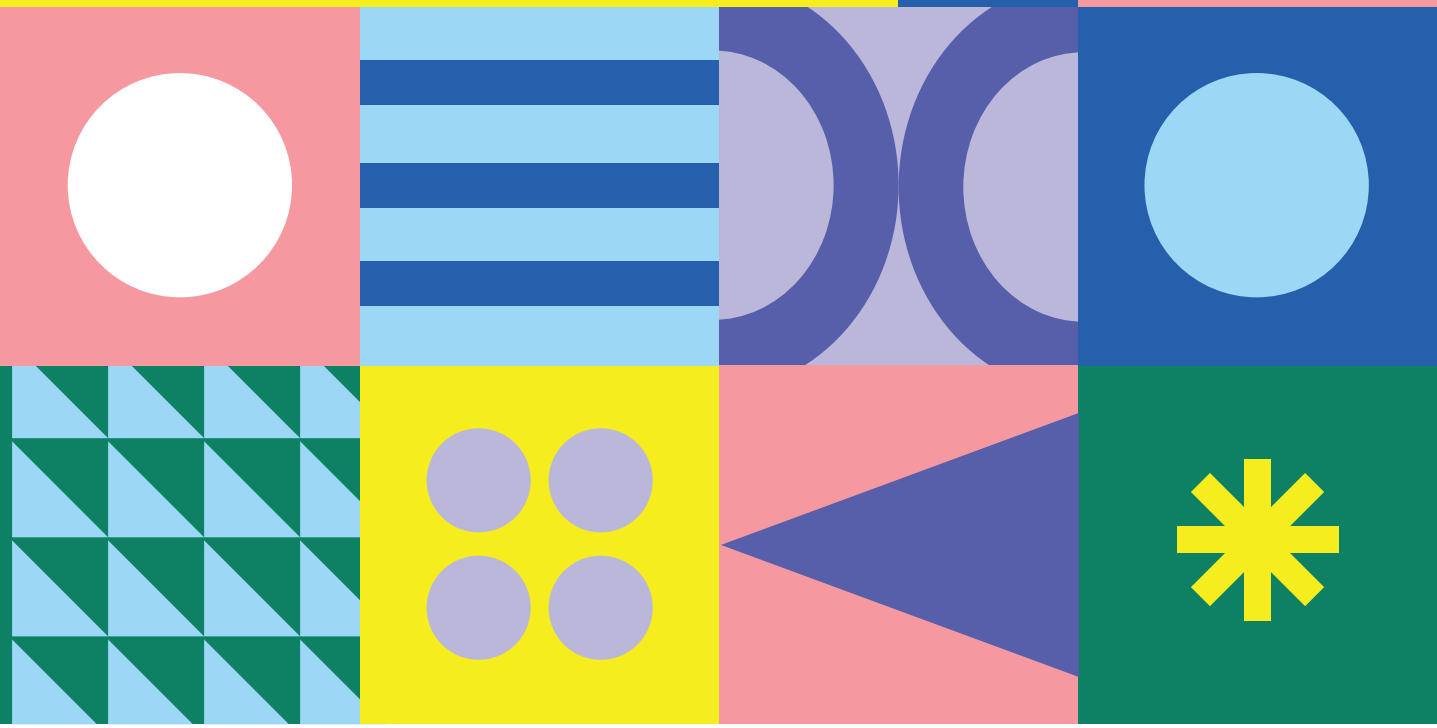
ORTA DOĞU TEKNİK ÜNİVERSİTESİ
ENDÜSTRİYEL TASARIM BÖLÜMÜ



EXPERIMENT EQUIPMENT FOR SCIENCE EDUCATION IN SECONDARY SCHOOLS

In collaboration with Turkish Ministry of Education Course Equipment Production Center and Nesibe Aydın Educational Institutions

ORTAOKUL FEN BİLGİSİ DERSLERİ İÇİN DENEY ALETLERİ

MEB Ders Aletleri Yapım Merkezi ve Nesibe Aydın Eğitim Kurumları İşbirliğiyle

MEB Ders Aletleri Yapım Merkezi ve Nesibe Aydın Eğitim Kurumları İşbirliğiyle Ortaokul Fen Bilgisi Dersleri için Deney Aletleri

Experiment Equipment for Science Education in Secondary Schools in Collaboration with Turkish Ministry of Education Course Equipment Production Center and Nesibe Aydın Educational Institutions

ID 202 Endüstriyel Tasarım II Şube B | *ID 202 Industrial Design II Section B*
2020-21 Bahar Dönemi | *2020-21 Spring Semester*

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Proje Tanımı

Bu proje 2020-21 akademik yılı bahar döneminde Orta Doğu Teknik Üniversitesi, Endüstriyel Tasarım Bölümünde yürütülen ID202 Endüstriyel Tasarım II dersi kapsamında, MEB Ders Aletleri Yapım Merkezi ve Nesibe Aydın Eğitim Kurumları işbirliğiyle gerçekleştirilmiştir. Projede öğrenciler, ekip çalışması yaparak ortaokul 5., 6., 7. ve 8. sınıf fen bilgisi derslerinde kullanılmak üzere, sınıf düzeylerine uygun olası senaryoları ve deney etkinliklerini göz önünde bulundurarak, deney aletleri geliştirmeyi amaçladılar. Her öğrenci ekibi için farklı konular belirlendi ve ekiplerden kendileri için belirlenen konunun kazanımlarını hedef alan senaryolar ve deney etkinlikleri geliştirmeleri beklendi. Öğrenciler, bu konulara yönelik tasarım çözümlerini geliştirirken, öğrenme bağlamını, ortaokul seviyesindeki öğrencilerin fizyolojik ve psikolojik yetenek ve ihtiyaçları ile öğrenme etkinliğinde eğlence ve oyunlaştırma yaklaşımlarını göz önünde bulundurdular. Ayrıca bu aletlerin sınıf ortamında kullanılması planlandığından, uzun süreli dayanıklılık, sağlamlık ve güvenlik gibi gereksinimlere önem verildi.

Projenin Aşamaları

Proje, 34 öğrencinin yer aldığı 11 ekip ile yürütüldü. Projeye ayrılan sekiz haftalık süreç, çevrimiçi araştırma, gözlem ve alan araştırması, senaryo kurgulama, fikir geliştirme, tasarım detaylandırma ve görselleştirme gibi aşamaları içerdi. Proje, MEB Ders Aletleri Yapım Merkezinin sahip olduğu üretim imkanlarının tanıtılması ve bunu takiben, belirlenen konulara yönelik öğrenim kaynaklarının, var olan deney aletlerinin, evde yapılabilecek deneylerin ve oyun ve oyuncakların internet üzerinden araştırılması ile

Project Brief

This project was carried out at Middle East Technical University, Department of Industrial Design in collaboration with Turkish Ministry of Education Course Equipment Production Center and Nesibe Aydın Educational Institutions, during the 2020-2021 Spring semester, as part of the ID202 Industrial Design II course. In this project, students were expected to work in teams to design experiment equipment for science education in secondary schools (5th, 6th, 7th and 8th grades) by considering possible scenarios and experiment activities at these grade levels. Different topics were assigned to each team and they were expected to develop the scenario and the experiment activity based on the learning objectives of the topic. While developing design solutions, the students were required to consider the learning context, the learner's physiological and psychological capabilities and needs, and integrating fun and gamification in the learning activity. Moreover since this equipment is for the classroom environment, long-term durability, robustness and safety are critical requirements that were considered in design.

Project Stages

The project was carried out with 34 students in 11 teams. The six weeks dedicated to this project involved stages, such as online research, observation and field research, scenario building, idea generation, design detailing and presentation. The project started with a presentation on production facilities of Turkish Ministry of Education Course Equipment Production Center and this was followed by an online search activity for investigating learning materials, existing experiment equipment, home-made experiments and toys and games related to

başladı. Sonrasında, öğrenciler, Nesibe Aydın Eğitim Kurumlarında çevrimiçi yürütülen fen bilgisi derslerine gözlem amaçlı katıldılar ve fen bilgisi öğretmenleri ile odaklandıkları konular üzerine görüşmeler yaptılar; bu araştırma aşamalarından edindikleri içgörüleri temel alarak deney senaryoları geliştirdiler ve ilk fikirlerini ortaya koydular. Daha sonra, öğrenciler, bu senaryoları canlandırdıkları ve ilk fikirlerini sundukları temsili videolar hazırladılar ve Nesibe Aydın Eğitim Kurumlarından fen bilgisi öğretmenlerine bu videoları sunarak onlardan geribildirim aldılar. Projenin sonraki aşamalarında, tasarım çözümlerini detaylandırmak ve geliştirmek için bir detaylandırma çalıştayı gerçekleştirildi. Çalıştay sonuçları, MEB Ders Aletleri Yapım Merkezinden temsilcilerin katılımıyla bir ön jüri yapılarak değerlendirildi. Proje, dersin yürütücüleri, ODTÜ Endüstriyel Tasarım Bölümü öğretim elemanları ve MEB Ders Aletleri Yapım Merkezi ve Nesibe Aydın Eğitim Kurumlarından temsilcilerin ve öğretmenlerin katılımı ile 25 Haziran 2021 tarihinde gerçekleştirilen final değerlendirme jürisi ile sona erdi.

Projeye değerli katkılarından dolayı, MEB Ders Aletleri Yapım Merkezinden Kudret Özdemir ve Zekai Çınar'a ve Nesibe Aydın Eğitim Kurumlarından Derya Gülerman, Buse Yılmaz ve Suat Pınarbaşı'ya içtenlikle teşekkürlerimizi sunarız.

the assigned topics. Afterwards, the students made observations in online science classes of Nesibe Aydın Educational Institutions and interviewed science teachers about their assigned topics. Based on the insights they gathered from research phases, the students developed experiment scenarios and generated initial ideas. Later, they enacted these scenarios and presented their initial ideas in mock-videos to receive feedback from science teachers from Nesibe Aydın Educational Institutions. In the later stages of the project, the design solutions were detailed and refined through a detailing workshop. Outcomes of the detailing workshop were evaluated in a preliminary jury by representatives from Turkish Ministry of Education Course Equipment Production Center. Finally, the project was concluded with a final jury held on 25 June 2021 with the participation of the course instructors, other tutors from the Department of Industrial Design at METU and representatives and teachers from Turkish Ministry of Education Course Equipment Production Center and Nesibe Aydın Educational Institutions.

We would like to thank Kudret Özdemir and Zekai Çınar from Turkish Ministry of Education Course Equipment Production Center and Derya Gülerman, Buse Yılmaz and Suat Pınarbaşı from Nesibe Aydın Educational Institutions for their valuable contributions to this project.

Dersin Yürütücüleri

Prof. Dr. Gülay Hasdoğan
Dr. Öğr. Üyesi Gülşen Töre Yargın
Yarı Zamanlı Öğr. Gör. Levent Muslular
Araş. Gör. Aslıhan Tokat
Araş. Gör. Zeynep Yılmaz Ünlü

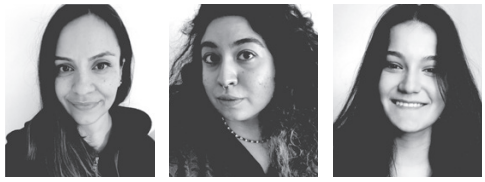
Course Team

Prof. Dr. Gülay Hasdoğan
Asst. Prof. Dr. Gülşen Töre Yargın
Part-time Inst. Levent Muslular
Res. Asst. Aslıhan Tokat
Res. Asst. Zeynep Yılmaz Ünlü

Rotatry

5. Sınıflar için Isı ve Sıcaklık Deney Seti

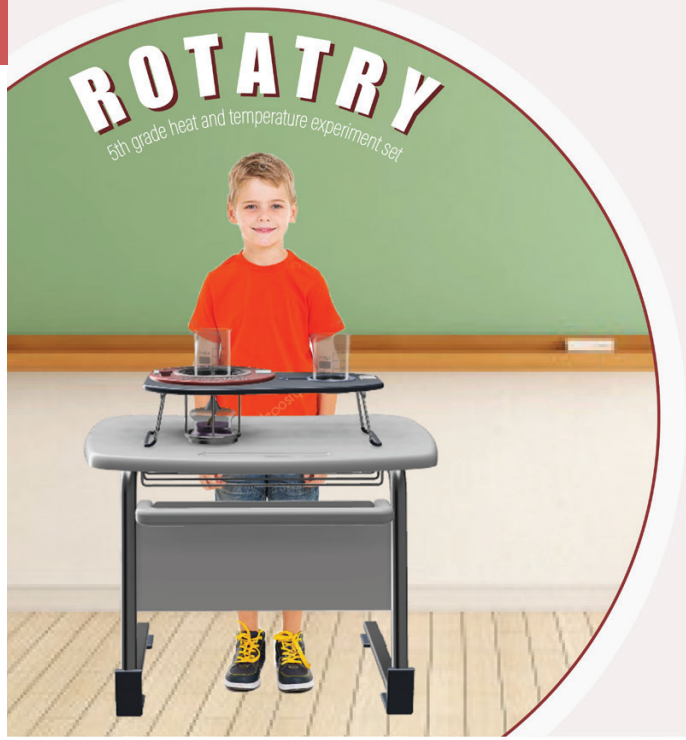
5th Grade Heat and Temperature Experiment Set

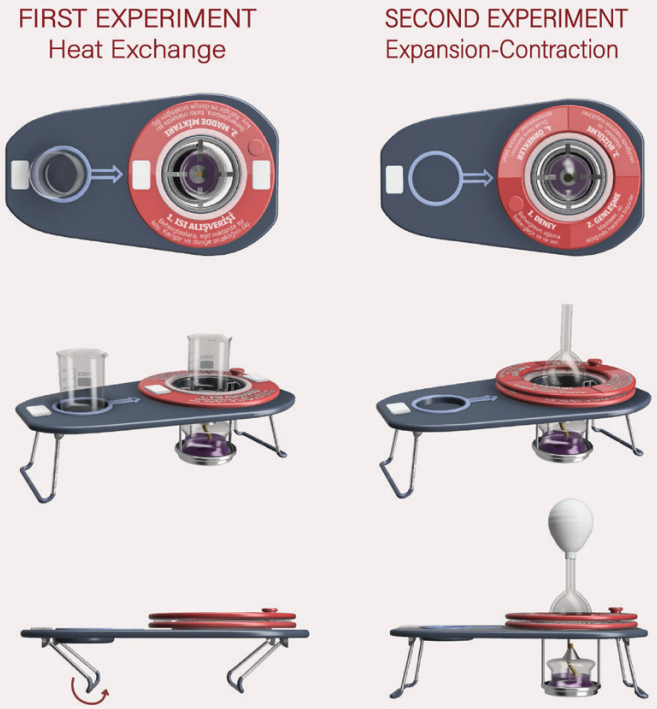


Tasarımcılar / ***Designers:***
Gülfer Demirpençe, Melis Ercan, İrem Erarslan

Rotatry'ın amacı, 5. sınıf öğrencilerinin ısı ve sıcaklık konularını kazanımlara uygun bir şekilde kavramalarıdır. Öğrenciler, deneyi yaparken sıcak suya veya ispirto ocağına temas etmedikleri için deneyi bir öğretmen gözetiminde kendi başlarına yapabilirler. Rotatry, dönen dairesel iki deney parçasından ve üç farklı deneyden oluşur. İlk iki deney, aynı ve farklı madde miktarlarına sahip maddeler arasındaki ısı alışverişini, üçüncü deney ise büzülme ve genleşme süreçlerini gösterir. Öğrenci, birinci deneyden ikinci deneye geçebilmek için dairesel parçayı döndürmelidir ve dönen parçalar üzerinde yer alan yazılar deneyler ve konu başlıkları hakkında bilgi verir.

Rotatry aims to enable 5th grade students to comprehend heat and temperature subjects in accordance with their learning outcomes. Students can do the experiment on their own under the supervision of a teacher, as they do not contact with the hot water or the spirit stove during the experiment. Rotatry consists of two rotating circular parts and three different experiments. The first two experiments demonstrate the heat exchange between substances with the same and different amounts of matter, and the third one shows the contraction and expansion processes. The student should rotate the circular part in order to pass from the first experiment to the second , and the directions on the rotating parts give information about both the experiments and the subjects.





Scenario

SET-UP
(Teacher)

1. 
The set is stored in the cupboard with other experiment materials.

2. 
The teacher brings the experimental setup to the classroom.

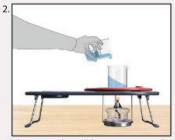
3. 
The teacher places the spirit stove from the top as shown in the figure.

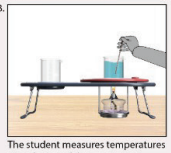
4. 
The teacher places the beakers onto the assembly.

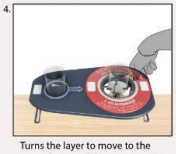
FIRST EXPERIMENT
Heat Exchange



1. 
The student pours equal amounts of water into the beakers.

2. 
She pours the cold water on top of the hot water and mixes them.

3. 
The student measures temperatures at each step of the experiment.

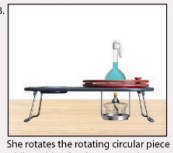
4. 
Turns the layer to move to the second stage of the experiment.

SECOND EXPERIMENT
Expansion-Contraction



1. 
The second rotating circular piece is attached to the set.

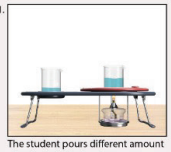
2. 
She puts water into the beaker and puts a balloon over the beaker.

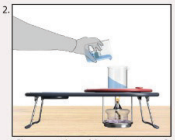
3. 
She rotates the rotating circular piece while waiting for the water to heat up.

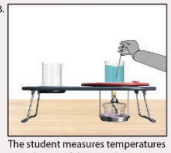
4. 
The ballon grows in volume with the effect of expansion.

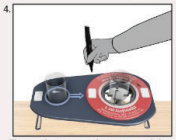
FIRST EXPERIMENT
Amount of Substance



1. 
The student pours different amount of water into the beakers.

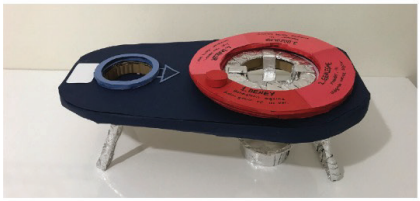
2. 
She pours the cold water on top of the hot water and mixes them.

3. 
The student measures temperatures at each step of the experiment.

4. 
The student, notes the measured data on the papers .

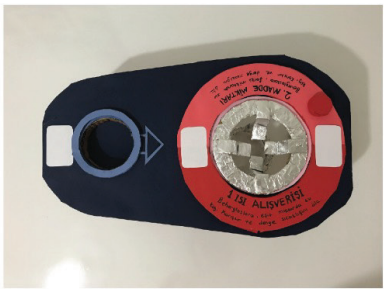
Mock-up







1. HEAT EXCHANGE



2. EXPANSION-CONTRACTION



DETAILS



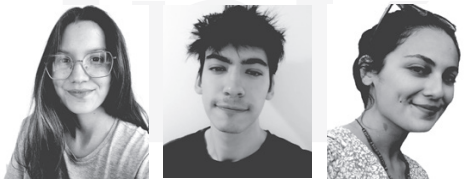




Bowl-Link

5. Sınıf Isı ve Sıcaklık Konusu Deney Aleti

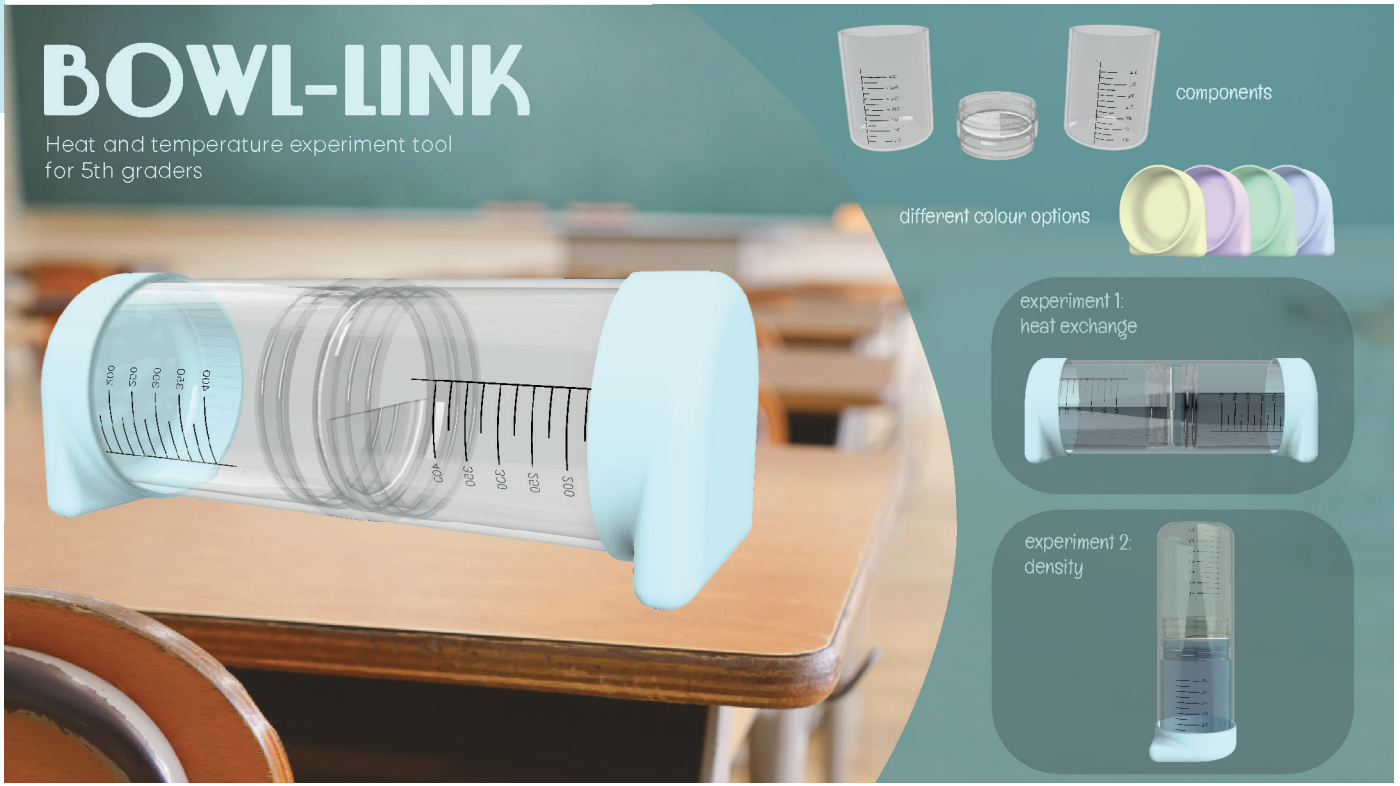
5th Grade Heat and Temperature Experiment Tool



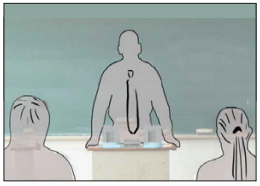
Tasarımcılar / *Designers:*
Beste Eşlik, Kutay Durular, Melis Balcı

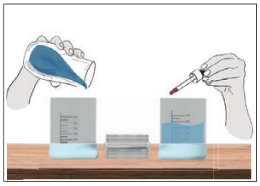
Bowl-link, 5.sınıfta ısı ve sıcaklık konusunda yapılan deneyleri gerçekleştirmek için tasarlanmıştır. Bu deney aleti, farklı miktarda, farklı sıcaklıklarda ve yoğunluklarda sıvılarla üç farklı deney yapmaya olanak sunar. Yatay ve dikey kullanılabilen deney aletinde ortadaki mekanizma döndürülerek su akışı sağlanır. Sıcaktan soğuğa akışın tanecik titreşimiyle gerçekleşmesi farklı renkteki sıvılarla gözlemlenebilir. Dikey kullanımda, ısınma nedeniyle yoğunluğu değişen sıvıların hareketleri görülebilir. Farklı miktarda ve sıcaklıkta sıvılar karıştırıldığında denge sıcaklığı termometre yardımıyla ölçülür.

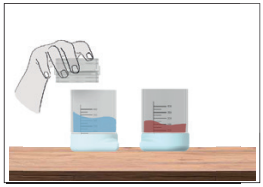
Bowl-Link is designed to conduct heat and temperature experiments for the 5th grade. This experiment set allows three experiments with different amounts of liquids at different temperatures and densities. It can be used both horizontally and vertically. The flow of liquids is achieved by turning the mechanism in the middle. The concept of heat transfer from hot to cold caused by vibrations of the particles can be observed by using colored liquids. In the vertical position, the movements of liquids with different densities caused by heat can also be seen. When liquids with different volumes and temperatures are mixed, the equilibrium temperature of the mixture can be observed with the help of a thermometer.

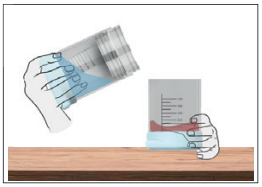


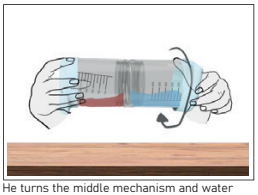
Scenario

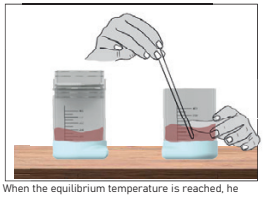

After the teacher explains the topic to the class, he wants to intensify it with some experiments.

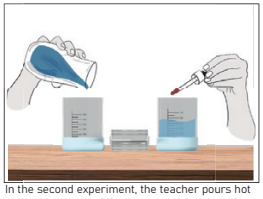

In the first experiment, he pours hot and cold water in different cups and drops different colors to show heat exchange with colors.

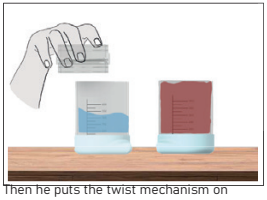

Then he puts the twist mechanism on one of the cups.

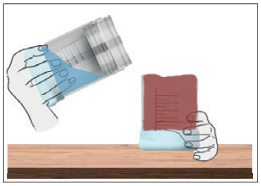

After putting the mechanism, he attaches the cups together.

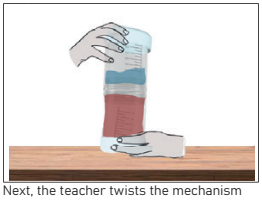

He turns the middle mechanism and water starts flowing between cups, and the heat exchange begins.

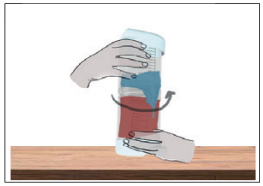

When the equilibrium temperature is reached, he separetes the cups and measures the final temperature. The class observes that the final temperature is closer to the water with more volume.

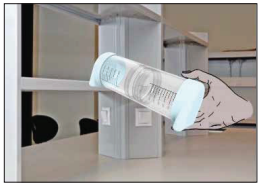

In the second experiment, the teacher pours hot and cold water in different cups and drops different colors to show that heat is transfered from hot to cold, and also the effects on density.


Then he puts the twist mechanism on one of the cups.


After putting the mechanism, he attaches the cups together.

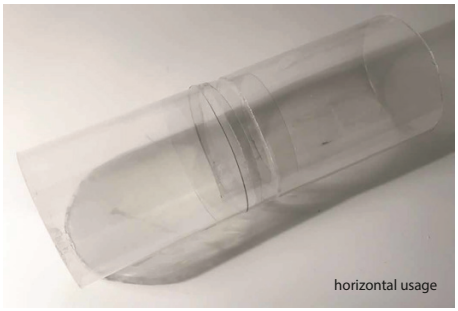

Next, the teacher twists the mechanism by holding from the silicone stands/handles.


After the water flows, the class observes that heat is transfered from hot to cold and cold liquids have more density than hot liquids.


When the experiments are over, the teacher puts away the experiment tool on the shelf.

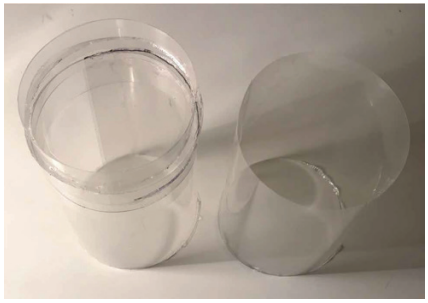
Mock-up


components


horizontal usage


vertical usage


open twist mechanism



Mockup Videoları Linki
https://drive.google.com/drive/folders/1-5hkonowSI-J_LnKG20dW_VotNELQYT2i

Cycle

5. Sınıflar için Ay'ın Hareket ve Evrelerini Gözlemleme Seti

Moon's Movements and Phases Observation Set for 5th Graders





Tasarımcılar / *Designers:*
Nevra Banu Aslan, Özlem Güney, Berkay Gövdeli

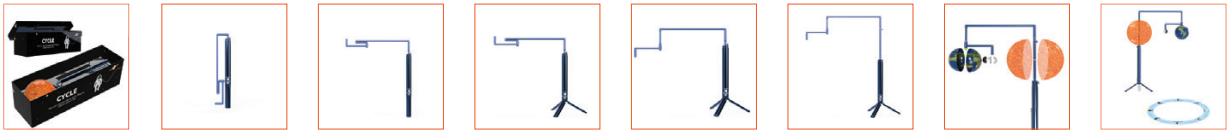
'Cycle', ortaokul öğrencilerinin Güneş, Dünya, Ay arasındaki hareketleri ve Ay'ın döngülerini incelemeyi sağlayan bir gözlem-deney setidir. Dünya modelinin setten ayrılabilir olması sayesinde, öğrenciler Dünya konumuna geçerek Ay'ın hareket ve evrelerini gerçekçi bir biçimde gözlemleyebilir. Ayrıca zemine konan Ay'ın evreleri grafiği ile ders kazanımlarını pekiştirir. Ayarlanabilir boyu, Arduino motora bağlı Ay ve Dünya döngü seçenekleri ve pilli olmasıyla tüm öğrenciler için akıcı bir deney süreci sağlar. Kompaktlığı sayesinde kendi kutusu içinde depolanabilir.

'Cycle' is an observation-experiment set showing the Sun, Earth, and Moon's movements, together with the phases of the Moon. Thanks to the Earth model detachable from the set, students can stand in the position of the Earth and observe the movements and phases of the Moon in a more realistic way. Additionally, the phase chart placed on the floor supports learning outcomes. The set provides a smooth experiment process for all students with its adjustable height, Moon, and Earth cycle options connected to an Arduino motor and batteries. It can be stored inside its box due to its compact nature



Scenario

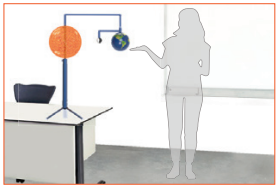
SET-UP



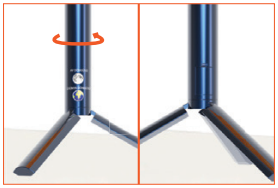
STORYBOARD



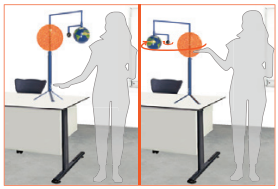
Teacher unboxes and sets the product.



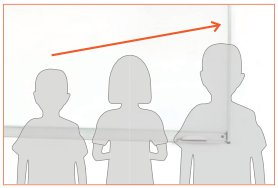
Teacher introduces the subject and the set.



Then explains Earth Cycle and Moon Cycle features powered by batteries.



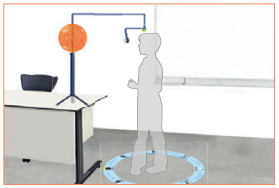
Teacher pushes on the buttons cycles, then gives the lecture.



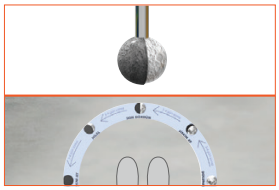
After listening to movements of planets, students line up according to their height.



Teacher adjusts the height, detaches the Earth.



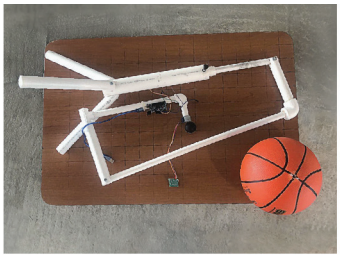
Student stands on the defined area.



Student compares the phase with guide chart and learns the topic.

Mock-up













Eklipso

6. Sınıf Öğrencileri için Tutulmalar Deney Modeli

Eclipses Experiment Model for 6th-Grade Students



Tasarımcılar / *Designers:*
Ahmet Efkan Giritli, Elif Ekin Kaptan, Yasmin Acar, Mehmet Aflazi

Eklipso, 6. sınıf öğrencilerine Güneş ve Ay tutulmaları konularını anlatmayı amaçlayan bir deney setidir. Aynı zamanda bu set ile öğrenciler, Ay'ın evreleri ve mevsimler hakkında da temel bilgiler edinebilirler. Sette, merkezde Güneş'in bulunduğu uzayı temsil eden bir düzlem üzerinde Dünya ve Ay kendi yörüngelerinde hareket ettirilebilirler. Güneş küresindeki ışık kaynağı sayesinde, Dünya ve Ay küreleri üzerinde gölge oluşumlarını görebilirler. Bu sayede deney seti, tutulmalar konusunu öğrenciler için daha anlaşılır hale getirir. Ayrıca, deney düzlemi üzerinde anlatımı ve deneyi gerçekleştirmeyi destekleyici bilgiler içeren görsel öğeler bulunmaktadır.

Eklipso is an experiment set that aims to help 6th-grade students understand the concepts of Solar and Lunar eclipses. With this set, students also acquire basic knowledge about the topics 'the phases of the Moon' and 'seasons'. In this set, Earth and Moon can be moved in their orbits and placed on a board which represents the space where Sun is placed at the center. Students can see the shadows on the Earth and the Moon spheres with the help of the light source located inside the Sun. By this way, the set enables them to comprehend eclipses more clearly. Moreover, the experiment set has infographics on the board illustrating the concepts to help teachers and students in their lectures and experiments.



Scenario

STORYBOARD

STEP 1

ASSEMBLING
EXPERIMENT SET



The teacher picks up the Eklipso experiment set package



The teacher puts out the Sun from its package on the table



The teacher puts on the board parts together around the Sun



Finally, the cable is plugged in, the set is ready for the experiment

STEP 2

EDUCATION WITH
THE EXPERIMENT SET



The teacher begins to explain the experiment and its features



The teacher explains the the main purpose of the experiment, with the help of infographics



Then, the teacher begins to explain how the Earth should have an axial tilt on the symbols for the experiment



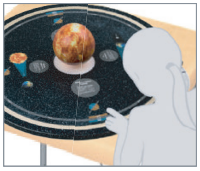
Finally, the teacher explains the Moon's phases briefly before starting the eclipses experiment

STEP 3

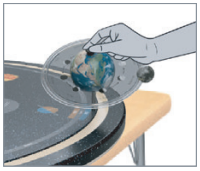
ECLIPSES EXPERIMENT



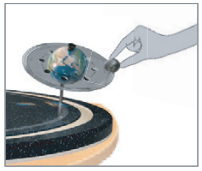
First, the student puts a human figure on the Earth



The student learns that they should bring the Earth where the Moon's orbit tilt is parallel to the Sun



The student brings the Earth to that place while the teacher turns on the switch on the cable



The student brings the Moon on the Earth's shadow and learn how the Lunar Eclipse happens



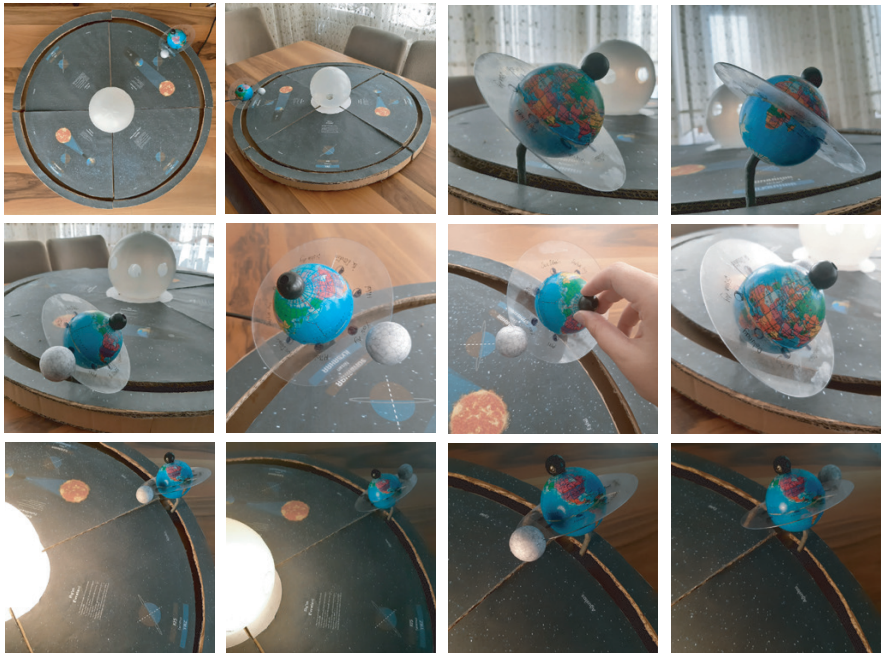
Then, the student then brings the Moon to the opposite side and learns the Solar Eclipse



After finishing the experiment, the teacher disassambles the Eklipso set to put it back to the shelf

Mock-up

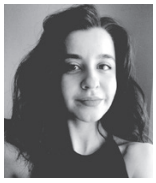
FINALISED 1:1 PHYSICAL MOCK-UP MODEL



Ecllipsse

6. Sınıflar için Güneş ve Ay Tutulması Etkileşimli Poster Tasarımı

Lunar and Solar Eclipse Interactive Poster Design for 6th-Graders

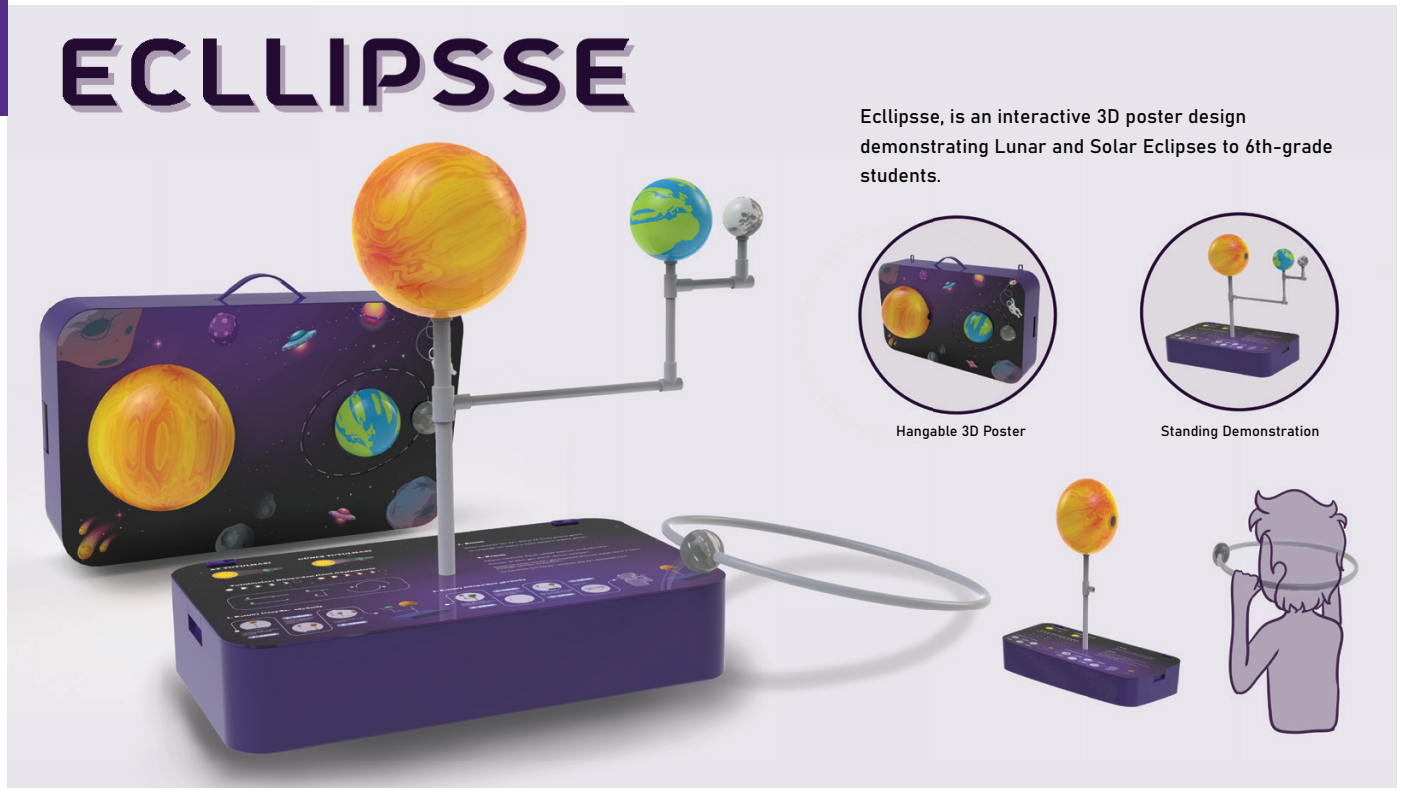




Tasarımcılar / *Designers:*
İrem Ertaş, Şeyma Günal, Elif Çöklü

Ecllipsse, ortaöğretim 6. Sınıf öğrencilerine 'Tutulmalar' konusunu anlatmayı ve göstermeyi amaçlayan üç boyutlu ve etkileşimli bir poster tasarımıdır. Tasarım kutu şeklinde bir poster olup, kurulum için gereken bütün parçalar kutunun içinde yer almaktadır. Tasarımın arka kapağındaki açıklamalar sayesinde deney parçalarının öğrenciler tarafından birleştirilip kurulması beklenmektedir. Deneyin iki farklı pozisyonda kullanılabilir olması, öğrencilere hem uzay hem de Dünya perspektifinden bakmaları için olanak sağlar. Deney sonunda kutu, parçalarla birlikte toplanıp duvara asılabilir. Böylelikle, öğrenciler öğrendiklerini pekiştirebilir.

Ecllipsse is a 3D interactive poster design which aims to explain and demonstrate 'Eclipses' for 6th grade students. The design box is in the form of a 3D poster, and all the components needed for the setup are included in the box. Because of the clear explanations on the back cover, it is expected that the parts will be assembled by the students. The fact that the experiment can be used in two different positions allows students to observe eclipses from both space and Earth perspectives. In the end, as the box can be gathered with the parts and hung on the wall, the students can reinforce what they have learned.



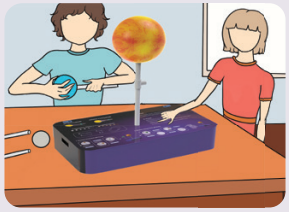
Scenario



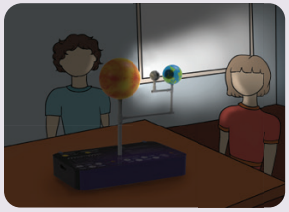
Teacher takes the experiment box into the class.



She calls the class around the teacher's desk for the experiment.



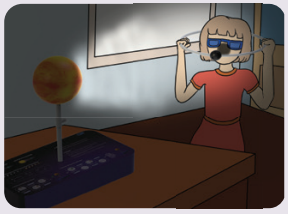
Students install components onto the experiment box by reading the intructions at the back.



After installing, they turn off the lights or close the curtains and open the flashlight. They observe the experiment from the space perspective.



Then, students remove the Earth and its parts from the experiment. One of the students place the Moon in the circle and the circle around his/her head with the help of the teacher.



Again, they turn of the lights and open the flashlight. This time, the student observes the eclipse from the Earth's perspective.



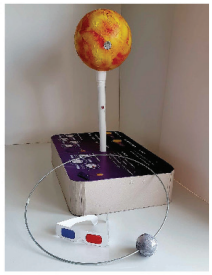
When the experiment is finished, they put the components into the box, their related places. Then the experiment box is hanged onto the class wall.



Students can observe the Lunar and Solar Eclipses in the class after lessons or in breaks.

Mock-up





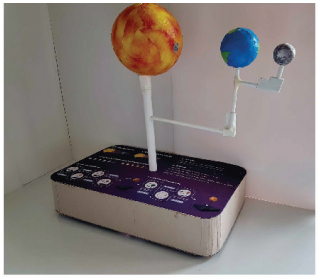














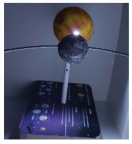




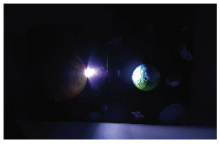


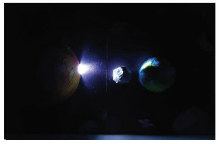


observing in a dark room

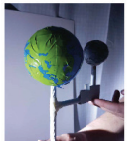












LenSee

7. Sınıf Öğrencileri için Mercek Deney Seti

Lenses Experiment Set for 7th-Grade Students





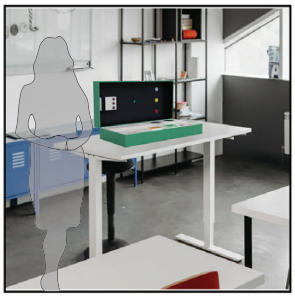
Tasarımcılar / *Designers:*
Deniz Çelik, Melda Atıcı, Pınar Başer

Lensee, 7. sınıf öğrencilerinin optik konusunda gözlem yapmasını ve gerçek hayattaki kullanımlarını anlamalarını amaçlar. Deney seti iki ana gözlem alanından oluşur. Birincisinde öğrenciler, aynı zamanda setin kapağı olan ekranda ışığın kırılmasını inceleyebilir ve öğretmenleriyle küçük bir oyun oynayabilirler. Diğer gözlem alanında ise, öğrenciler günlük hayattan örneklerin bulunduğu kartlarla farklı merceklerin kullanım alanlarını ilişkilendirebilirler. Deney setinin bütün parçaları kullanım sonrası kutunun içinde depolanabilir.

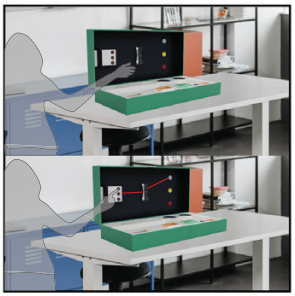
This experiment set is designed for the 7th-grade students to make observations about optics and understand their use in real life. The set has two main observation areas. On the first one, students can observe the light refraction and play a game with their teacher on the screen part, which is also the cover of the storage box. On the second one, students can associate the real-life uses of the lenses with the cards and observe the changes in the image of a human figure. All of the experiment units are placed inside the box itself. After using, the experiment materials can be stored in the box.



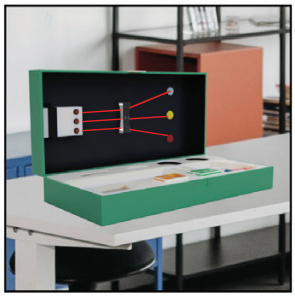
Scenario



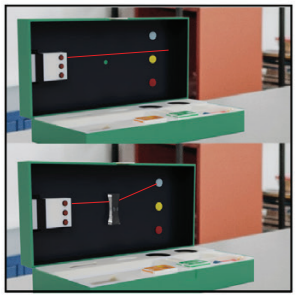
After theoretical lecture, teacher brings the lenSee set to the clasroom for observation.



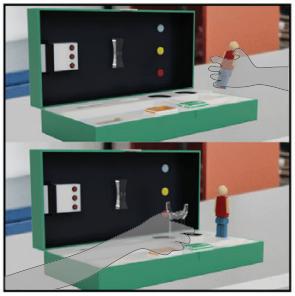
Teacher places the refraction lenses and the turn the laser light on.



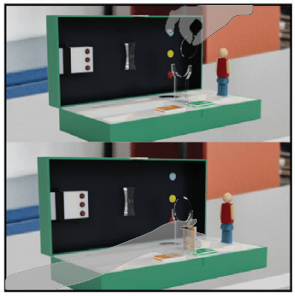
Students can observe the light refraction with concave and convex lenses.



Teacher can ask questions about where will the ray lights target and they can play a short question&answer game.



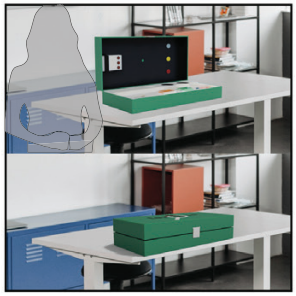
Teacher places the figure and card box for student's to associate the lenses and the real life objects they are used in.



Students can place the real life objects cards and the related lens together to see the association.

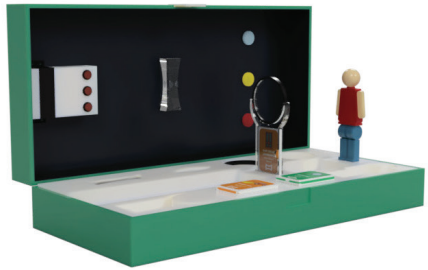


Students can observe the changes in figure with different lenses.



All of the materials can be stored in the box after observation.

Mock-up













Leuca

7. Sınıf Öğrencileri için Elektrik Devreleri Modüler Deney Kiti

A Modular Electrical Circuits Experiment Kit for 7th Grade Students

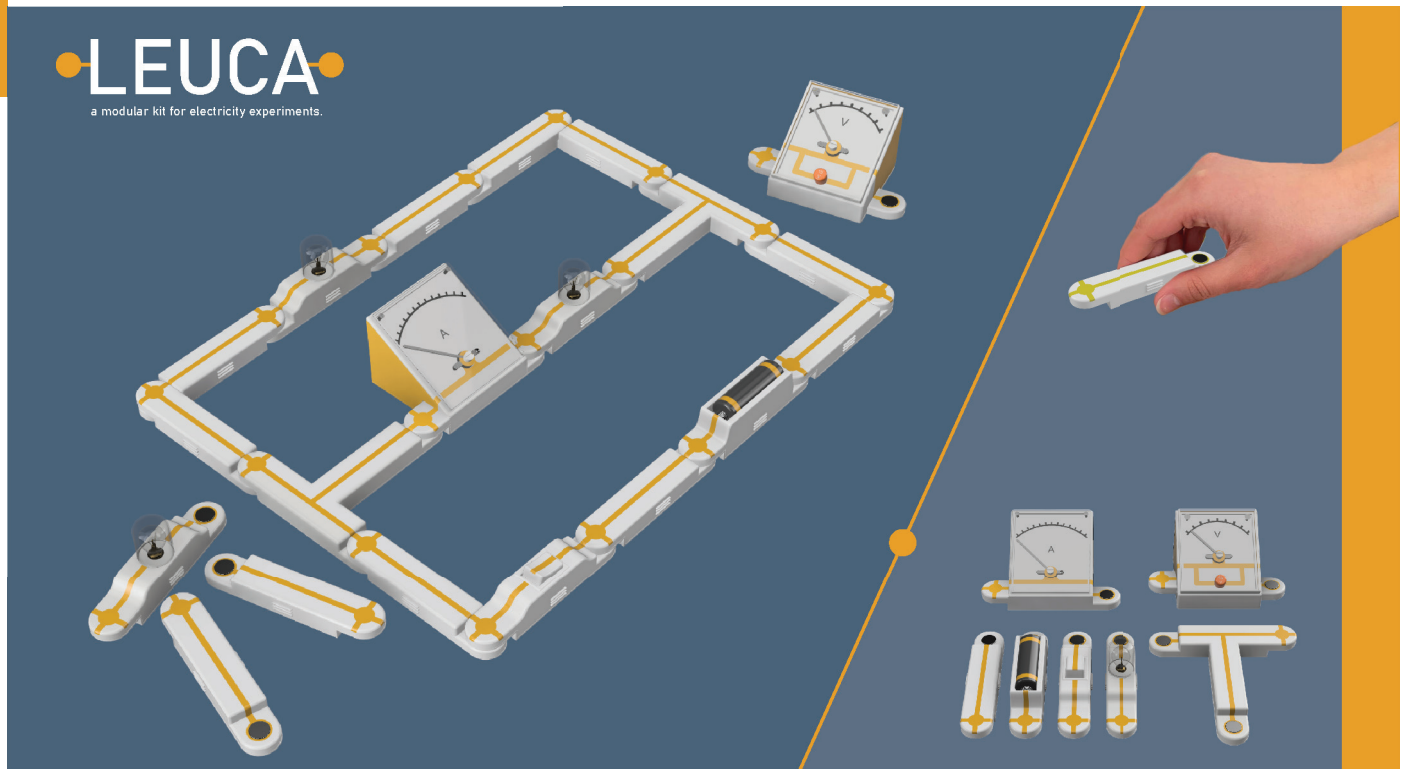




Tasarımcılar / *Designers:*
Sena Çoban, Alkın Gültekin, Ezgi Böcü

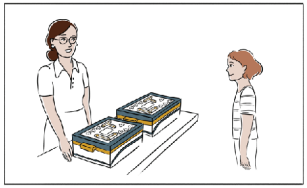
Leuca, 7. Sınıf öğrencilerinin elektriği soyut bir kavram olmaktan çıkarıp, daha rahat algılayabilmelerine yardımcı olmayı amaçlayan, modüler bir deney kitidir. Modüllerin manyetik birleşim detayları sayesinde, öğrencilerin kablo kullanımlarını kolaylaştırmak ve odaklarını elektrik kavramları üzerine yoğunlaştırmak amaçlanmıştır. Farklı formlardaki modüller, öğrencilerin birçok devre türünü deneyimlemesini sağlar. Modüllerin formları tasarlanırken kablo kullanımının getirdiği uzun süreli kullanım ve pratiklik konularındaki sorunlar göz önünde bulundurulmuştur. Deney kitinin içerisinde bulunan görev kartları öğrencilerin deneyi uygulamasını kolaylaştırır. Saklama kutusu, kitin hasar görmeden saklanabilmesi için modüllerin formlarına uygun olarak tasarlanmıştır.

Leuca is a modular experiment kit aimed to help 7th grade students to comprehend the subject of electricity which is an abstract concept. Thanks to the magnetic connection details of the modules, it enables students to focus on the concept of electricity rather than on tangling cables. With the help of different modules, it allows students to experience different types of circuits. While designing the forms of the modules, the problems of long-term use and practicality caused by the use of classical cables were taken into consideration. The task cards in the experiment kit make it easier for students to practice the experiment. The storage box is designed in accordance with the forms of the modules so that the kit can be stored without damage before and after use.

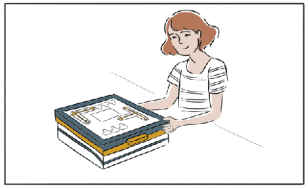


Scenario

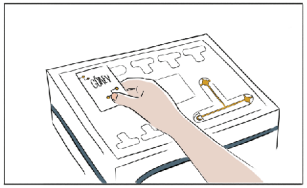
Storyboard



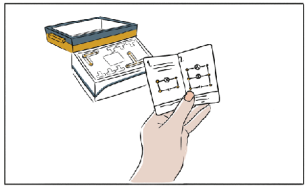
The teacher gives students the Leuca Experiment Kit.



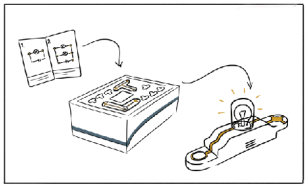
Students take their kits.
They can experiment with a group or individually.



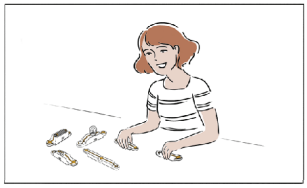
They take one card from the task cards.



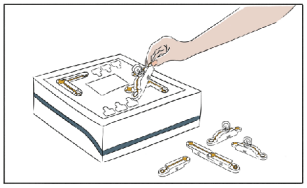
They open the card and read the first step.



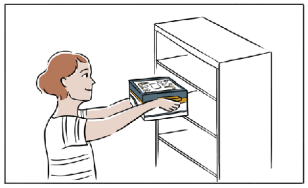
After reading the first step, they will take the modules they need from the box.



Step by step, they accomplish the task by using magnetic modules.



After they finished their tasks, they put the modules back into the box.



They store the kit in their school cabinets.

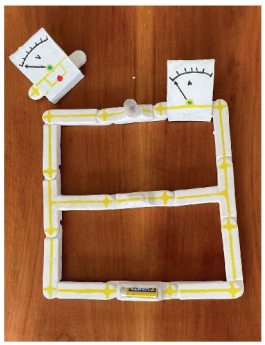
Mock-up

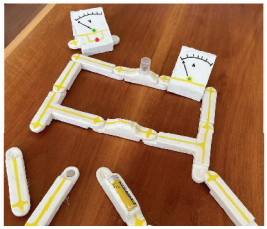
Mock-up & Details From The Final Design

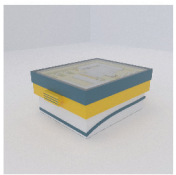


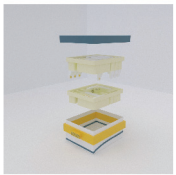


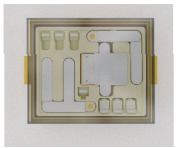




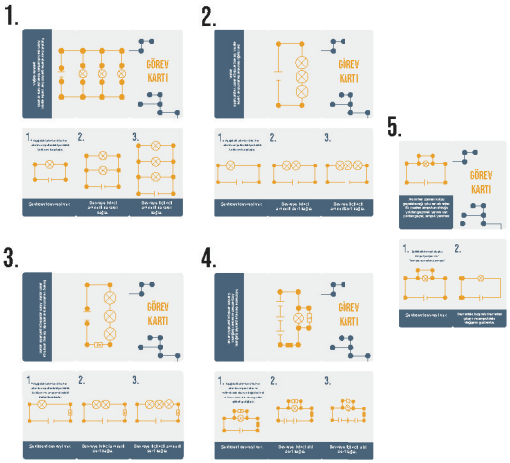








Task Cards



Plug-in

8. Sınıf Öğrencileri için Basit Makineler Deney Seti

Basic Machines Experiment Set for 8th Graders

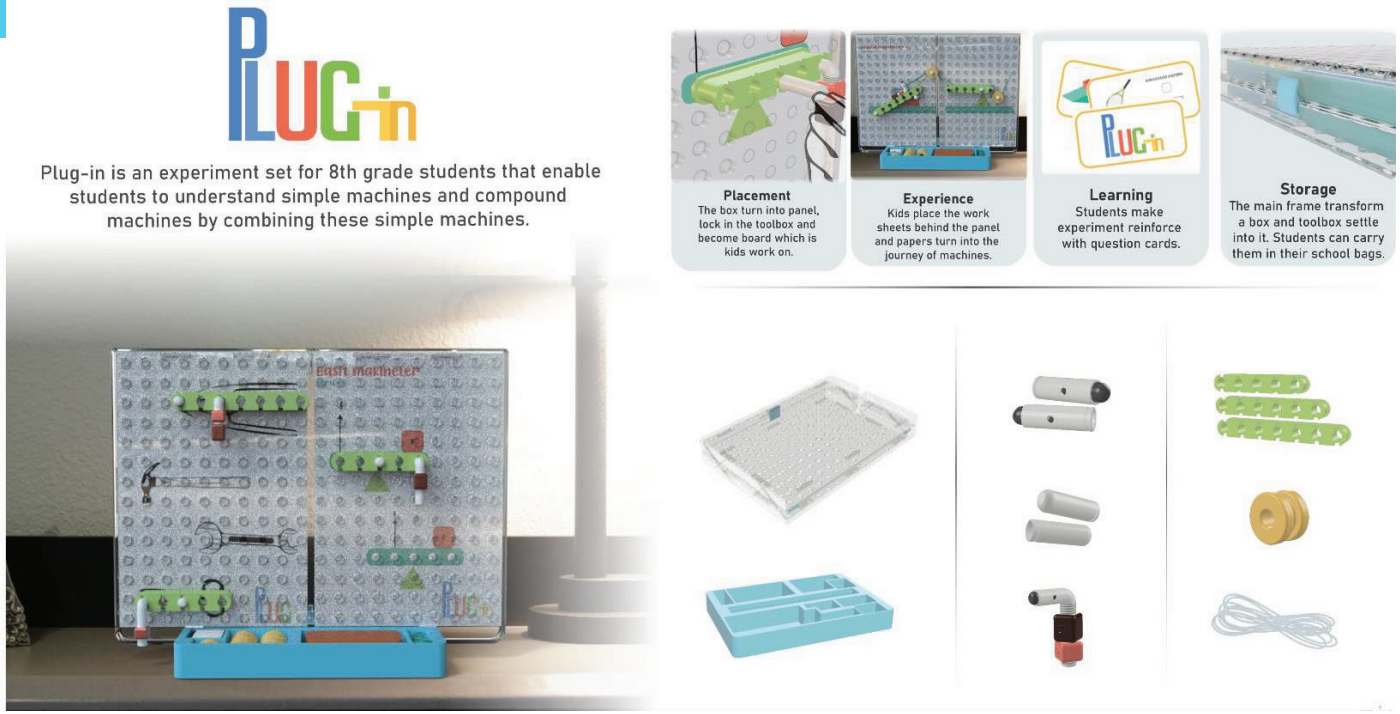




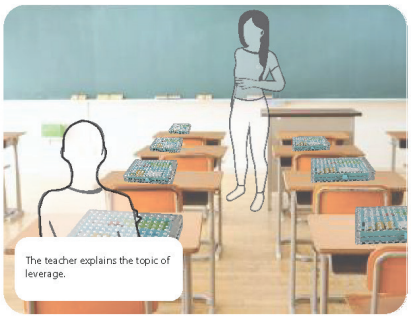
Tasarımcılar / *Designers:*
Şevval Kale, Umut Dündar, Selen Beyaz

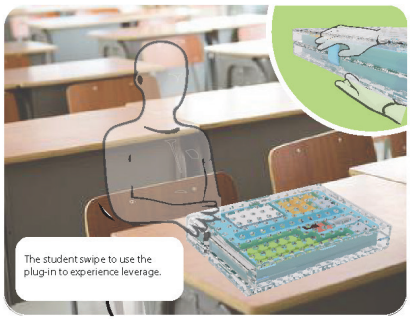
Plug-in, 8. Sınıf öğrencileri için basit makineleri günlük hayattaki örnekleriyle anlatarak öğrencinin anlamasına olanak sağlamayı amaçlayan çok parçalı bir deney setidir. Kutudan panel formuna dönüşen delikli şeffaf platform, arkasına yerleştirilen açıklayıcı kazanım kağıtları üzerinde basit makine düzenekleri oluşturulmasını hedefler. Bu sayede, öğrenciler günlük hayatta ve test sorularında karşılaştıkları örnekleri bu setle modelleyerek inceleyebilir. Parçaların birbirine geçme detayı sayesinde, öğrencilerin deney esnasında daha özgür ve rahat çalışabilmeleri sağlanır. Sürgülü kilit yapısıyla ürün kolayca açılır ve kapanır. Şeffaf platform, aynı zamanda kutu görevini üstlenerek setin taşınmasını ve saklanmasını kolaylaştırır. Farklı detaylara sahip parçalar sayesinde, öğrenciler hem basit makineleri hem de bu basit makineleri birleştirerek bileşik makineleri deneyimleyebilirler.

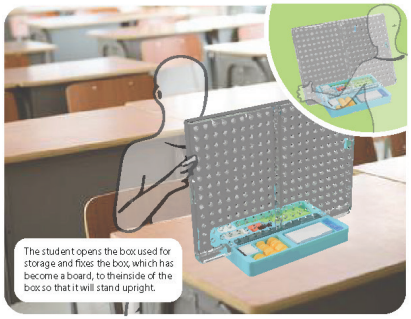
Plug-in is an experiment set for the 8th grade students that enables them to understand simple machines with daily examples. Transforming from a box to a panel form and then holding the explanatory sheets placed behind, the transparent platform aims to enable generating simple machine mechanisms. By this way, students can examine examples they encounter in daily life and test questions through modelling them with this set. Because of the interlocking detail of the parts, it is aimed to allow students to work more freely and comfortably during the experiment. The platform opens and closes easily with its sliding lock structure. The transparent panel also acts as a box, making it easy to transport and store. Thanks to the different detailed parts, students can experience both simple machines and compound machines by combining these simple machines.

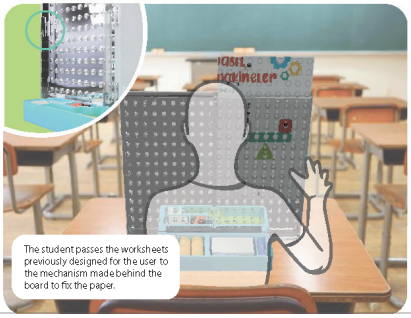


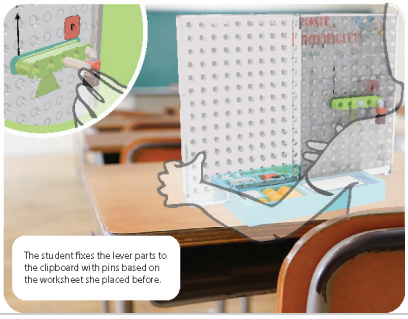
Scenario

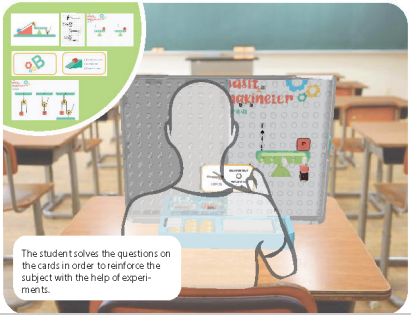






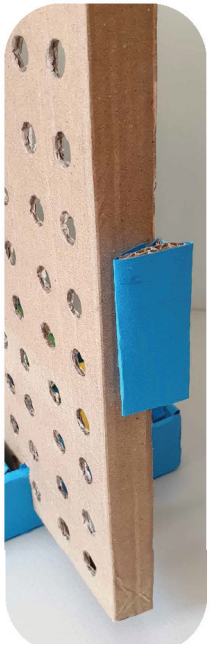






Mock-up









Build-Up

8. Sınıf Öğrencileri için Modüler Basit Makineler Deney Seti

A Modular Simple Machines Experiment Set for 8th Graders



Tasarımcılar / *Designers:*
Beyza Günay, Ezgi Atacan, Ömer Faruk Aktunç

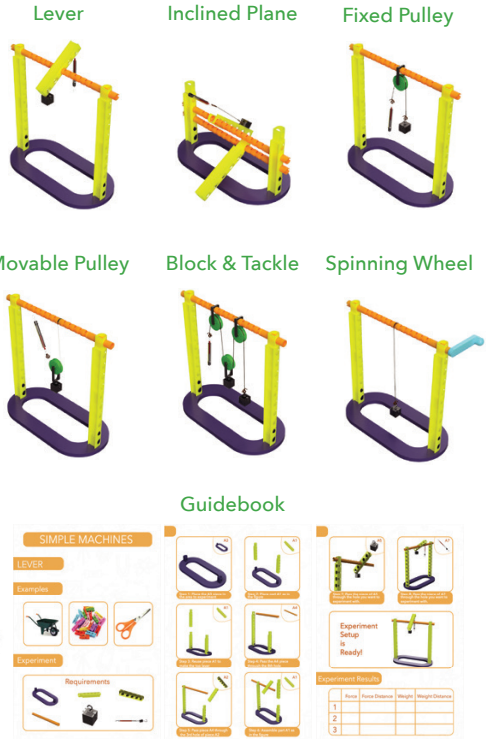
Build-Up, 8. Sınıf düzeyindeki öğrencilerin, düzenekleri kendileri oluşturarak, basit makineler konusunu öğrenmelerini amaçlayan bir deney setidir. Öğrenciler aynı parçaları farklı kombinasyonlarla bir araya getirerek müfredatta yer alan kaldıraç, eğik düzlem, sabit ve hareketli makara, palanga ve çıkrık gibi basit makineleri kurabilirler. Set içerisinde sunulan kılavuz ile öğrencilere deney aşamaları gösterilir ve yaptıkları deneyin sonuçlarını not etmeleri beklenir. Kılavuzda yer alan günlük hayat örnekleri ile öğrencinin konuyu daha iyi kavraması amaçlanır.

Build-Up is an experiment set that aims to teach simple machines with mechanisms that 8th grade students build by themselves. Students can build all simple machines in the curriculum such as lever, inclined plane, fixed and movable pulley, block and tackle and wheel in a single set, with different combinations of the parts in the set. With the manual presented in the set, the experiment stages are shown to the students, and they are expected to note the results of their experiment. With the daily life examples presented in the manual, it is aimed to enable the student to understand simple machines better.

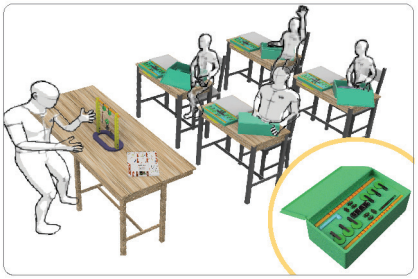
BUILD UP

Simple machines experiment set for 8th grade students

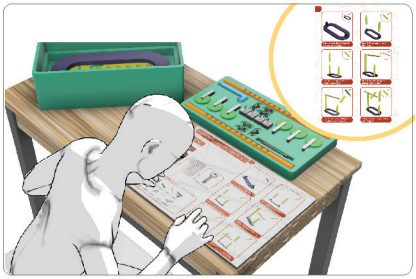




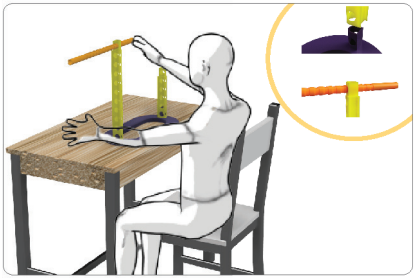
Scenario



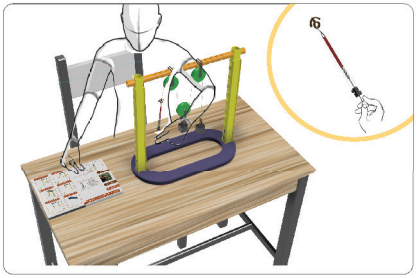
The teacher introduces the experiment set to the students



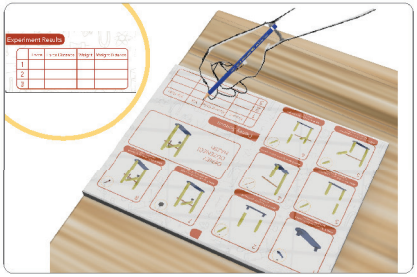
Students review the guidebook



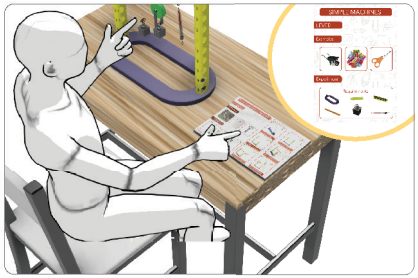
They build the experimental setup



They make the experiment



They note down the experiment results.



They compare experiment with daily life examples

Mock-up

Lever



Inclined Plane



Fixed Pulley



Spinning Wheel



Pressurox

8. Sınıf Öğrencileri için Basınç Deney Set

A Pressure Experiment Set for 8th Graders

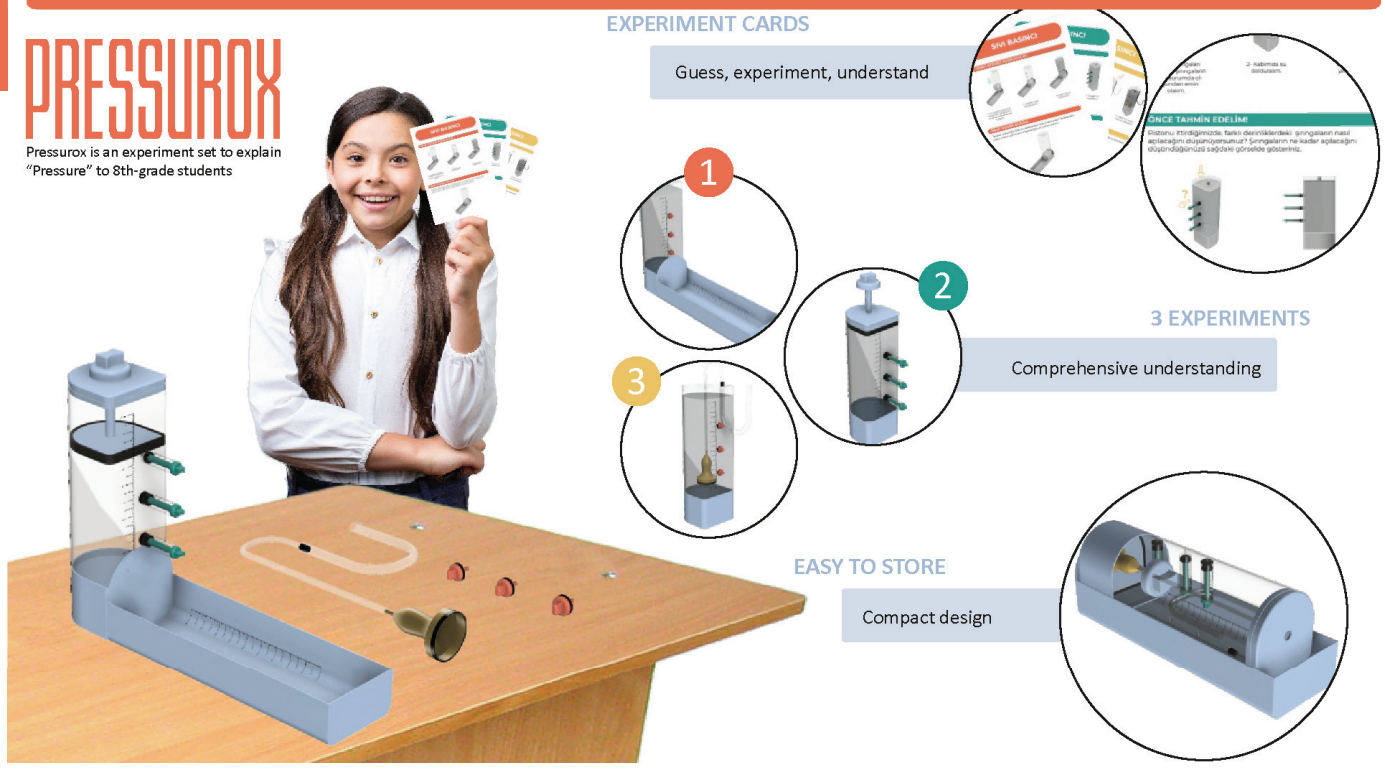




Tasarımcılar / ***Designers:***
Dilek Aybalık, Emir Demirkaya, Zeynep Baran

Pressurox, 8. sınıf öğrencilerinin basınç konusunda öğrendiği teorik bilgileri, deneyerek ve gözlemleyerek öğrenmelerini amaçlamaktadır. Set, üç farklı deney imkânı sağlar. Birinci deneyde öğrenciler, haznenin sahip olduğu üç delik yoluyla, sıvı basıncının derinliğe bağlı olduğunu gözlemlerler; ikinci deneyde hazneye bağlı şırıngalar ve haznenin içinde sıvıyı iten piston sayesinde sıvıların basıncı her yöne ve eşit ilettiğini kavrarlar; üçüncü deneyde ise ana hazneye takılan U borusuna bağlı hortum, huni ve balon yardımıyla gaz basıncı ve sıvı basıncının ilişkisini görürler. Ayrıca, setin içinde konu kartları sağlanmaktadır. Bu kartlar öğrencilerin deneyle ilgili notlar alabilmesini sağlar. Modüler yapısından ötürü, Pressurox toplandığında çok az yer kaplar.

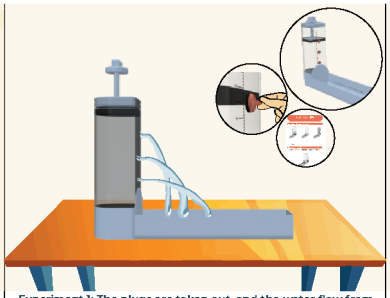
Pressurox aims to enable 8th grade students to support their theoretical knowledge on pressure by experimenting and observing. The set provides three different experiments. In the first one, students observe fluid pressure's dependency on depth through three holes on the main container. In the second one, they comprehend how liquids transfer pressure equally in all directions by pushing down the piston and observing the syringes attached to the main container. In the third experiment, they see the relation between liquid and gas pressure with a hose, cone and balloon connected to the U pipe on the main container. Additionally, experiment cards are provided in the set that allow students to take notes during the experiment. Pressurox takes up very little space when not in use due to its modular structure.



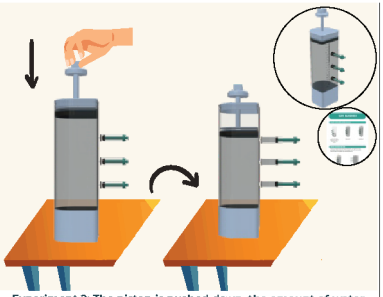
Scenario



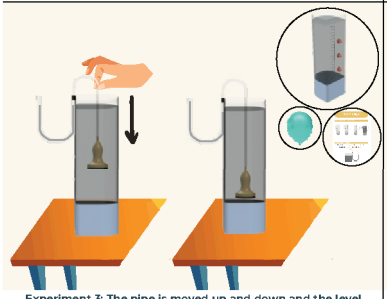
The set and the cards are given to the student groups, made of two.



Experiment 1: The plugs are taken out, and the water flow from each hole is observed while using the cards.



Experiment 2: The piston is pushed down, the amount of water that is now in the syringes are measured while using the cards.



Experiment 3: The pipe is moved up and down and the level change in the U-tube is observed while using the cards.

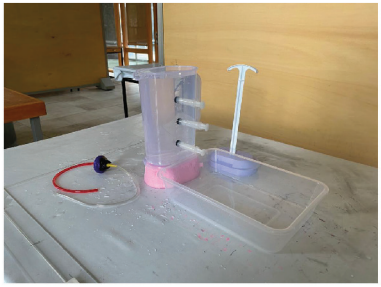


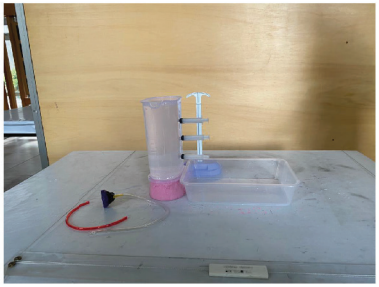
After the experiments are finished, everything is put into the main container and placed into the water callecting container.

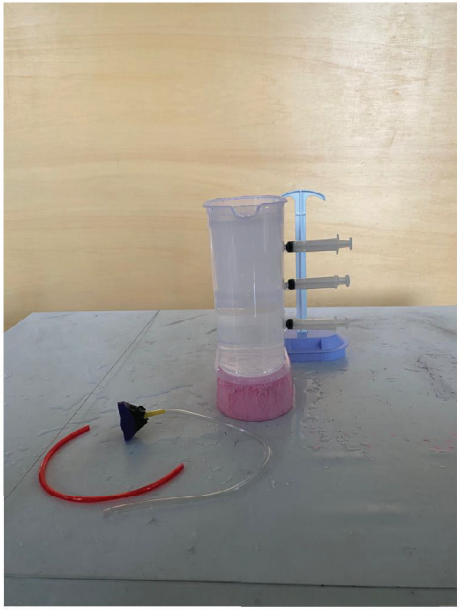


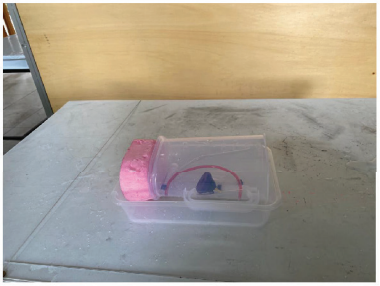
The set is stored easily without taking much space.

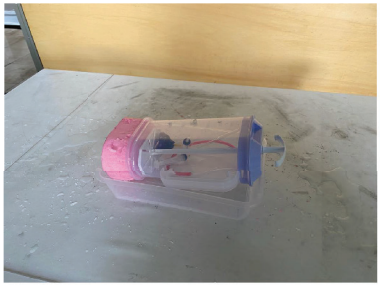
Mock-up











Electra

8. Sınıf Öğrencileri için Elektrostatik Deney Seti

An Electrostatic experiment Set for 8th Graders





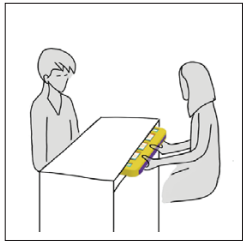
Tasarımcılar / *Designers:*
Elif Işık, Pınar Çobanoğlu, İpek İlayda Bellisan

Electra, ortaöğretim 8. sınıf öğrencilerine "Elektrostatik" konusunun içerdiği kazanımları öğrenme ve gözlemleme imkânı sunan oyunlaştırılmış bir deney setidir. Electra, öğrencilere interaktif bir deney ortamı yaratırken, aynı zamanda pozitif, negatif ve nötr cisimlerin birbirleri ile etkileşimlerini öğrenmelerini ve öğrendiklerini fiziksel olarak gözlemlemelerini sağlar. Deney seti birbiri ile iç içe geçerek kurulumu sağlanabilen ana gövde, malzeme çekmecesi ve deney ekranı olmak üzere üç ana parçadan oluşmaktadır. Bütün parçalar deney kutusunun içinde depolanabilir. Deney ekranındaki iki alüminyum küre, çubuklar ve malzeme çekmecesine bağlı kumaş kullanılarak yüklenir ve öğrencilerin elektrostatik etkileşimi gözlemesini sağlar.

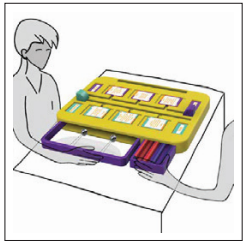
Electra is a gamified experiment set that enables 8th grade students to learn and observe learning outcomes of the "Electrostatic" unit. Electra creates an interactive experiment stage for students, and also, it lets students to learn and observe the interaction of positive, negative and neutral charges. The experiment set includes three main parts that are the main box, equipment drawer and the experiment screen which can be easily set up by attaching the screen on top of the box. All parts can be stored in the body box. Two aluminium balls that are placed in the experiment screen are charged with sticks and fabrics in the equipment drawer. By this way, it enables students to observe the electrostatic interaction.



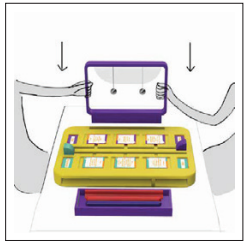
Scenario



Student pulls out the set of experiments that can be stored under the bench.



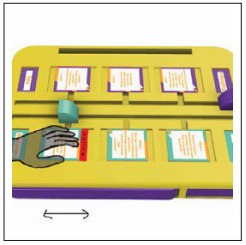
The material box and the experiment screen stored in the set are easily taken out.



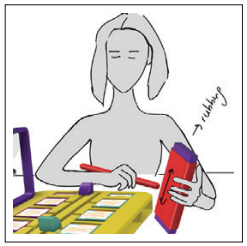
The experiment screen is placed in the experiment box, the material box takes its place on the bench.



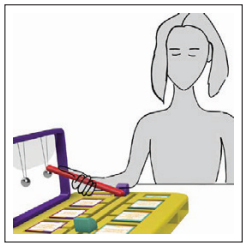
Student 1 moves the pawn and stands on the question card. Asks the question to student 2.



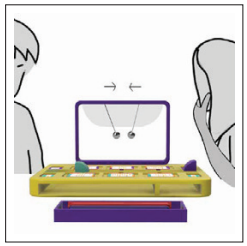
There are two different options under the cards. The student shows their answers by swiping the card forward or backward.



Student 2 uses the materials in the material box. To begin by rubbing the rod against the fabric.



Student touches the rod to the aluminum ball.



They observe the electrification between two aluminum balls.

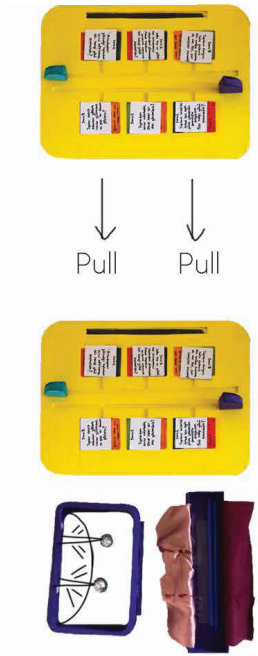


Now it's time for Student 2.



After students have asked all the questions in the experiment, they complete the experiment.

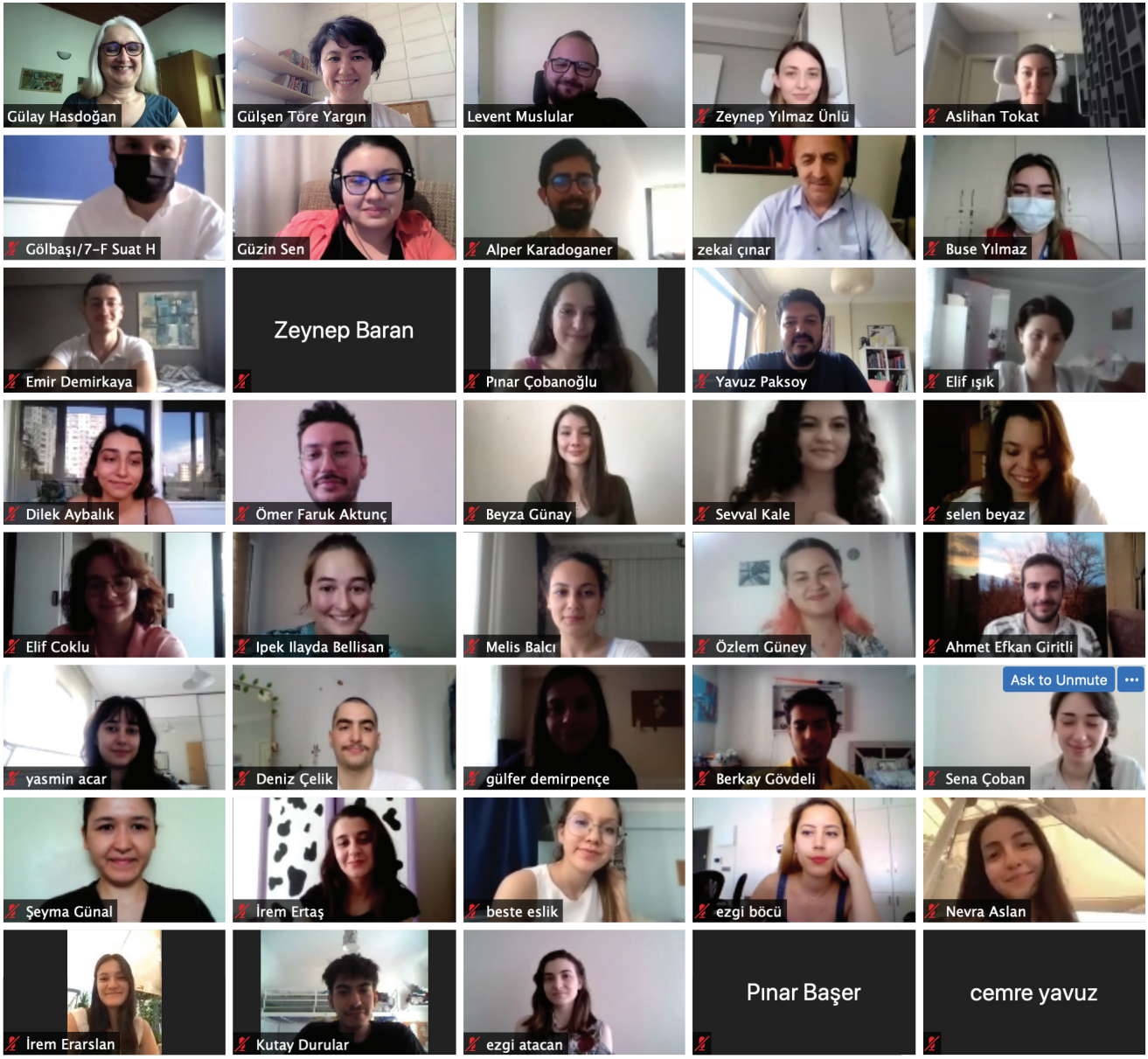
Mock-up







Final Jury


Gülay Hasdoğan
Gülşen Töre Yargın
Levent Muslular
Zeynep Yılmaz Ünlü
Aslihan Tokat
Gölbaşı/7-F Suat H
Güzin Sen
Alper Karadoganer
zekai çınar
Buse Yılmaz
Emir Demirkaya
Zeynep Baran
Pınar Çobanoğlu
Yavuz Paksoy
Elif ışık
Dilek Aybalık
Ömer Faruk Aktunç
Beyza Günay
Sevval Kale
selen beyaz
Elif Coklu
Ipek Ilayda Bellisan
Melis Balcı
Özlem Güney
Ahmet Efkan Giritli
yasmin acar
Deniz Çelik
gülfer demirpençe
Berkay Gövdeli
Ask to Unmute
Sena Çoban
Şeyma Günal
İrem Ertaş
beste eslik
ezgi böcü
Nevra Aslan
İrem Erarslan
Kutay Durular
ezgi atacan
Pınar Başer
cemre yavuz



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