentioned more than ever. In a nutshell, it can be concluded that foundations of STEM approach laid more than a century ago.

Keywords: STEM, construction kits, technical toys

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Middle Schools' Students Approaches to the STEM/STEAM Disciplines in Their Projects

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Abstract

Abstract: In recent years, STEM/STEAM education practices in schools have become increasingly common. One of these applications is the “This is My Work” project competition, which has been organized by TÜBİTAK and MEB since 2005. Although the projects focus on the disciplines of mathematics and science at the middle school level, in reality, students focus on solving daily life problems by considering topics from many different fields of science together. With the mentioned competition, which is held regionally and nationwide, students defend and promote their designs that they have developed for their own solutions to the daily problems. Considering the fields of science in which STEM/STEAM disciplines are traditionally included, it is naturally expected that students' designs are also developed for certain courses. In this study, it is focused on which science disciplines they actually see their designs which they have put forward in the cited competition. For this aim, in the catalogues of the projects from 2017 through 2021, it has been tried to determine which science field the students study including STEM/STEM disciplines need to be identified. The project catalogues of the competition were examined by document analysis. In the study, in which “STEM” or “STEAM” expressions were determined as the analysing unit, the determined explanations were subjected to content analysis and comments were made on the perspectives of STEM/STEM disciplines in the projects of middle school students. The examinations reveal that middle school students have generally studied subjects related to mathematics and natural sciences in their projects. In addition, students were able to present products and designs in different fields, from language teaching to history, from cultural values to different areas of art. The students explained which of the STEM/STEAM education disciplines corresponds to each dimension of their designs that concern different fields of science. Evaluations show that each teacher or adult involved in the education and training process of the students taking care of the natural, social and cultural environment can create a starting point for such studies during the understanding of the relevant activities. For this reason, teachers in different branches are expected to contribute to the process in such student activities at schools.

Keywords

Interdisciplinary education; student projects; STEM; STEAM; document analysis

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Workshop: Research & Development Process in Constructing Wooden Technical Toys

Hakkı İlker Koştur¹

Abstract

STEM education approach aims to develop skills which are needed in the 21st century business world and it is considered to be one of the most important developments in education field. In the Turkish 2018 science course curriculum, although it is not clearly stated that it is based on STEM approach, there are similar STEM education aims in order to develop entrepreneurship, engineering, material design, innovative thinking and creativity. In such a learning environment where students design materials like engineers, it can be seen that the interactive education process is strongly dependent on the research & development (R&D) perspective. In a typical R&D process, companies continuously arrange set of innovative activities in order to develop new services or products and improving existing ones. In a STEM based learning environment, students carry out similar R&D activities.

This workshop aims to present the R&D process in several wooden technical toys which are tested by tens of students who were enrolled in science laboratory course in Başkent University for more than a decade and developed in an amateur home atelier by the instructor. In the workshop, unique examples of wooden technical toys which are products of years of experience and years of R&D process will be presented to the audience.

Keywords: STEM, research and development, technical toys, material design

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