

# Learn STEM

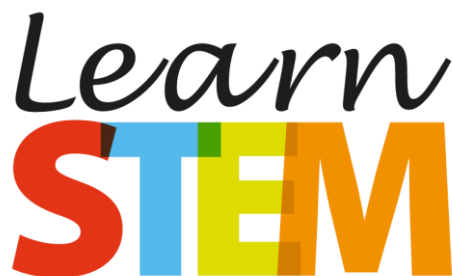
Innovative STEM learning in schools

## Pedagogical Model

for Innovative STEM

Learning and Teaching

### Annex 1: Good Practice Examples of Innovative STEM Learning



<http://www.learn-STEM.org>

**Coordinator:**

Open University of the Netherlands (OUNL)

**Project Partners:**

Agora, Roermond (Agora), Kaunas Science and Technology Park (KSTP),  
Kaunas Simonas Daukantas Progymnasium (KSDP), Association Effebi (Effebi),  
Technical University of Applied Sciences Wildau (TUASW), Madan Park (Madan),  
Group of Schools Emidio Navarro (GSEN), Eekhout Academy (Eekhout)

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# Learn STEM

## The Pedagogical Model for Innovative STEM Learning and Teaching

### Annex 1: Good Practice Examples of Innovative STEM Learning

#### Authors:

Christian M. Stracke	(Open University Netherlands, Heerlen - OUNL)
Guido van Dijk	(Agora Roermond School, Netherlands - Agora)
Jurate Daneniene	(Kaunas Science and Technology Park, Lithuania - KSTP)
Vaiva Kelmelyte	(Kaunas Science and Technology Park, Lithuania - KSTP)
Fred Lisdat	(Technical University of Applied Science Wildau, Germany - TUASW)
Anita Wesolowski	(Technical University of Applied Science Wildau, Germany - TUASW)
António Barreiros	(Group of Schools Emido Navarro, Almada, Portugal - GSEN)
Rui Baltazar	(Group of Schools Emido Navarro, Almada, Portugal - GSEN)
Wim Simoens	(Eekhout Academy Kortrijk, Belgium - Eekhout)
Jo Desutter	(Eekhout Academy Kortrijk, Belgium - Eekhout)
Alcino Pascoal	(Madan Park of Science and Technology, Caparica, Portugal – MP)
Alma Rimkevičė	(Kauno Simono Daukanto Progimnazija School, Lithuania - KSDP)
Mario Spatafora	(Effebe Association, Rome, Italy - Effebe)
Ana Maria Cotovanu	(Effebe Association, Rome, Italy - Effebe)
Alessia Spatafora	(Effebe Association, Rome, Italy - Effebe)

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## Annex 1: Good Practice Examples of Innovative STEM Learning

This collection provides some examples of good practices for teaching Science, Technology, Engineering and Mathematics (STEM) through innovative pedagogical approaches.

Furthermore, we address specific examples to follow for teaching STEM in the **Learn STEM Inquiry Learning Package** that is also online available at [www.Learn-STEM.org/Model](http://www.Learn-STEM.org/Model).

	Example 1
Title/Name of the example	Eratosthenes Experiment
Organization, country and website	Inspiring Science Education: <a href="http://www.inspiring-science-education.net/showcases/eratosthenes-experiment">http://www.inspiring-science-education.net/showcases/eratosthenes-experiment</a> <a href="http://portal.opendiscoveryspace.eu/en/community/eratosthenes-experiment-2015-820309">http://portal.opendiscoveryspace.eu/en/community/eratosthenes-experiment-2015-820309</a> <a href="http://portal.opendiscoveryspace.eu/en/edu-object/eratosthenes-experimenthighschool-820142">http://portal.opendiscoveryspace.eu/en/edu-object/eratosthenes-experimenthighschool-820142</a>
Brief description (abstract)	Eratosthenes Experiment for the Measurement of the Earth's Circumference <p>The Eratosthenes Experiment calculates the circumference of the Earth by using eLearning educational tools and simple instruments, repeating the experiment of the Greek mathematician, Eratosthenes (276 BC-194 BC). This experiment enabled Eratosthenes to prove the sphericity of the Earth and to measure its circumference.</p> <p>Full set of learning materials, online tools and tutorials for school teachers and learners.</p> <p>Two schools on the same longitude have to collaborate and to measure the shadow of a stick of 1 m in length.</p>
Age range	12 to 18
Subject/discipline or cross-disciplinary	cross-disciplinary
Name of providing Learn STEM partner	OUNL



	Example 2
Title/Name of the example	Babies and the moon
Organization, country and website	Inspiring Science Education <a href="http://portal.opendiscoveryspace.eu/de/node/842060">http://portal.opendiscoveryspace.eu/de/node/842060</a>
Brief description (abstract)	This STEM lesson intends to explore misconceptions related to the moon.
Age range	6 to 14
Subject/discipline or cross-disciplinary	cross-disciplinary
Name of providing Learn STEM partner	OUNL



	Example 3
Title/Name of the example	Star in the Box
Organization, country and website	Inspiring Science Education <a href="http://portal.opendiscoveryspace.eu/en/community/star-box-828460">http://portal.opendiscoveryspace.eu/en/community/star-box-828460</a>
Brief description (abstract)	<p>Star In A Box offers a lesson plan for one- or two-hour sessions using the highly interactive Star In A Box application. This App simulates the evolutionary stages of stars of various masses. Learners can follow changes in temperature, pressure and size for various stars. Sample questions of various difficulties are provided.</p> <p>Learners will learn about the way stars are detected from Earth, about types of stars (i.e. stars of different masses) and about how this affects their lifecycles as well as learn about stellar evolution using the Hertzsprung-Russel diagram.</p> <p>This lesson plan aims to support physics and astronomy qualifications.</p>
Age range	14 to 18
Subject/discipline or cross-disciplinary	cross-disciplinary
Name of providing Learn STEM partner	OUNL



	Example 4
Title/Name of the example	Formula 1 in schools
Organization, country and website	Inspiring Science Education <a href="https://inspiring-science-education.eu/news/f1-schools-2014-world-finals">https://inspiring-science-education.eu/news/f1-schools-2014-world-finals</a>
Brief description (abstract)	The F1 in schools is a worldwide multi-disciplinary challenge and one of the largest educational initiative promoting Science, Technology, Engineering and Mathematics (STEM). It is now in its 15 <sup>th</sup> year of operation and has expanded across the world operating in over 30 countries. Learners form a team of three to six members and are commissioned to design, construct and race a small scale Formula One car made from F1 model block and powered by compressed air cylinders. Furthermore, teams must prepare a pit display, interviews, oral presentation and a 20 page portfolio showcasing their work. Sponsorship must be gathered and collaborations formed. Another important requirement of this competition is innovation. Some main examples of F1 in school innovations will be discussed in this demo. Teams are also given the opportunity to compete regionally, nationally and internationally for the F1 Schools World Championship trophy. Since the demonstrator could cover more than one didactical unit, this example (one didactical unit) was selected for the needs of advanced level teams qualified to compete at regional and national finals. The lite version of Logger Pro ISE Tool will be used for analysing the average speed data of F1 in schools team cars.
Age range	9 to 19
Subject/discipline or cross-disciplinary	cross-disciplinary
Name of providing Learn STEM partner	OUNL



	Example 5
Title/Name of the example	Increase your swimming pool experience
Organization, country and website	Katholieke Scholengroep RHIZO vzw Burgemeester Nolfstraat 39, 8500 Kortrijk Flanders - Belgium <a href="http://www.rhizo.be">www.rhizo.be</a> <a href="http://www.designyourcity.be">www.designyourcity.be</a>
Brief description (abstract)	<p>Taking a swim in the local swimming pool, can sometimes be a bit boring or disappointing.</p> <ul style="list-style-type: none"> <li>– Learners identify what aspects of the swimming pool may be annoying by investigating, interviewing and analysing the obtained data.</li> <li>– Learners discuss the problem, brainstorm and collect ideas to select several possible solutions.</li> <li>– Afterwards they do test runs and produce a prototype.</li> <li>– This prototype is presented to the management of the swimming pool.</li> </ul>
Age range	12-14
Subject/discipline or cross-disciplinary	Design thinking as a method of STEM didactis
Name of providing Learn STEM partner	Eekhout Academy

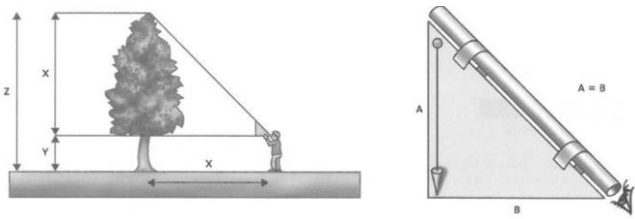


	Example 6
Title/Name of the example	A water-driven lifting crane
Organization, country and website	STEM tornooi (Flemish Technology and STEM Competition) Flanders - Belgium <a href="http://www.technologieolympiade.be/vto/index.php?request=stemtornooi/index">www.technologieolympiade.be/vto/index.php?request=stemtornooi/index</a>
Brief description (abstract)	<p>The company Aquatech is located next to the river Schelde. This is of course the ideal location to transport as many goods as possible by waterway. To do so, the company uses small containers and smaller ships for freight transport.</p> <p>Aquatech has no place and money for huge cranes to load the small containers onto the ships. How can they bring the load of five containers on board?</p> <p>Designing a water-driven crane would be an additional challenge. We use no electricity, no motors, but only water to set the crane in motion.</p> <ul style="list-style-type: none"> <li>– Learners are challenged to make a preliminary study of this project and produce a scale model of the crane.</li> <li>– Different aspects of STEM assignments are possible: <ul style="list-style-type: none"> <li>○ How will the crane move?</li> <li>○ What movements will the crane have to perform?</li> <li>○ What are the basic principles of hydraulics and how can we apply them in our project?</li> <li>○ What is the size, weight and shape of the containers to be moved?</li> <li>○ How can we best lift the containers?</li> <li>○ How are we going to manage the task?</li> </ul> </li> </ul>
Age range	12-14
Subject/discipline or cross-disciplinary	Principles of mechanics and hydraulics
Name of providing Learn STEM partner	Eekhout Academy





	Example 7
Title/Name of the example	Paris Dakar Ramp Jump Challenge
Organization, country and website	SIBE Sportlaan 4, 8300 Knokke-Heist Flanders - Belgium <a href="http://sibe.be">http://sibe.be</a>
Brief description (abstract)	<p>In the Paris-Dakar rally, cars have to bridge gaps in the sand surface. To practise this manoeuvre, the rally pilots use slopes or ramps.</p> <p>How can we help those pilots with the construction of such a ramp?</p> <ul style="list-style-type: none"> <li>– After looking at a number of movies of cars and skiers jumping from a ramp (succeeding and failing), learners brainstorm in groups about how to design this ramp.</li> <li>– Research - design – study of material.</li> <li>– Construction of the ramp of max. 1.5 m which you can bridge a minimum distance of 1 m.</li> <li>– Design a car (or vehicle: it can also be a tricycle) that can bridge this distance and ends up on all its wheels.</li> <li>– Presentation of the structure (ramp and car) and the result of your jump by oral presentation, movie or didactic material.</li> <li>– Reflection at the end of the project: Explain what problems you encountered during this project and how you solved them.</li> </ul>
Age range	12-14
Subject/discipline or cross-disciplinary	Physics and mathematics - movement and friction - calculation of angles - balance - bridge the distance - gravity and centre of gravity - surface, aerodynamics ...
Name of providing Learn STEM partner	Eekhout Academy

	Example 8
Title/Name of the example	Find and measure the highest tree in the woods
Organization, country and website	Sint-Andreaslyceum Sint-Kruis Fortuinstraat 29, 8310 Sint-Kruis Flanders – Belgium <a href="http://humaniora.sask.be">http://humaniora.sask.be</a>
Brief description (abstract)	<p>To renew the ridge of an old farm, the building company wants to replace the central beam. How can we find the tree that has the minimum required dimensions? How can we build a tool to measure the height of a tree?</p>  <p>Find out what kind of tree is the tallest. Why is this tree taller than the others?</p>
Age range	14-16
Subject/discipline or cross-disciplinary	Engineering, Math, Natural Science
Name of providing Learn STEM partner	Eekhout Academy



	Example 9
Title/Name of the example	Educational activities in STEM (STEAM) days
Organization, country and website	Engineering Lyceum of Kaunas University of Technology (KUT), Kaunas, Lithuania <a href="http://www.inzinerijoslicejus.ktu.edu/inzinerija/inzinerine-veikla">www.inzinerijoslicejus.ktu.edu/inzinerija/inzinerine-veikla</a>
Brief description (abstract)	<p>Numerous options for STEM activities:</p> <ol style="list-style-type: none"> <li>1. Learners take part in the STEAM profile events, organised by the educational institution. One of them is <b>“STEAM DAY”</b>: During the event, engineering issues are discussed, experiments at the laboratories are realised, lectures and workshops are done and all the topics are related to STEM. Learners participate in many educational activities at Kaunas University of Technology and in other various science and business institutions.</li> <li>2. At the <b>“Engineer's Day”</b>, learners visit various institutions dealing with engineering topic (for example an aviation museum) and participate in specific educational programs, for example "Why do planes fly?". During these trips, learners get know more about the engineering constructions, particular techniques, learn about specific engineering equipment, can visit museum expositions etc.</li> <li>3. <b>Design Week</b>: exhibitions of learners' engineering projects are organised and displayed as interactive exhibitions. The event stimulates interest in the possibilities of contemporary media art expression, engineering, communication and technology synergy.</li> <li>4. Learners <b>visit the KUT laboratories</b>, for example: visiting Faculty of Chemistry, where they are introduced to various research, food production and the process of creating new recipes. Learners also learn how food industry specialists are trained, what kind of knowledge students get, how much they learn and what they do to get the successful job after finishing their degrees.</li> <li>5. <b>Trips to engineering profile factories</b>: learners attend and visit the company's workshops, where they get acquainted with engineering, automated production lines and practically get acquainted with the peculiarities of technologies used in modern construction products.</li> </ol>
Age range	7-18
Subject/discipline or cross-disciplinary	Crossdisciplinary: engineering, ICT, chemistry, technology, design
Name of providing Learn STEM partner	Kaunas Science and Technology Park, Lithuania



	Example 10
Title/Name of the example	Engineering Educational Program for pupils
Organization, country and website	VGTU Engineering Lyceum, Vilnius, Lithuania, (Engineering lyceum of Vilnius Gediminas Technical University) <a href="http://www.vgtulicejus.lt/inzinerija/inzinerinis-ugdymas/">http://www.vgtulicejus.lt/inzinerija/inzinerinis-ugdymas/</a>
Brief description (abstract)	<p>Up to 25% of the content of the engineering discipline is integrated into the programs at the VGTU engineering lyceum. The aim is to present a comprehensive picture of the world to learners and to develop their ability to combine engineering and general competences in school. More than 75% of engineering educational programs are directed towards the practical application of knowledge and technology, creative work, project implementation, technological process, management and design, as well as presentation of work and learners' future career planning</p> <p>Engineering Educational Program: learners are trained in 3 block lessons (lectures and practice) taking place at VGTU Sunrise valley (Science and Technology Park) in: construction, mechanics and design. All blocks consist of two to three academic hours, then learner carry out two to three laboratory exercises. Learners attend a 12-14 hour engineering course after which consultants discuss contents with learners and learners write their reports. Learners participate in design lessons, practical design and graphics. The program is implemented by subject teachers and university lecturers.</p>
Age range	15-17
Subject/discipline or cross-disciplinary	Crossdisciplinary: Design, mechanics, construction
Name of providing Learn STEM partner	Kaunas Science and Technology Park, Lithuania



	Example 11
Title/Name of the example	Robotic Academy and Robotic camps
Organization, country and website	VGTU Engineering Lyceum, Vilnius, Lithuania, (Engineering lyceum of Vilnius Gediminas technical university)
Brief description (abstract)	<p>The main goal of the Robotic Academy is to teach learners- so called <i>little inventors</i>, that learning is a lifelong process and that the best investment is always in their knowledge and experience. For the inventors of classes 1-8 all years are intended to reveal the power and practical simplicity of mathematics.</p> <p>Learners are introduced to the world's most relevant competences of STEM. Also, this this academy explains the many mathematical bases and practical applications of the theory based on the examples of the most popular computer games (Minecraft, League of Legends, Overwatch, Battlefield).</p> <p>Tasks and constructions of these games are used and applied. All competences are interpreted through the prism of mathematics and robotics. At the academy, the mathematical knowledge gained during school lessons is consolidated and used in practical tasks with robots by designing, programming and testing.</p> <p>During the class, learners deal with real-world problems, developing quick-prototype solutions for problems, problem-solving experiments and discuss results. They develop all the STEM competences, discovering their strongest side. Programs are prepared on the basis of <b>LEGO Education</b> methodologies acquired by the Robotics Academy's experience in non-formal education and meet the requirements of formal education.</p>
Age range	7-14
Subject/discipline or cross-disciplinary	Robotics (engineering)
Name of providing Learn STEM partner	Kaunas Science and Technology Park, Lithuania



	Example 12
Title/Name of the example	'Festival Nacional de Robótica' Portuguese Robotics Festival
Organization, country and website	Organisers vary from year to year. In 2017, the University of Coimbra was responsible: <a href="http://www.uc.pt">www.uc.pt</a> <a href="http://robotica2017.isr.uc.pt">http://robotica2017.isr.uc.pt</a> This nationwide event is sponsored by several institutional partners (public and private) as well as the Institute of Electrical and Electronics Engineers (IEEE).
Brief description (abstract)	This competition is supported by many schools throughout the country, namely via the action of their respective robotics clubs. There are four different topics for the competitions which take place at one location (Coimbra in April 2017), that is: <ul style="list-style-type: none"> <li>• <u>OnStage Junior</u>: robots dance following the music;</li> <li>• <u>Futebol Junior</u>: football tournament with small teams composed of two robots, a game table and a human referee (comprises three sub-groups, according to the age of learners);</li> <li>• <u>Resgate Junior</u>: learners are separated by age, thus forming several sub-groups for this topic. The goal is to program a robot which is going to fulfil a rescue mission autonomously in a field full of obstacles and danger;</li> <li>• <u>FreeBots Junior</u>: challenges learners from primary, secondary and vocational schools to present the robots they have developed (with innovative features) in a technical and public demonstration. This includes physical robots (one or more), mobile or otherwise, terrestrial, aquatic or aerial.</li> </ul>
Age range	8-19
Subject/discipline or cross-disciplinary	Cross-disciplinary: mathematics, programming, mechanical engineering and robotics
Name of providing Learn STEM partner	Madan Parque



	Example 13
Title/Name of the example	The Young Engineer School (at the VGTU Lyceum) and Technical creativity classes “Future engineering”
Organization, country and website	VGTU Engineering Lyceum, Vilnius, Lithuania, (Vilnius Gediminas Technical University) The Young Engineer School (academy)
Brief description (abstract)	<p>The Young Engineer School is a free academy that is founded at the VGTU Lyceum and provides informal lessons. Learners are provided with free thematical lectures of STEM disciplines.</p> <p>Professors, associate professors and lecturers provide a comprehensive introduction to the study programs, prospects of obtaining a diploma, career opportunities, etc.</p> <p>After receiving more than five lectures, the Young Engineer certificate is given.</p> <p>Lectures and workshops thematics: Design, architecture, aircraft engineering, biomechanics, robotics, safety engineering during emergency situations, construction business and the application of the latest ICT technologies.</p>
Age range	15–18
Subject/discipline or cross-disciplinary	Mathematics, ICT, engineering
Name of providing Learn STEM partner	Kaunas Science and Technology Park, Lithuania



	Example 14
Title/Name of the example	Robotics
Organization, country and website	Education Development Centre
Brief description (abstract)	<p>Programming and development of robots is getting more and more popular in Lithuania each year. However, these activities are mostly related to informal education or projects (<a href="http://patinka.infobalt.lt/">http://patinka.infobalt.lt/</a>). Lithuania is planning to include robotics' modules in general education curricula.</p> <p>Further information:</p> <p>Robotics academy: <a href="http://www.robotikosakademija.lt/">http://www.robotikosakademija.lt/</a></p> <p>Robotics competition: <a href="http://www.robotiada.lt/">http://www.robotiada.lt/</a></p> <p>Website of robotics competition organizers: <a href="http://patinka.infobalt.lt/">http://patinka.infobalt.lt/</a></p>
Age range	11-19
Subject/discipline or cross-disciplinary	Cross-disciplinary. Robotics encourages creativity, independence, persistence and curiosity in innovations in each learner. It develops communication and collaborative work skills.
Name of providing Learn STEM partner	KSDP





	Example 15
Title/Name of the example	ICT school
Organization, country and website	VGTU Engineering Lyceum, Vilnius, Lithuania, (Vilnius Gediminas technical university)
Brief description (abstract)	<p>Vilnius Gediminas Technical University (VGTU) IT School invites learners to courses on information technologies i.e. programming of web pages, combining design elements, working on the latest project management techniques and using electronics and mechanics laboratories. During lectures, different technologies and their applications are tailored according to the individual needs of the learner.</p> <p>The lectures are held at modern workshops of the VGTU Creativity and Innovation Centre and also at the Sunrise Valey (Science and Technology Park).</p> <p>Students learn together with the most advanced specialists in their field at one of the strongest Lithuanian Technology Universities.</p>
Age range	11–14
Subject/discipline or cross-disciplinary	Informal education: ICT
Name of providing Learn STEM partner	Kaunas Science and Technology Park, Lithuania



	Example 16
Title/Name of the example	3D printers
Organization, country and website	'MARCH' EU funded project Education Development Centre (EDC)
Brief description (abstract)	3D printers open up wide possibilities in education. 3D printers give a new perspective on learning and teaching common subjects: mathematics, technologies, drawing, arts. This practice is particularly related to the surrounding environment and is gaining popularity in various industry branches.  Further information:  Additional seminars to guide teachers and learners: <a href="http://www.upc.smm.lt/nauijenos/stem/3d.php">http://www.upc.smm.lt/nauijenos/stem/3d.php</a>
Age range	11–19
Subject/discipline or cross-disciplinary	Cross-disciplinary: mathematics, technologies, drawing, arts
Name of providing Learn STEM partner	Effebe Association, KSDP



	Example 17
Title/Name of the example	STEM Learning - Activity Case Studies
Organization, country and website	STEMNET ( <a href="https://www.stem.org.uk">https://www.stem.org.uk</a> ) <a href="https://www.stem.org.uk/resources/collection/3035/activity-case-studies">https://www.stem.org.uk/resources/collection/3035/activity-case-studies</a> (registration data needed)
Brief description (abstract)	A collection of STEMNET case studies which profiles activities completed by STEM ambassadors. These activity case studies include a set of career case studies which describe job positions of STEM ambassadors who lead the activities. STEM ambassadors are volunteers of all ages working in a range of STEM-related roles from apprentice engineers to geologists and nuclear physicists to zoologists.
Age range	11–19
Subject/discipline or cross-disciplinary	Cross-disciplinary: Careers, Design and technology, Engineering, Mathematics, Science
Name of providing Learn STEM partner	Effebe Association



	Example 18
Title/Name of the example	<p>“Euston, we have a problem...to solve!”</p> <p>Abstract from <i>Working together: Making STEM happen in secondary schools</i>, available online at:</p> <p><a href="https://wellcome.ac.uk/sites/default/files/making-stem-happen-in-secondary-schools-wellcome-2012.pdf">https://wellcome.ac.uk/sites/default/files/making-stem-happen-in-secondary-schools-wellcome-2012.pdf</a></p>
Organization, country and website	Wellcome Trust, charity registered in England and Wales ( <a href="https://wellcome.ac.uk/">https://wellcome.ac.uk/</a> )
Brief description (abstract)	<p>As part of ‘Enginuity’, a dedicated STEM creativity week, students at South Camden Community School in Euston designed and built kites to help them understand the principles of flying. Participants tested and adapted their designs before competing in a timed flight trial to discover whose prototype worked best. As in other successful STEM activities, learners’ enjoyment was improved by involving experts and using clear parameters. This project also drew on the school’s cultural diversity by looking at the worldwide enthusiasm for kite flying.</p> <p>(From pages 20–21:</p> <p><a href="https://wellcome.ac.uk/sites/default/files/making-stem-happen-in-secondary-schools-wellcome-2012.pdf">https://wellcome.ac.uk/sites/default/files/making-stem-happen-in-secondary-schools-wellcome-2012.pdf</a>)</p>
Age range	Not specified
Subject/discipline or cross-disciplinary	Subject: aircraft design
Name of providing Learn STEM partner	Effebi Association



	Example 19
Title/Name of the example	School of the “2 <sup>nd</sup> educational way” Dahme Spreewald, Germany External lab courses on biology
Organization, country and website	Schule des Zweiten Bildungsweges Landkreis Dahme Spreewald (this school provides university entrance degrees for learners who failed the general school system) <a href="http://www.zbw-lds.de/index.php?option=com_content&amp;view=article&amp;id=96&amp;Itemid=102&amp;limitstart=2">www.zbw-lds.de/index.php?option=com_content&amp;view=article&amp;id=96&amp;Itemid=102&amp;limitstart=2</a>
Brief description (abstract)	Visits of external school labs are an essential part of the concept of this school for the natural sciences. At the “Gläsernes Labor” of the Max Delbrück Centre in Berlin-Buch, learners perform experiments working with DNA. They start by extracting DNA from saliva and separate different DNA fragments in a gel electrophoresis. Learners learn about staining of DNA to make the DNA sequences visible. They are introduced into the principles of “genetic fingerprinting” in order to identify persons. They further get introduced to general biological work practice, i.e. using a pipette, centrifuge and electrophoresis.
Age range	18–24
Subject/discipline or cross-disciplinary	Biology – Lab practice as part of STEM didactic
Name of providing Learn STEM partner	TUASW



	Example 20
Title/Name of the example	Youth Research Centre (Jugendforscherzentrum)
Organization, country and website	Paul Dessau Gesamtschule Zeuthen, Germany <a href="http://www.gesamtschule-zeuthen.de/index.php/forschung/jugend-forscht">www.gesamtschule-zeuthen.de/index.php/forschung/jugend-forscht</a>
Brief description (abstract)	<p>The school has founded a ‘research centre’ to coordinate youth research activities in collaboration with scientific institutions. Project ideas can come from learners, teachers or research institutions, but the activities are performed by the learners themselves. This project establishes and consolidates contact between learners and scientists.</p> <p>In collaboration with the TUAS Wildau, learners developed a lactose sensor which can quantitatively measure lactose concentrations e.g. in milk. Here, learners need to combine knowledge about chemistry, physics and biology to set up a fully functional system.</p> <p>They take part in regional and national competitions with their inventions and learn to explain and demonstrate their ideas and results to the public.</p>
Age range	16–19
Subject/discipline or cross-disciplinary	<p>Biology (as well as chemistry and physics)</p> <p>Establishment of work timeline and evaluation of success</p> <p>Development of team work capabilities</p>
Name of providing Learn STEM partner	TUASW



	Example 21
Title/Name of the example	MINT-EC National excellence school network, Germany
Organization, country and website	Network of schools that aims to provide excellence in STEM learning <a href="https://www.mint-ec.de">https://www.mint-ec.de</a>
Brief description (abstract)	STEM education as part of a comprehensive education (in German STEM corresponds to 'MINT'): <ul style="list-style-type: none"> <li>- preparation of learners for the future in economy, science and society</li> <li>- development of specific STEM interests</li> <li>- introduction to professional careers</li> <li>- endorsement of interested learners</li> <li>- cooperation among schools</li> <li>- cooperation with scientific institutions and companies</li> <li>- information and motivation to enrol for a STEM study course at universities</li> <li>- workshops, camps, competitions, school slams and courses for teachers</li> <li>- literature resources for teachers to develop STEM courses</li> </ul>
Age range	11–19
Subject/discipline or cross-disciplinary	mathematics, informatics, natural sciences and engineering
Name of providing Learn STEM partner	TUASW



	Example 22
Title/Name of the example	'STEM Toys'
Organization, country and website	Science4You (private company) <a href="https://brinquedos.science4you.pt/38-stem">https://brinquedos.science4you.pt/38-stem</a>
Brief description (abstract)	<p>STEM toys helps children to stimulate their cognitive abilities in these areas while they play. Toys like scientific kits, puzzles, quizzes and logic games are great tools to develop logical and critical thinking, stimulate curiosity and become more aware of the world around them.</p> <p>The company Science4you believes in innovation and is always looking for new trends in educational toys. Science4you promotes STEM systems as a way to stimulate knowledge through practical experiences.</p> <p>Science4you has a team of experts who work on the development of toys to supply children with learning tools focused on STEM interests and prepare them for their future.</p>
Age range	all ages
Subject/discipline or cross-disciplinary	Cross-disciplinary
Name of providing Learn STEM partner	Madan Parque





	Example 23
Title/Name of the example	Theatre sports
Organization, country and website	Education Development Centre
Brief description (abstract)	<p>Theatre sports encourages theatre improvisation. It aims to create groups' narrative to focus on the present without preparing or contemplating for activities. Improvisation encourages competitiveness. Humor is essential in theatre sports. Activities in theatre sports require courage, use humor to express feelings, emotions and to have no prejudice. It encourages participants to combine different experiences and transfer them to new situations. Theatre sports aims to release creative forces, relax, 'switch-off' their minds and surrender to creativity. Professional actors use sports to relax, build a team and activate their subconsciousness. The same objectives can be achieved in this education process.</p> <p>It could be applied to various educational environments without additional equipment needed. It enables to form informal/closer ties between teacher and learner. Theatre sports could be used to reveal creativity, communication skills and develop general competences.</p> <p>Further information:</p> <p>Lecture by Zilvinas Beniusis: 'Theatre sports: release imagination':  <a href="https://youtu.be/DRFv9miQFew">https://youtu.be/DRFv9miQFew</a></p> <p>Comments on theatre sports:  <a href="https://youtu.be/2YEjTU_YD4U">https://youtu.be/2YEjTU_YD4U</a> (start at 1:18 min. and turn on EN subtitles)</p>
Age range	11–19
Subject/discipline or cross-disciplinary	Cross-disciplinary
Name of providing Learn STEM partner	KSDP



	Example 24
Title/Name of the example	MakerKlas
Organization, country and website	Qeske, Netherlands, <a href="http://www.geske.nl">www.geske.nl</a> , <a href="http://www.makerklas.nl">www.makerklas.nl</a>
Brief description (abstract)	MakerSpace is a field lab where people can explore, research, invent, make, learn, share all kind of ideas about high technology and low technology.
Age range	10–99
Subject/discipline or cross-disciplinary	Cross-disciplinary
Name of providing Learn STEM partner	Agora



	Example 25
Title/Name of the example	Agile Learning
Organization, country and website	Niekée / Agora Roermond, The Netherlands: <a href="http://www.agoraroermond.nl">www.agoraroermond.nl</a> / <a href="http://www.niekee.nl">www.niekee.nl</a>
Brief description (abstract)	Agile Learning process supports the way of learning where learners explore their own curiosity. The process of learning can be visualised by using Scrum. Learners lead and own their learning process. The role of the teacher is coach. Field experts are available when needed. Agile Learning promotes student's self-regulation and the possibility to be flexible in taking the next steps. Entrepreneurship is one of the effects we observe for this type of learning. Learners develop innovative skills (collaboration, critical thinking, creativity and communication).
Age range	12–18
Subject/discipline or cross-disciplinary	Cross-disciplinary
Name of providing Learn STEM partner	Niekée



	Example 26
Title/Name of the example	Agile Learning
Organization, country and website	Agrupamento de Escolas de Portela e Moscavide, Portugal <a href="http://agepm.pt/cms/">http://agepm.pt/cms/</a> <a href="https://www.facebook.com/groups/orobotajuda">https://www.facebook.com/groups/orobotajuda</a>
Brief description (abstract)	Using robots as an educational help to encourage learners' curiosity towards the discovery and learning of basic concepts within physics and chemistry, mathematics and computers. Planning and presentation of experimental activities by and for students stimulates and promotes interest in STEM and self-learning.  By using robots we intend to draw young people's attention to activities related to science, particularly to engineering and information technologies. Therefore, learners in the school plan and build prototypes to solve specific problems.
Age range	8–18
Subject/discipline or cross-disciplinary	Maths, physics, programming, robotics
Name of providing Learn STEM partner	Agrupamento de Escolas Emídio Navarro - PORTUGAL



	Example 27
Title/Name of the example	The Inventors
Organization, country and website	The Inventors, Portugal <a href="http://www.theinventors.io">http://www.theinventors.io</a>
Brief description (abstract)	The Inventors develops educational kits and classes that aim to inspire a new generation of inventors. These include projects around coding, electronics, design, game creation, animation and other creative subjects.
Age range	7–14
Subject/discipline or cross-disciplinary	Cross-disciplinary: technology and creative subjects
Name of providing Learn STEM partner	Agrupamento de Escolas Emídio Navarro - PORTUGAL

## About Learn STEM, the European Alliance for Innovative STEM learning in schools:



We need innovative and better school education in Science, Technology, Engineering and Mathematics (STEM) as key sectors for our future life, work and society. The European Alliance **Learn STEM** focuses their interrelation and integration in cross-disciplinary and reflective STEM education and pedagogical methodologies. Main goal of **Learn STEM** is to improve the quality and efficiency of STEM learning in secondary schools. Consequently **Learn STEM** aims at increasing the pupils' interest in STEM and building STEM competences. Therefore **Learn STEM** designs and provides pedagogical methods and tools for secondary schools to explore and solve real life questions. Thus, **Learn STEM** supports and contributes to the key objective of the European Education and Training 2020 Strategy (ET 2020) that fewer than 15% of 15-year-olds should be under-skilled in reading, mathematics and science.

Moreover, the **Learn STEM** project will also address the need to enhance knowledge of and about science as a precondition to prepare Europe's population to be actively engaged, responsible citizens as well as conversant with the complex challenges facing society. In the PISA study 2015 most students expressed a broad interest in science topics and recognised the important role that science plays in their world; but only a minority reported their participation in science activities. In addition, teachers still declare they need more professional development linked to tailoring, diversifying, and innovating teaching practices. Thus, **Learn STEM** aims at strengthening secondary schools capacity to develop skills in subjects such as science, technology, engineering and mathematics through innovative and interactive pedagogical methods and approaches. The project will provide teachers and schools with a pedagogical model and educational tools to support pupils to connect with the 'real-life' applications of STEM, in particular related to Internet of Things (IoT) and robotics, which represent two very popular sectors in the technological field.

Under the lead of the Open University of the Netherlands, **Learn STEM** brings together nine Partners from six European countries (NL, IT, DE, PT, LT, BE) developing the **Learn STEM** Pedagogical Model and the Inquiry learning package. All these contents will be integrated in the open online learning environment and offered as a free course for teacher training.

More information about **Learn STEM** online:

<http://www.Learn-STEM.org>

### **Learn STEM Contact:**

Coordinator: Dr. Christian M. Stracke  
Organization: Open University of the Netherlands  
E-Mail: [christian.stracke@ou.nl](mailto:christian.stracke@ou.nl)



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