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STEAMTeach

STEAM Education for Teaching Professionalism

STEAMTeach Austria

Tony Houghton, Imam Rahmadi, and Zsolt Lavicza

WORKSHOP AGENDA

STEAM & STEAMTEACH Overview

Professional Development Framework worked examples inc curricular context

- Analysing Sporting Performance Movement
- 3D Modeling and Printing, Microgames
- Zero Cost Energy Bike, Chain Reaction - create your own

STEAM collaborative teachers group project(s)

- STEAM Travel to Mars
- Mind the Gap: Folding Paper Bridges

Presentations & Next Steps

- From trainers and teachers

The first section presents a project overview and first interviews with five Austrian expert teacher trainers relating to a STEAM framework to build a portfolio of integrated STEAM projects:

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From KIKS to STEAMTEACH

Great results

Without teachers it doesn't work…

Change focus to teachers

To be sustainable

STEAMTeach
STEAM Education for Teaching Professionalism

Cross Cultural STEAM* Professional Development for in- and pre-service teachers working within the existing teacher-training infrastructure and implemented by teachers in their schools.

Build up a portfolio of integrated STEAM projects covering Science Technology Engineering Art Maths inc curricular context where applicable.

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5 PARTNERS

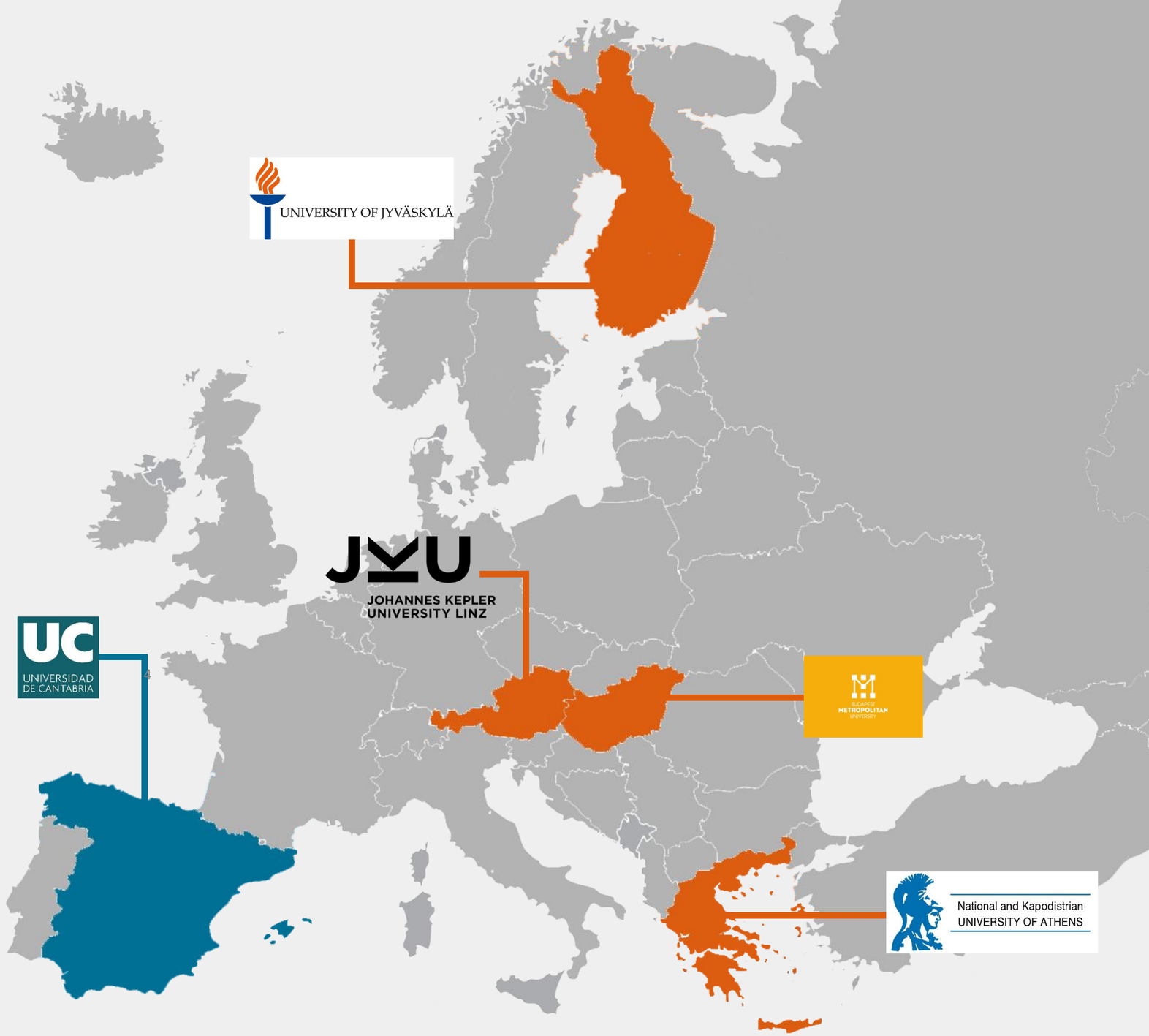
SPAIN (leaders)

Finland

Greece

Hungary

Austria



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PROJECT PHASES

Research

State on the Art on STEAM teacher training programmes

STEAM education barriers

Programme design

Designing the Cross-Cultural programme

Programme implementation

Testing the initial programme at

- Workshops
- High schools

Refining programme + implementation

Refining the initial programme

Testing the new programme

Evaluation

Evaluation of the project

AUSTRIA FRAMEWORK

FIRST PROFESSIONAL DEVELOPMENT FRAMEWORKS

AUTUMN/WINTER

Dissemination

SEPTEMBER 2022

Multiplier events

Events in each country aimed at disseminating the project results

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Austria STEAM Framework

Five expert teacher trainers > STEAM AUSTRIA draft framework > consolidated across five countries

- **Integrated STEAM Collaborative groups**/network within school and outside
- **Project Based Learning:** content integration, problem-centred, inquiry-based, design-based and cooperative learning
- Project and Problem based approach supported by appropriate scaffolding and best practice, **proven "plug-and-play"** modules and games which can be easily inserted into an integrated STEAM approach
- **Mix of physical and on-line** working synchronously and asynchronously
- Focus on **affective factor for students and teachers** (learning that relates to the learner's interests, attitudes, and motivations)

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Project Based Learning (PBL) Dimensions

Thibaut et al. (2018) contemplated five PBL dimensions, as follows: content integration, problem-centred, inquiry-based, design-based, and cooperative learning.

Content integration implies combining knowledge and skills from STE(A)M disciplines, with one discipline playing a dominant role (Martín-Páez et al., 2019). Three approaches to content integration are usually described: multidisciplinary (Conradty & Bogner, 2019; Kim, 2016), interdisciplinary (Chaaban et al., 2021) and transdisciplinary (Herro & Quigley, 2017; Quigley et al., 2020b). The multidisciplinary approach entails learning content separately in each discipline but within a common theme (English, 2016; Gresnigt et al., 2014). The interdisciplinary approach juxtaposes content from at least two disciplines, establishing explicit connections (Gao et al., 2020). In the transdisciplinary approach "the curriculum transcends the individual disciplines" (Gresnigt et al., 2014, p. 52) and knowledge and skills are applied in real-world situations (English, 2016; Gresnigt et al., 2014). Apart from these three approaches, some authors considered the monodisciplinary one (Gao et al., 2020), which is not a STE(A)M integrated approach as it incorporates content from a single discipline (Toma & García-Carmona, 2021).

Problem-centred, implicates solving problems in authentic contexts (Conradty & Bogner, 2019; Margot & Kettler, 2019). These problems tend to be open-ended and ill-defined, encouraging creative solution pathways (Herro et al., 2019) and multiple answers (Diego-Mantecón et al., 2021).

Inquiry-based learning seeks to promote processes such as questioning, hypothesizing, experimenting, and deducing conclusions (Pedaste et al., 2015; Thibaut et al., 2018). In the design-based dimension, engineering and technology are central (Li & Schoenfeld, 2019): technology is viewed as a tool to create and test artefacts (Akgun, 2013) and engineering is viewed as the context to apply mathematical and scientific content (Margot & Kettler, 2019).

Design-based learning fosters problem solving and creativity, facilitating mathematical knowledge acquisition (Li & Schoenfeld, 2019), reasoning (English & King, 2019), and positive attitudes toward mathematics (Diego-Mantecón et al., 2019). The last dimension,

Collaborative learning, emphasizes teamwork —"students working together for a common purpose" (Chapman et al., 2010, p. 39). According to Chu et al. (2019), teamwork helps students to examine phenomena and to relate new knowledge to existing knowledge. It also provides opportunities for generating discussions, solving conflicts, and communicating openly (Chaaban et al., 2021).

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Project Based Learning (PBL) Dimensions

Content integration combining knowledge and skills from STE(A)M disciplines and transcends the individual disciplines" (Gresnigt et al., 2014, p. 52)

Problem-centred, solving problems in authentic contexts (Conradty & Bogner, 2019).

Inquiry-based promote processes such as questioning, hypothesizing, experimenting, and deducing conclusions (Pedaste et al., 2015).

Design-based fosters problem solving and creativity (Schoenfeld, 2019),

Collaborative learning, emphasizes teamwork —"students working together for a common purpose" (Chapman et al., 2010, p. 39).

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Presentations & Next Steps

From trainers and teachers

This section starts with a detailed sports project worked example including curricular context and illustrating **Project Based Learning: content integration, problem-centred, inquiry-based, design-based and cooperative learning** approach.

It provides links to an existing HP multi-user course, Youtube explanatory videos and a link to the free TRACKER movement capture software.

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Professional Development Framework Project Examples*

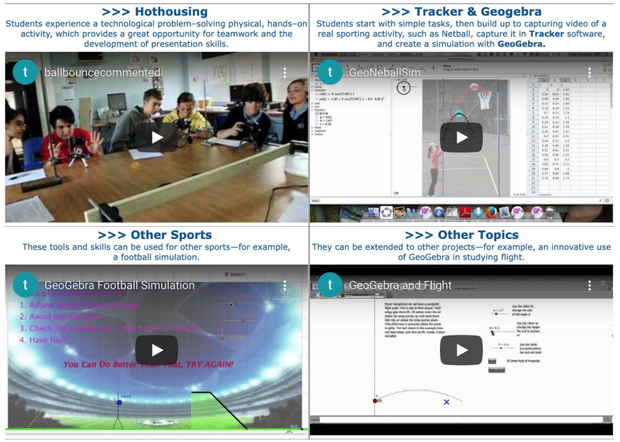
ANALYSING SPORTING PERFORMANCE

PROJECT JUSTIFICATION

CURRICULAR CONTEXT

STEPS TO BE EXECUTED

TABLE OF CONTENTS



Generic PDF Framework

https://docs.google.com/document/d/1w_ZJXtAWvLA2IKMUF6p_0PCSlOfX7hAS/edit?usp=sharing&ouid=116785179076121452044&rtpof=true&sd=true

Analysing Sporting Performance Movement

Workshop 1:
Identifying the problem, Generating ideas

Workshop 2:
Exploring the Science & Maths, Designing & Constructing the Model

Using sporting movement as a hook, our objectives are to:

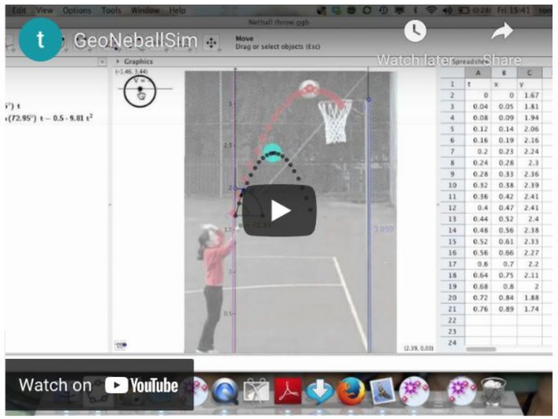
1) develop technology, communication and collaboration skills using the industry-proven Hothousing workshop intensive agenda

2) engage in activities that include video–capturing and movement analysis using Tracker, and GeoGebra mathematical software for statistics, analysis and simulation

3) gain a better understanding of gravity, acceleration and equations of horizontal and vertical motion of projectiles

Each of these new skills can be applied and adapted to a vast array of other STEM projects

Workshop 3:
Evaluating & Refining the Model



Workshop 4:
Presenting the Project

Checklist:

- Integrated STEAM Collaborative groups
- **Project Based Learning:** content integration, problem-centred, inquiry-based, design-based and cooperative learning
- Proven “plug-and-play” modules
- Mix of physical and on-line
- Affective factor for students and teachers

Original HP Analysing Sporting Performance

https://sites.google.com/site/cciteasp2/home

Getting Started with Tracker - D. Brown

https://youtu.be/La3H7JywgX0

Analysing Sporting Performance PDF

https://docs.google.com/document/d/1mfmUIQ2VpJ7F4eimdRNxSJLxB3vOFeaZ/edit?usp=sharing&ouid=116785179076121452044&rtpof=true&sd=true

Analysing Sporting Performance PPT

https://docs.google.com/presentation/d/1pZvlWizRzJ2hNjkNpQwmWMyn6Eiimabg/edit?usp=sharing&ouid=116785179076121452044&rtpof=true&sd=true

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SKY SPORTS HD 2

Project Justification

This offers an opportunity for students to engage in ***collaborative learning*** *and for teachers to engage in multidisciplinary, supportive, collaborative groups/networks within school and outside*. It offers a ***Project, Problem, Inquiry, Design - based approach*** *supported by appropriate scaffolding and best practice, proven "**plug-and-play" modules,** notably Tracker software and Geogebra* which can be easily inserted into the integrated STEAM approach and used in other STEAM activity, for example on-line games and flight . Above all, by looking at various sporting activities chosen by students and also real-life sporting heroes, it provides a focus on ***affective factors*** *for students and teachers* (learning that relates to the learner's interests, attitudes, and motivations)."

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Overview

Participant age: 14-16 year-old-students	***No. of participants:*** **Groups of 4-6**	***Duration:*** **8 hours**
Level of knowledge: None	*No. of teachers:* 2	*Type of venue:* Regular classroom Outdoor space
Learning methodologies: Collaborative learning Problem-based learning Project-based learning	*Involved disciplines:* Mathematics Technology Sport	*Technological needs:* Computer Mobile phones Internet Portable cameras
Most emphasised learning methodology: Collaborative learning Problem-based learning Project-based learning Inquiry-based learning Design-based learning	*Main addressed topics:* Analysing sporting performance	*Estimated project cost:* 0 €

Curricular Content

DISCIPLINE	**CURRICULAR CONTENT ADDRESSED**
Science	Flight: gravity, acceleration and equations of horizontal and vertical motion of projectiles
Technology	Video capture technology, Tracker and GeoGebra software
Engineering	
Arts	Various sporting activities.
	Communication and collaboration skills
Mathematics	Statistics, analysis and simulation using real-life data

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Steps to be Executed

Project Based Learning: content integration, problem-centred, inquiry-based, design-based and cooperative learning

Identifying the problem, Generating ideas	**Exploring the Science & Maths, Designing & Constructing the Model**	**Evaluating & Refining the Model**	**Presenting the Project**
Workshop 1Focus ←----------			
----------Workshop 2 Focus←----------			
----------Workshop 3 Focus ←----------			
----------Workshop 4←--			

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Workshop 1:

Identifying the problem, Generating ideas

10.00 – 10.10 Welcome and Objectives

10.10 – 10.20 Challenge: How can we analyse sporting performance?

10.20 – 10.40 Group work

Students split into groups of 5 to address the challenge (teachers stand back). :-)

3 minutes of discussion, then present first ideas for 60 seconds!

10.50 – 12.30 Group work

Bouncing Ball Video Capture, Tracker & GeoGebra Taster: Discussion and agreement on "who does what," research, expert interviews, development of solution and plan, practice presentation

12.30 – 12.50 Group 60–second presentations/demonstrations

Receive feedback, discuss team–working experience

12.50 – 13.00 Next Steps and Close

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Workshop 2:

Exploring the Science & Maths, Designing & Constructing the Model

Welcome and Project Objectives

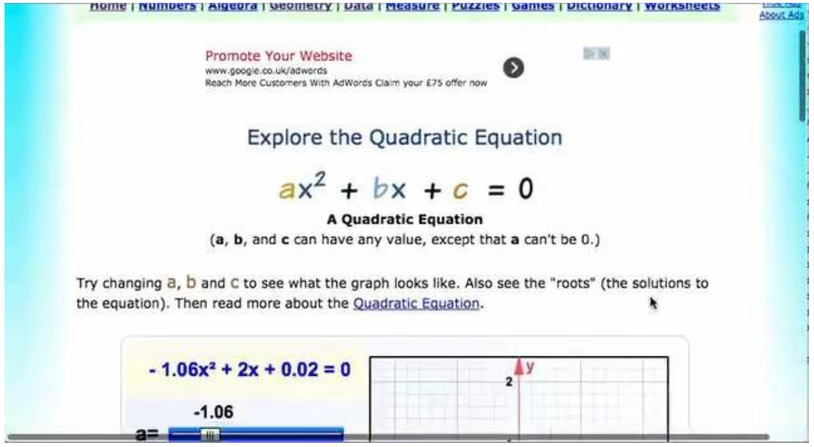
Video capture, Tracker, and GeoGebra re–cap

Discussion and play with real–life examples

"Do your own" activity—students develop their own ideas with help, as/if requested

Presentation preparation

60–seconds Presentation: YOUR activity, ideas, and next steps



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Workshop 3:

Evaluating & Refining the Model

Welcome and individual project presentation update—feedback and suggestions from pupils and experts

Pupils work on their individual projects and are visited by our various experts receiving support as and when needed

Tracker and GeoGebra Help in developing project—from GeoGebra experts

GeoGebra on-–line communication and collaboration including getting content on GeoGebra during the day

Individual project presentation update and agreement on next steps and meeting

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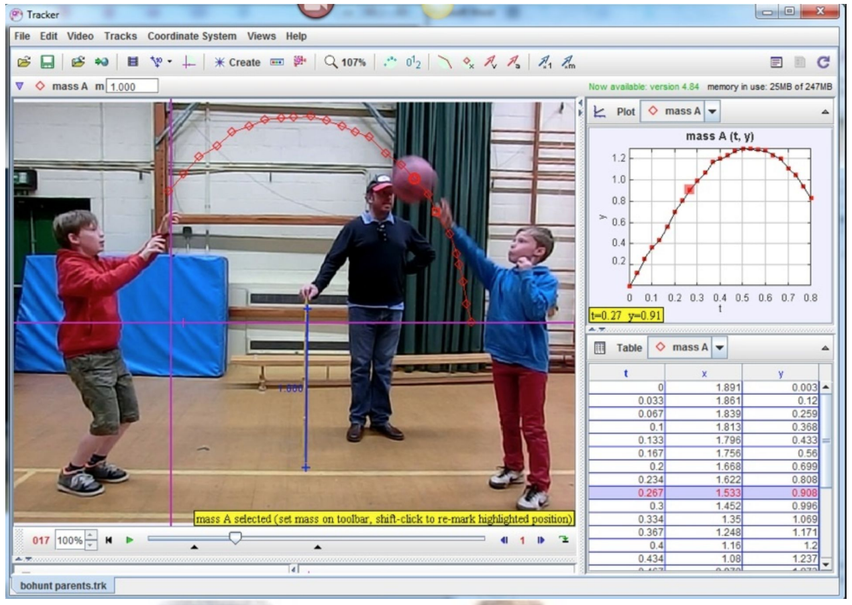
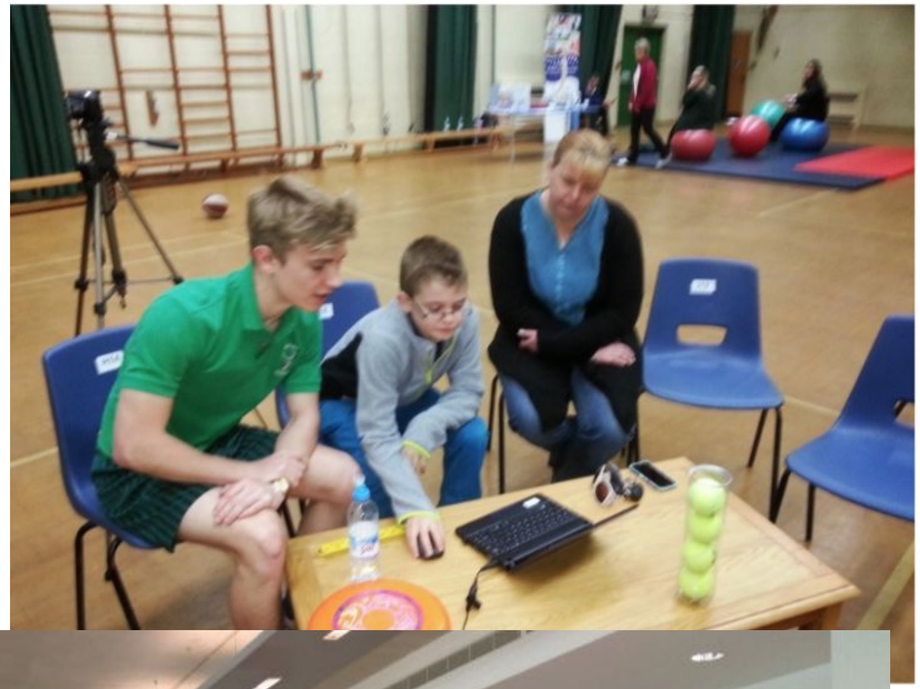
Workshop 4:

Presenting the Project

Students present their work—project description and demonstration





Next Steps

Using sporting movement as a hook, our objectives are to:

1) develop technology, communication and collaboration skills using the industry-proven Hothousing workshop intensive agenda

2) engage in activities that include video–capturing and movement analysis using Tracker, and GeoGebra mathematical software for statistics, analysis and simulation

3) gain a better understanding of gravity, acceleration and equations of horizontal and vertical motion of projectiles

Each of these new skills can be applied and adapted to a vast array of other STEM projects eg student-generated microgame

Next Steps

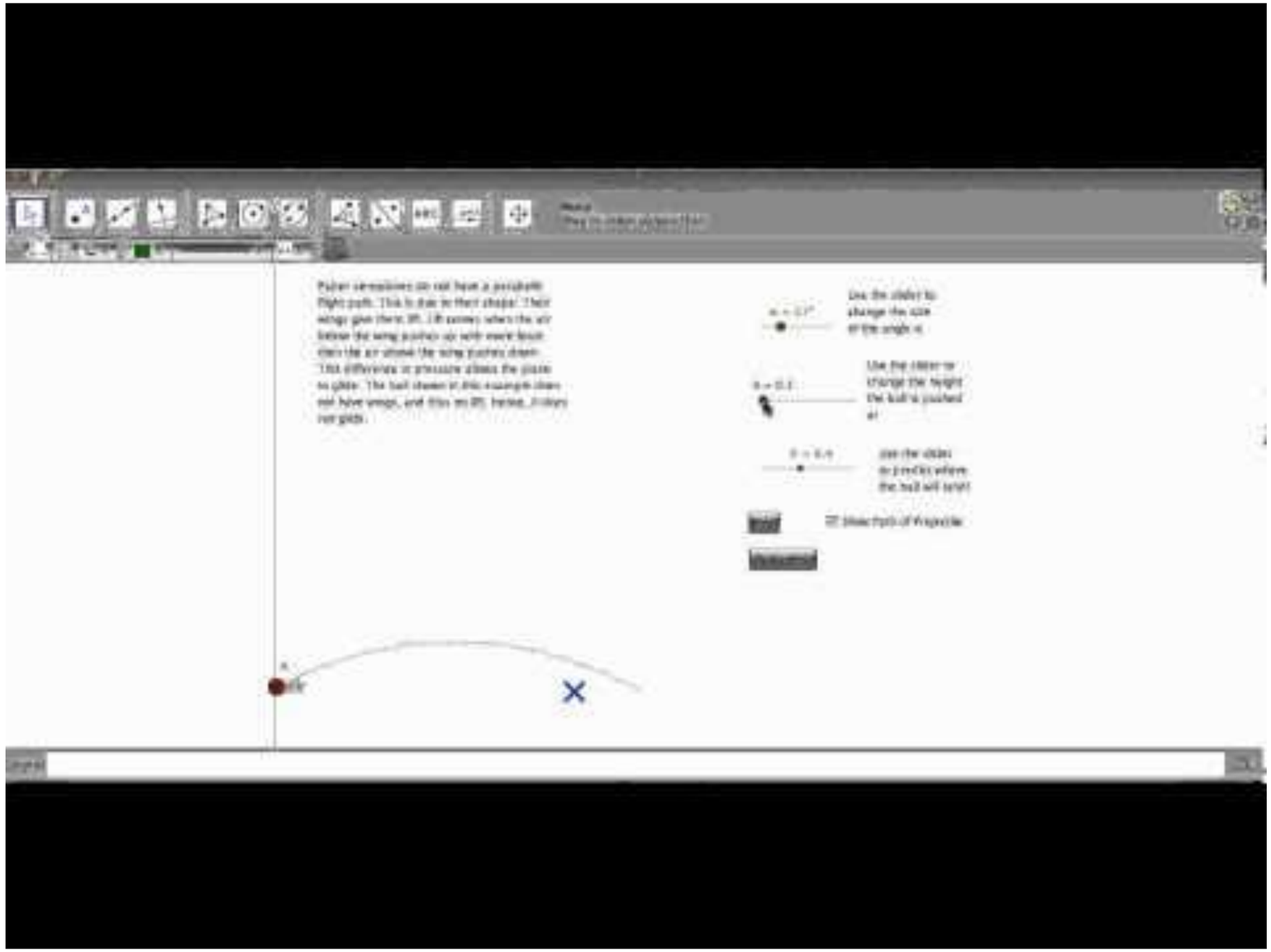
Design a cool STEAM project for young students with GeoGebra (Twelve 16-17 yr old students 3 * 2 hour sessions over summer holidays U of Cambridge)

Paper planes for age group years 5-9, it's not too technical, and it is very visual and interactive and simple to understand

We used Geogebra to produce an animated tutorial of an origami piece (such as a paper aeroplane). Once the plane has been made, experiments with throwing the plane show that it does not fly in a parabolic curve, as a ball would.

We have produced an interactive geogebra spreadsheet to show how a ball would fall. Another geogebra spreadsheet demonstrates the flight trajectory of the plane. I have also produced a word document describing very simply, how the plane flies.

GeoGebra Hothousing



Next Steps

We normally take 2-hours to explore movement, taking and analysing video clips using Tracker software.

This time we taught eight 15-year olds how to do it - and then asked them to mentor younger pupils...and their parents...in 50 minutes.

Kids teaching Kids - and Parents

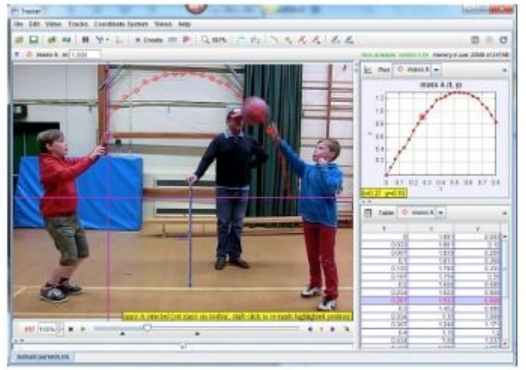
Mentor Seb 15:
It was very interesting for people to learn it quickly and I think I learnt a lot too

Student Jake 10:
Clever how you can connect computers to cameras and analyses the footage

Mum:
Amazing how sport goes into computer and covers science and technology. Seb (mentor) was very good at helping Jake

Mentor Hannah 15:
I like PE and ICT so it was good putting the two together. I was very interested!! Software is easy to use!!☺

Dad:
Great software, good to explore it more and we will be having a go at home. Thank you.



Student Thomas 13:
Eye opening. Not what I was expecting. Going to get it. Tracker easy to use.

Student Jake 15:
I enjoyed using the software and learning about how many forces get upon something so simple. Love this.

Computing programmes of study (key stages 3 and 4 National curriculum in England September 2013)

Undertake creative projects that involve selecting, using, and combining multiple applications, preferably across a range of devices, to achieve challenging goals, including collecting and analysing data and meeting the needs of known users.

Mathematics programmes of study (key stage 3 National curriculum in England)

Develop fluency; mathematical reasoning and competence in solving increasingly sophisticated problems... apply their mathematical knowledge in science, geography, computing and other subjects.

English programmes of study (key stage 3 and 4 National curriculum in England September 2013)

Competent in the arts of speaking and listening, making formal presentations, demonstrating to others and participating in debate...speak confidently and effectively in a range of formal and informal contexts,

Supporting a point of view by referring to evidence...recognising the possibility of and evaluating different responses... making an informed personal response that derives from analysis and evaluation

Science programmes of study (key stage 3 National curriculum in England September 2013)

Present reasoned explanations, including explaining data in relation to predictions and hypotheses

Design and technology programmes of study (key stage 3 National curriculum in England)

Critique, evaluate and test their ideas and products and the work of others, take into account the views of intended users and other interested groups

Art and design programmes of study (key stage 3 National curriculum in England)

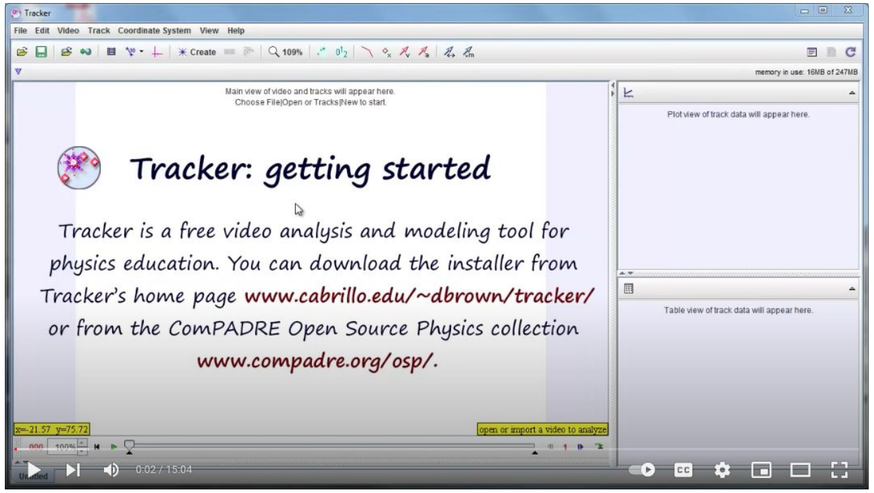
Analyse and evaluate their own work, and that of others, in order to strengthen the visual impact or applications of their work

Resources

Original HP Analysing Sporting Performance
https://sites.google.com/site/cciteasp2/home

Analysing Sporting Performance PDF
https://docs.google.com/document/d/1mfmUIQ2VpJ7F4eimdRNxSJLxB3vOFeaZ/edit?usp=sharing&ouid=116785179076121452044&rtpof=true&sd=true

Tracker Free Software
https://physlets.org/tracker/



Getting Started with Tracker - D. Brown
https://youtu.be/La3H7JywgX0

WORKSHOP AGENDA

STEAM & STEAMTEACH Overview

Professional Development Framework (PDFs)

worked examples inc curricular context

Analysing Sporting Performance Movement

3D Modeling and Printing, Microgames

Zero Cost Energy Bike and Chain Reaction

- create your own

STEAM collaborative teachers group project(s)

STEAM Travel to Mars

Mind the Gap: Folding Paper Bridges

Presentations & Next Steps

From trainers and teachers

This section continues with a 3D Modeling and Microgames overview, both described in downloadable Professional Development Framework documents. It is followed by two further projects: Zero Cost Energy Bike and Chain Reaction, in which teachers might build in their own curricular contexts

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3D Modeling and Printing

Using art to create 3D models additionally inspired teachers to collaboratively create their own tools to utilize in their lessons. This showed us that using art as a motivating factor can help teachers to focus on and enjoy the opportunities of a technology and overcome resentments.

3D printable puzzles [12] to play and models created on GeoGebra [6] platform > Passive enjoyment

Real life object > 3D print > Active engagement

1.1 Project Overview

Participant age: From 20 to 65	***No. of participants:*** Groups of 10 to 20 people	***Duration:*** 5 to 6 hours, 2 parts
Level of knowledge: Basic Knowledge of GeoGebra, PC user, owner and user of a smartphone	***No. of teachers:*** 2 to 3 people would be perfect, one is the minimum	***Type of venue:*** A mix between a computer classroom and a makerspace with 3D printers
Learning methodologies: Collaboratively working on problems, task based	***Involved disciplines:*** all STEAM disciplines are involved	***Technological needs:*** Computers, two tablets, internet, 3D printers
Most emphasised learning methodology: Collaboration and problem based learning, modelling	***Main addressed topics:*** 3D thinking, mathematical modelling	***Estimated project cost:*** 1500 €

2.2 Content

DISCIPLINE	CURRICULAR CONTENT ADDRESSED
Science	Temperatures, slopes, shrinking of material, chemical components of materials, glass and melting points, ...
Technology	The use computers and CAD programs that are easy to use from 10 years and above
Engineering	The use 3D printers and create models that can be created in the real world
Arts	design objects that not only fulfill a purpose but that also express one's inner world
Mathematics	mathematical modelling, geometry, vertices, calculus, mirroring, scaling, ...

3D Modeling and Printing PDF

https://docs.google.com/document/d/19L2IkRpUBqH-es0HNjHE9iqpIYhc7_A7/edit?usp=sharing&ouid=116785179076121452044&rtpof=true&sd=true

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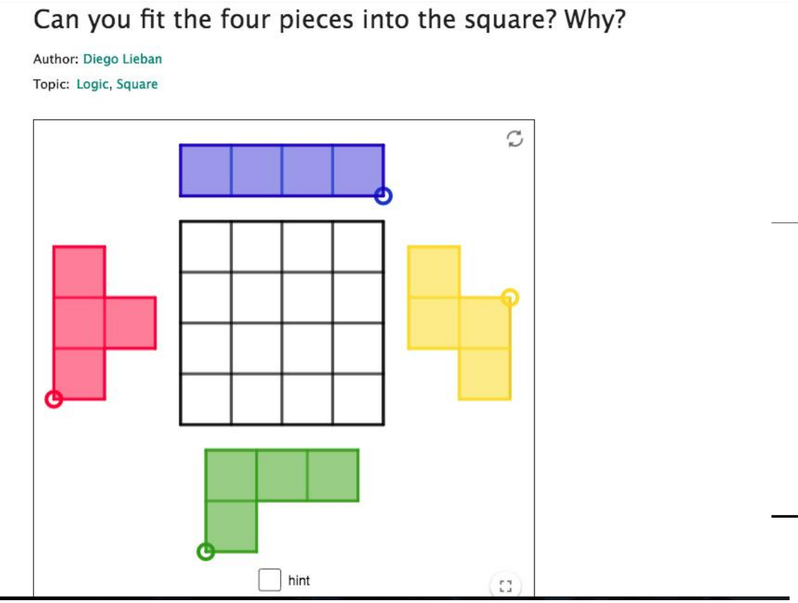
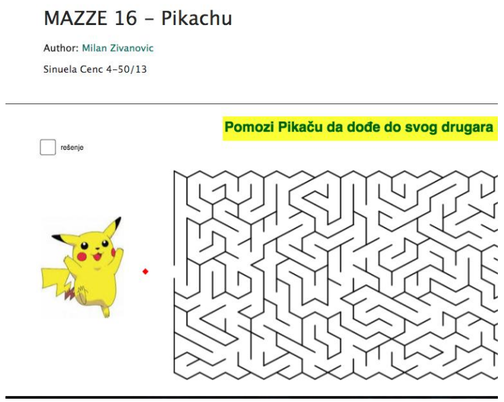
Student-generated Microgames

Microgames PDF:
https://www.steamteach.unican.es/wp-content/uploads/2021/11/STEAMTeach-Activity_Imam.pdf

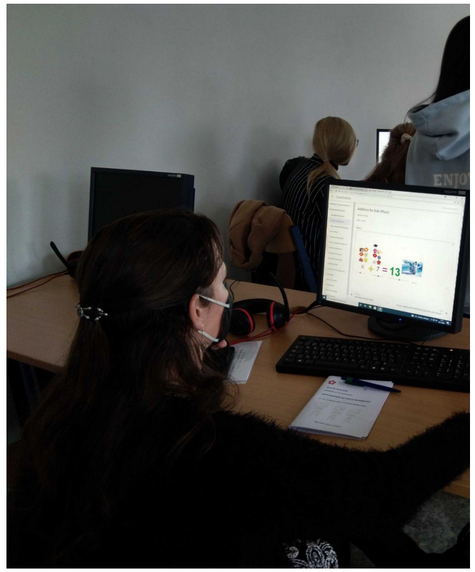


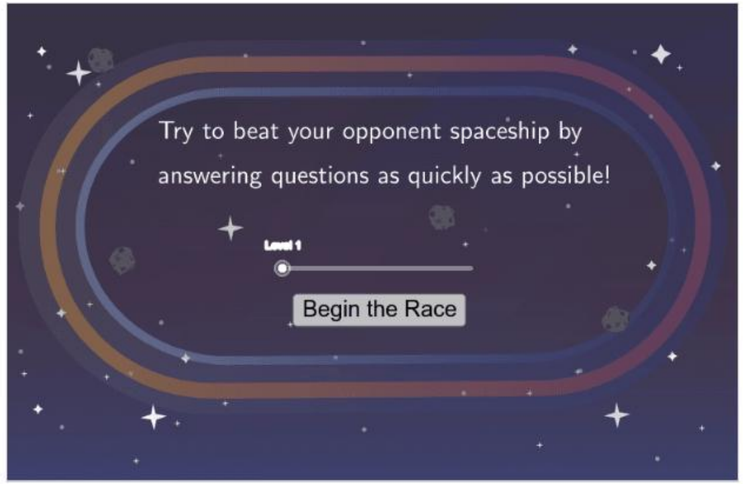


The present activity promotes students and teachers to be able to develop microgames on the GeoGebra platform. The activity could empower them to explore arts in connection to science, technology, engineering, and mathematics. Students and teachers could start expressing their creativity by designing a very short and small game with mathematical contents. This process is followed by constructing the design on GeoGebra so that they can apply science, technology, and engineering during the game developments. The process of designing and developing microgames can be done individually or in collaboration with peers. They may also share the created games to their peers for testing.

1.1 Project Overview

Participant age: 15 - 45	***No. of participants:*** Groups of 3 - 5	***Duration:*** 5 hours
Level of knowledge: Basic of GeoGebra, computer, and programming	***No. of teachers:*** 2 - 3	***Type of venue:*** Regular classroom Computer laboratory
Learning methodologies: Project-based learning Collaborative learning	***Involved disciplines:*** Science Technology Engineering Arts Mathematics	***Technological needs:*** Paper and pencil Computer Internet
Most emphasised learning methodology: Project-based learning	***Main addressed topics:*** Mathematical games	***Estimated project cost:*** 500 €





2 CURRICULAR CONTEXT

2.1 Key competences

The present activity develops students and teachers competences on digital literacy and STEAM.

2.2 Content

The content of this activity is described in the following table.

DISCIPLINE	CURRICULAR CONTENT ADDRESSED
Science	Proof of game concept
Technology	Computer and programming
Engineering	Coding and programming
Arts	Design and visualisation
Mathematics	Mathematical contents

Zero Cost Energy Scrap Bike: Technology & *Society*

Create a zero cost energy bike to deliver electricity in the home!

Imagine you are a young student in Ipswich High School, England building your scrap bike and posting a youtube video, then you see your partners school bike in Mumbai…

Project Based Learning: content integration, problem-centred, inquiry-based, design-based and cooperative learning

Identifying the problem, Generating ideas	Exploring the Science & Maths, Designing & Constructing the Model	Evaluating & Refining the Model	Presenting the Project

Participant age: ??	*No. of participants:* Groups of ??	*Duration:* ?? hours
Level of knowledge: ??	*No. of teachers:* ??	*Type of venue:* Regular classroom?? Laboratory?? Outdoor space?? …??
Learning methodologies: Content integration?? Problem-based learning?? Inquiry-based learning?? Design-based learning?? Collaborative learning??	*Involved disciplines:* Science?? Technology?? Engineering?? Arts?? Mathematics??	*Technological needs:* Computer?? Tablets?? Mobile phones?? Internet?? …
Most emphasised learning methodology: Content integration?? Problem-based learning?? Inquiry-based learning?? Design-based learning?? Collaborative learning??	*Main addressed topics:* ??	*Estimated project cost:* ?? €

DISCIPLINE	CURRICULAR CONTENT ADDRESSED
Science	
Technology	
Engineering	
Arts	
Mathematics	

Build into the Challenge your own curricular content….. the Technological and/or *Societal* Issues YOU wish to address

IB Curriculum (2020) states: '*Educational approaches should feature creative problem solving challenges including societal factors/needs'.*

Resources

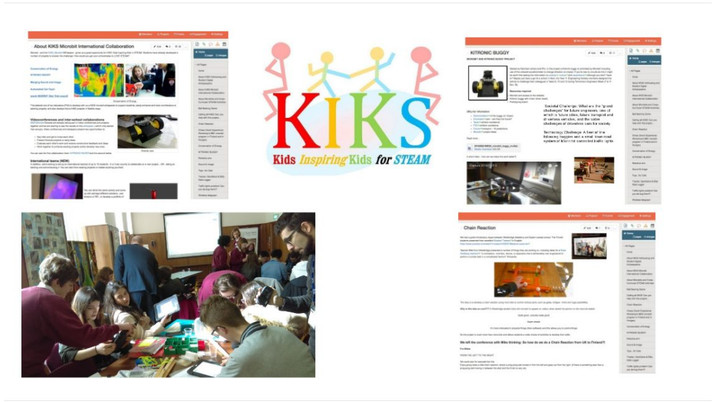
DIy Electric Bike From Scrap || Homemade Electric Bicycle

https://www.youtube.com/watch?v=giu_vrSfARM

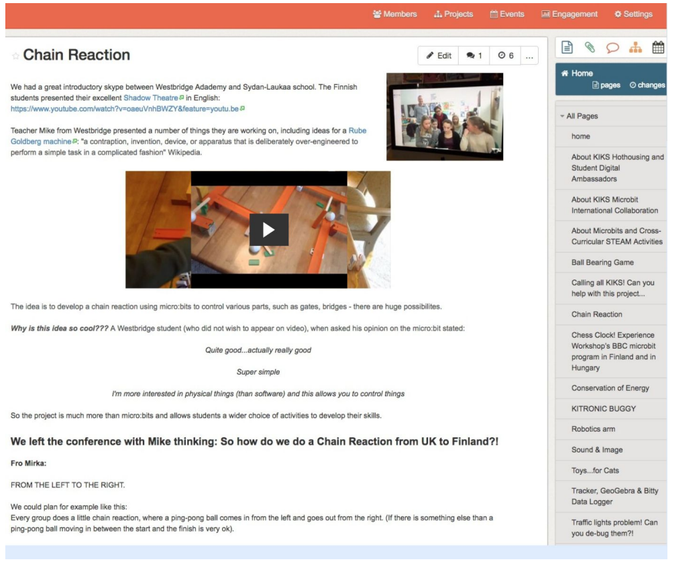
Scrapyard articles, prices…jobs, family livelihoods

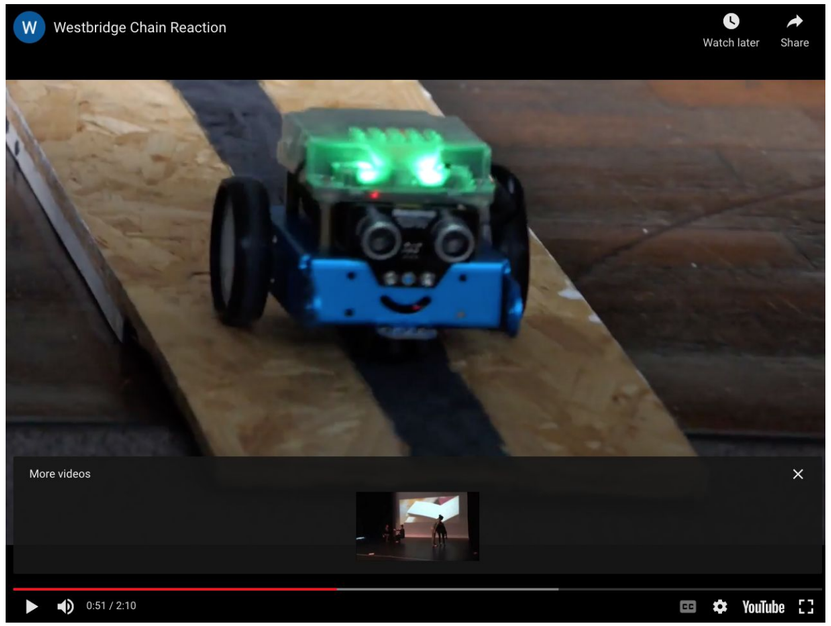
https://youtu.be/nrukZNcAqnw

Chain Reaction



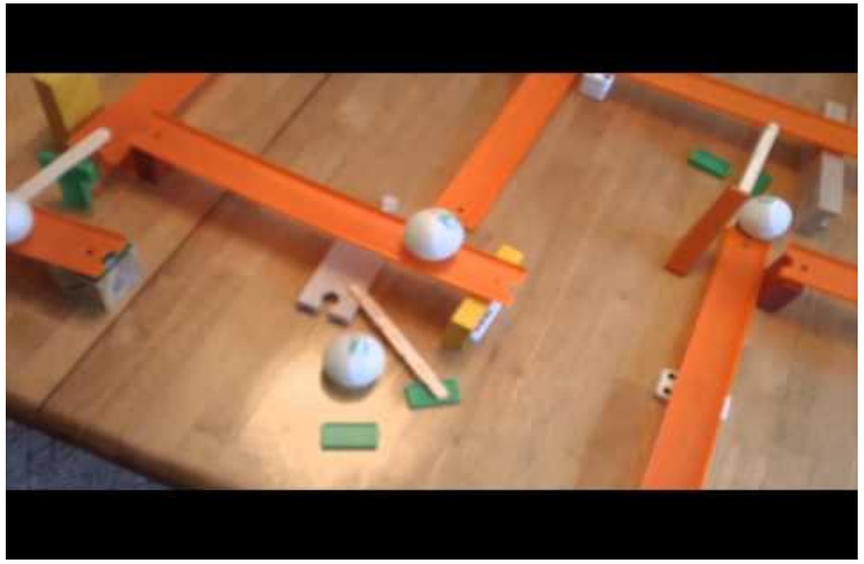
The KIKS (Kids Inspiring Kids in STEAM) objective is to get 'kids' developing STEAM (Science, Technology, Engineering, Art, Maths) activities for other kids in Hothousing workshops, Local Challenges and International Collaboration.





Project Based Learning: content integration, problem-centred, inquiry-based, design-based and cooperative learning

Identifying the problem, Generating ideas	Exploring the Science & Maths, Designing & Constructing the Model	Evaluating & Refining the Model	Presenting the Project

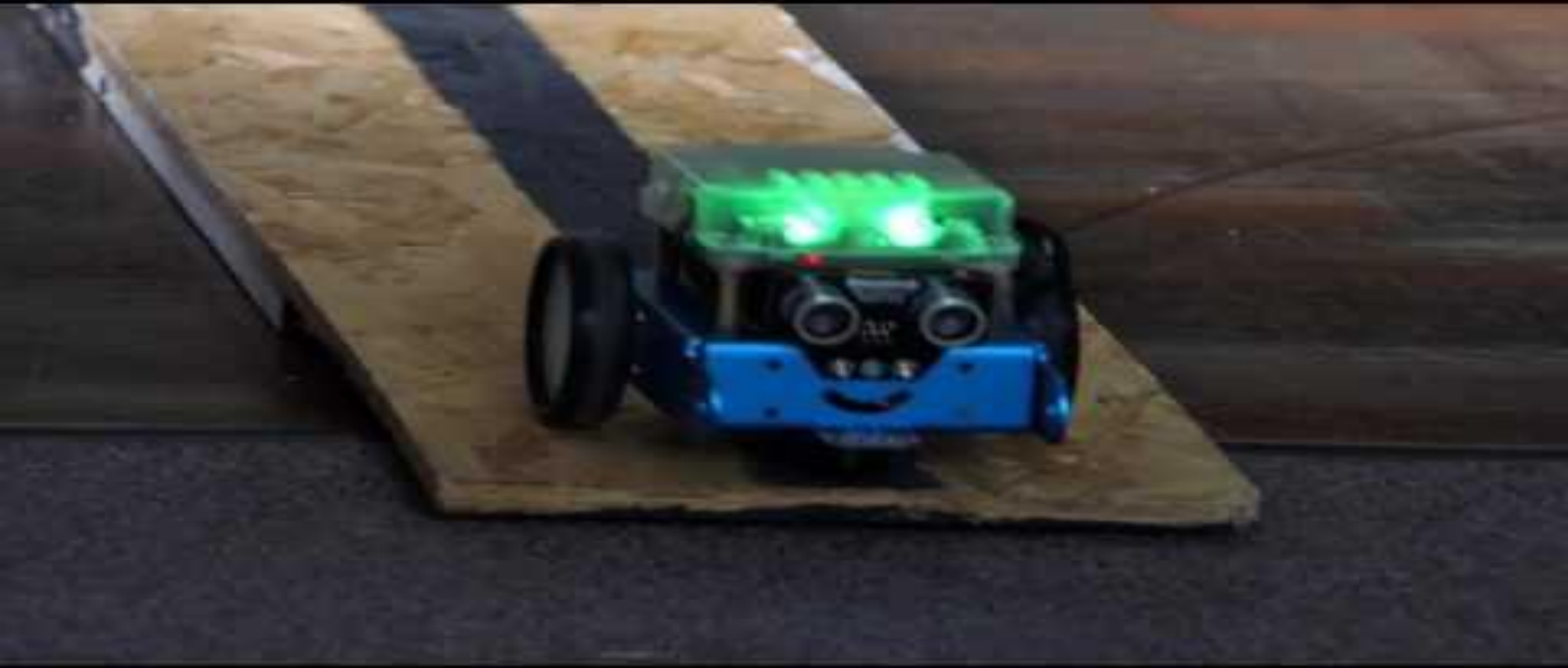


How would you get your schoolmates to LOVE STEAM?

Build into the Challenge your own curricular context eg chemistry, robotics, maths, control programming, art…..

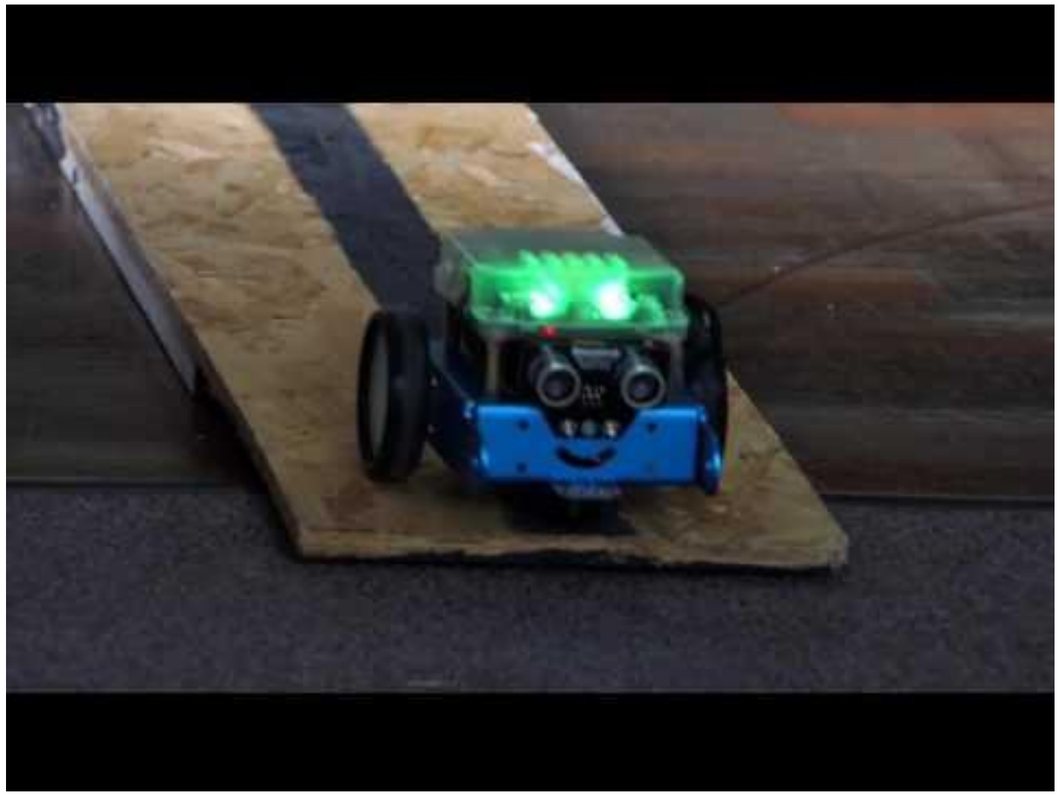
Participant age: ??	*No. of participants:* Groups of ??	*Duration:* ?? hours
Level of knowledge: ??	*No. of teachers:* ??	*Type of venue:* Regular classroom?? Laboratory?? Outdoor space?? …??
Learning methodologies: Content integration?? Problem-based learning?? Inquiry-based learning?? Design-based learning?? Collaborative learning??	*Involved disciplines:* Science?? Technology?? Engineering?? Arts?? Mathematics??	*Technological needs:* Computer?? Tablets?? Mobile phones?? Internet?? …
Most emphasised learning methodology: Content integration?? Problem-based learning?? Inquiry-based learning?? Design-based learning?? Collaborative learning??	*Main addressed topics:* ??	*Estimated project cost:* ?? €

DISCIPLINE	CURRICULAR CONTENT ADDRESSED
Science	
Technology	
Engineering	
Arts	
Mathematics	



Resources

Rube Goldberg Machine **https://youtu.be/863z_eHGIJw**



Westbridge Chain Reaction https://youtu.be/j7dodM5Esjw

WORKSHOP AGENDA

STEAM & STEAMTEACH Overview

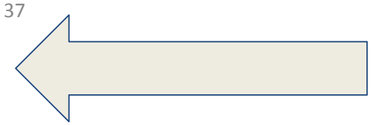
Professional Development Framework (PDFs) worked examples inc curricular context

Analysing Sporting Performance Movement

3D Modeling and Printing, Microgames

Zero Cost Energy Bike and Chain Reaction - create your own

STEAM collaborative teachers group project(s)



STEAM Travel to Mars

Mind the Gap: Folding Paper Bridges

Presentations & Next Steps

From trainers and teachers

Teacher trainers work with teachers in small groups to: develop their own ideas, identify any support requirements of Linz, delivery into the classroom, assessment/grading, collaboration, networking arrangements and next steps, 2 - minute presentation inc next steps.

Two minute presentation by participants on Idea, support requirements, delivery into the classroom, assessment/grading, collaboration/networking arrangements and next steps

Co-funded by the Erasmus+ Programme of the European Union

STEAMTeach

STEAM Travel to Mars

Stefan Waldegger and Martin Andre

Pädagogische Hochschule Tirol and Praxismittelschule and associated middle school:

Modern STEAM education increasingly involves and includes new aspects of technology. The intention of this project is to pick *space travel* as a highly engaging topic and design a concept, which includes all STEAM components. The concept is organized in stations, so students can choose from multiple small projects like 3D modelling and printing a mars-rocket, programming a mars-rover with scratch, planning and launching a water rocket and analysing its flight parabula via mobile devices or developing and printing 3D models of the planets within the solar system. We want to explore, how such a project can be developed, and which subject-specific and interdisciplinary learning processes can be observed during the implementation in a fourth class of secondary school.

Marsmission - Projekt der Praxismittelschule der PH

Michael E. Luxner - 4 / 10

1. 

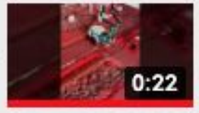
Raketenabschuss
Michael E. Luxner

2. 

Mission 1
Michael E. Luxner

3. 

Codefreaks sprechen über Ihre Aufgaben
Michael E. Luxner

▶ 

Mission 3
Michael E. Luxner

5. 

Landschaftsarchitektinnen
Michael E. Luxner

6. 

3D Druck Zeitraffer
Michael E. Luxner

7. 

ein Modellierer erklärt seine Aufgabe
Michael E. Luxner

8. 

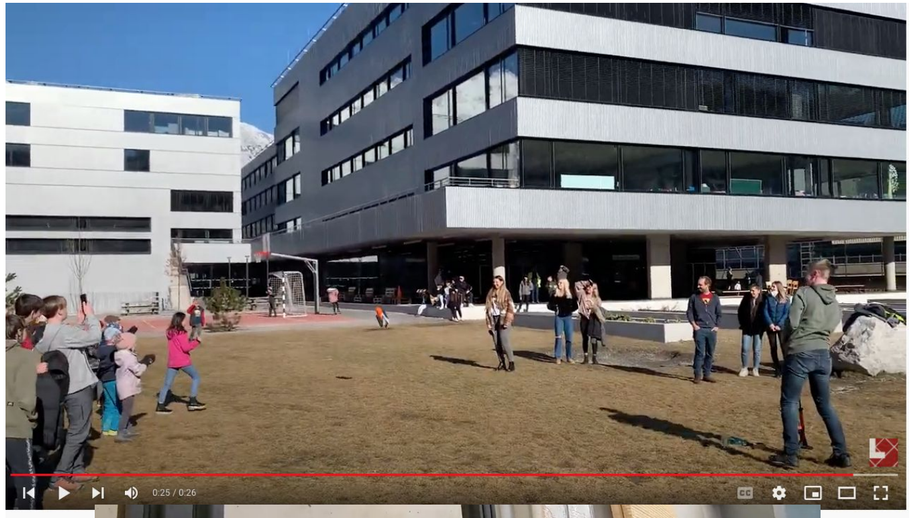
Modellierer stellen eine besondere Rakete vor
Michael E. Luxner

9. 

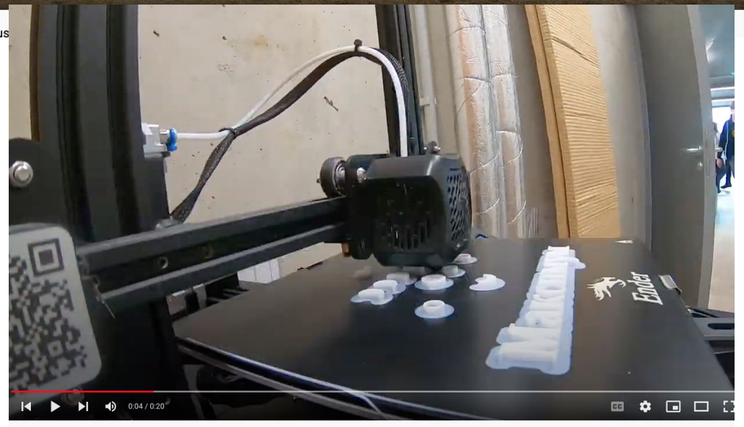
Recyclerinnen stellen ihr Lernprodukt vor
Michael E. Luxner

10. 

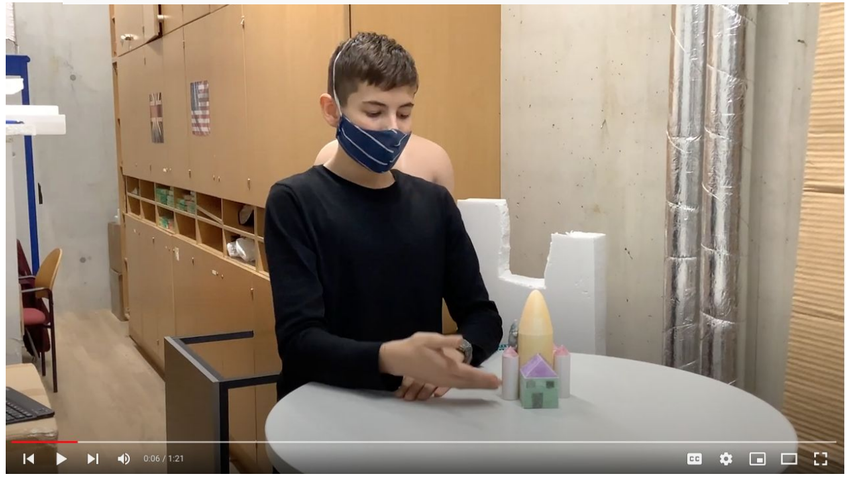
Recyclerteam: Die Rakete, die abheben wird!
Michael E. Luxner

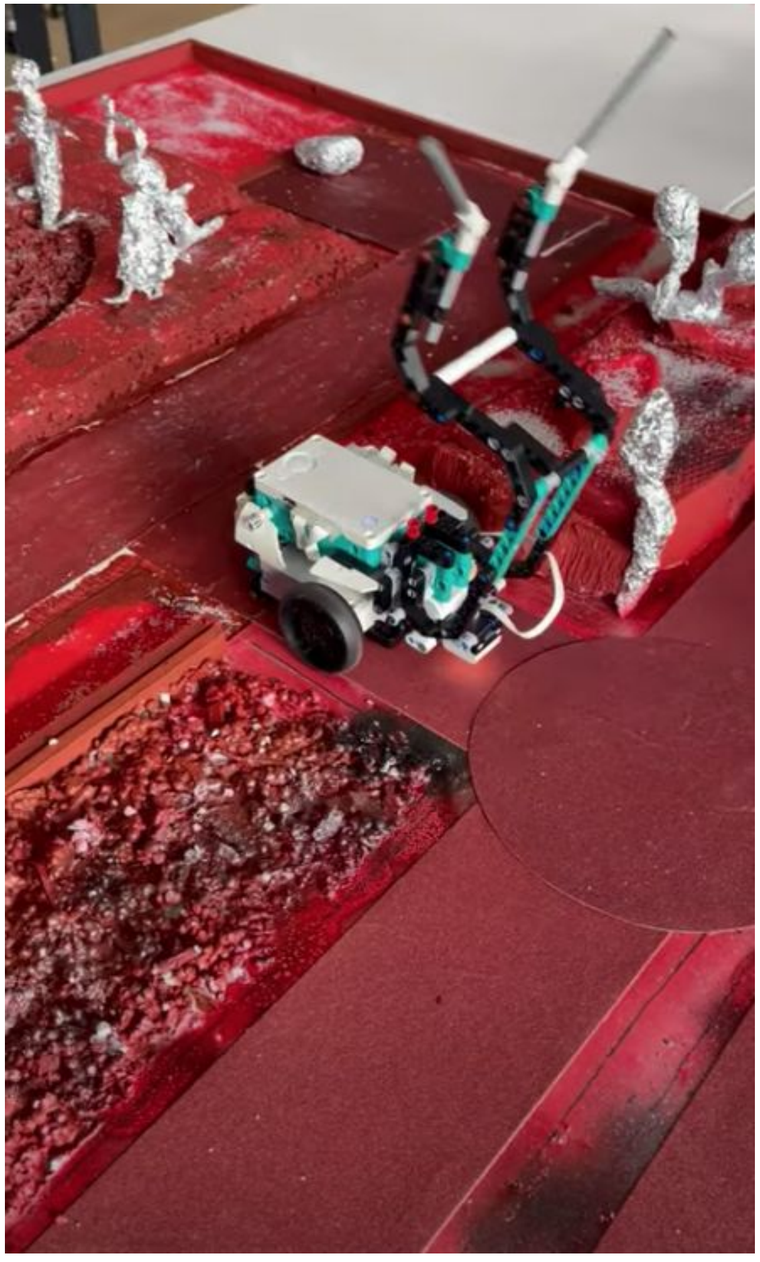


Raketenabschuss



D Druck Zeitraffer





Mind the Gap

A playful approach to implement paper folding in Steam Teaching

Maleczek Rupert & Andre Martin

Folding is since the Bauhaus (Koschitz 2016) an established method to teach and learn many things about Design, material behaviour, structural performance fabrication and many other things. If one particular material and a set of manipulations is used, we speak of material systems.

The aim of the presented project, is the implementation of a material system into the STEAM-Teaching approach. In this case a simple paperfolding method, that starts with a folded zigzag, and is further developed to a material system, that can generate different spatial folding configurations, that have tailored properties.

Starting from a simple task, the building of a paper structure, that spans over a fixed distance, and should be stable enough to resist a certain point load. As it is known that the simple zigzag is only stable if some additional measures are implemented (Engel 1925), the students need to learn some basic rules of technical and geometrical folding on purpose.

Engel, Heino. *Tragsysteme.* Hatje Cantz Verlag, 1925.

Koschitz, Duks. „Designing with curved creases.“ In *Advances in Architectural Geometry 2016*, von Sigird Adrianssens, Fabio Gramazio, Matthias Kohler, Achim Menges und Mark Pauly, Herausgeber: Hochschulverlag,AG ETH Zürich vdf, 82-103. Zurich: vdf, Hochschulverlag,AG ETH Zürich, 2016.

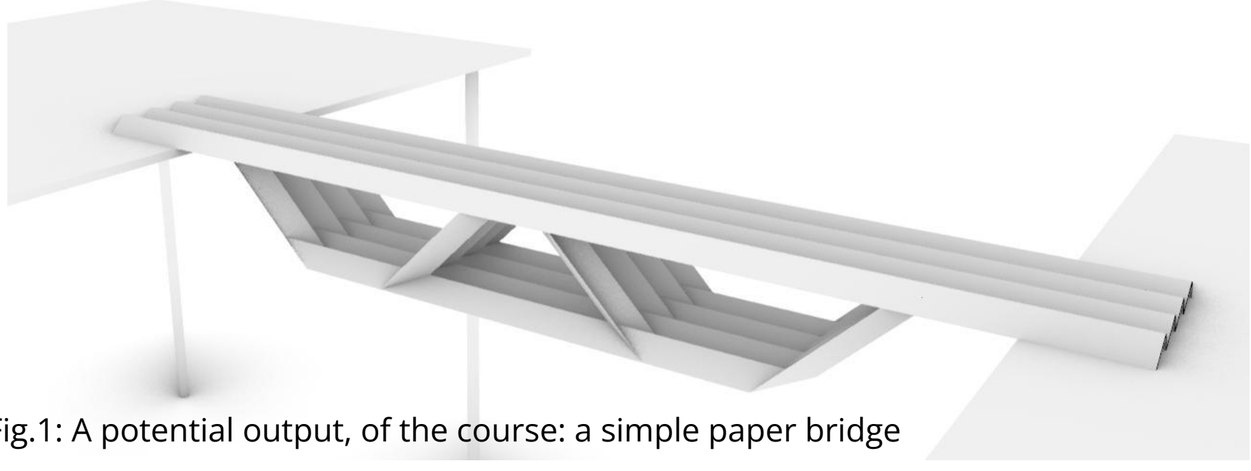


Fig.1: A potential output, of the course: a simple paper bridge

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Many thanks!

Tony Houghton
(ajh249@gmail.com)