Funded by the European Union

Spreading the magic of English language teaching
Project number: 2021-2-HU01-KA210-SCH-000050575

Implementing STEAM, Project based Methods, Social and Emotional Learning in Guidance Assessment and Mentoring

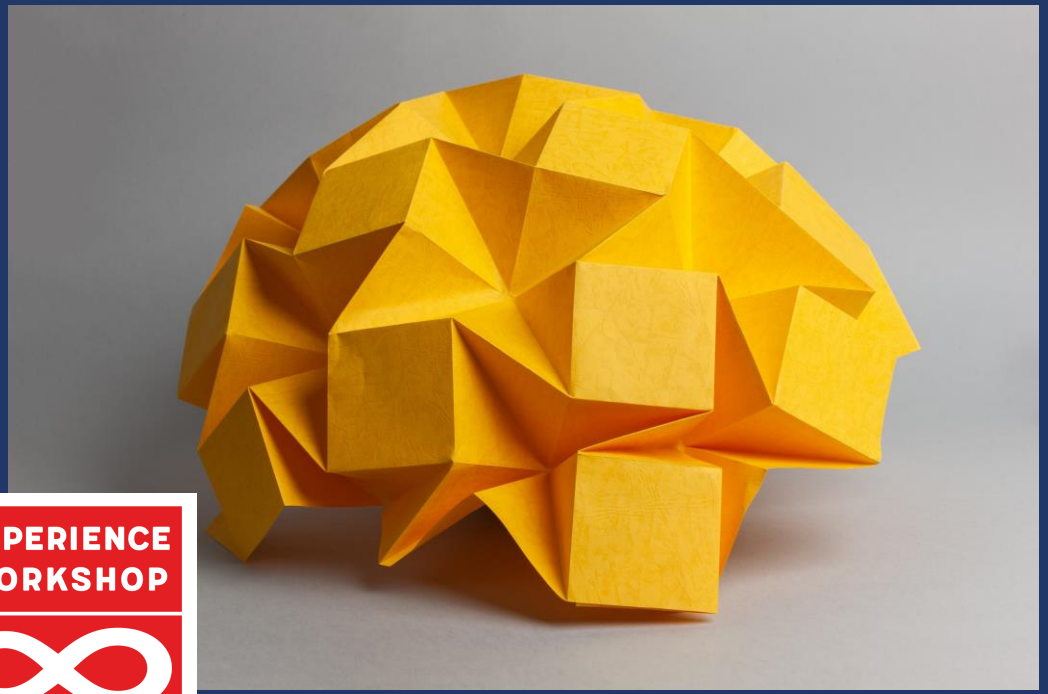
Main Training in Hungary

4-5 January 2023

MAGIC OF TEACHING

Implementing STEAM, Project-based Methods, Social and Emotional Learning in Guidance, Assessment and Mentoring

Dr. Kristóf Fenyvesi
University of Jyväskylä - Finnish Institute for Educational Research
Experience Workshop STEAM Network



JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Finnish Institute for Educational Research
Since 1968

EXPERIENCE WORKSHOP
www.experienceworkshop.org

ÉLMÉNYMŰHELY

www.elmenymuhely.hu

EXPERIENCE WORKSHOP

www.experienceworkshop.org

Kristóf Fenyvesi, Ph.D.

Finnish Institute for Educational Research
University of Jyväskylä, Finland

Innovative Learning Environments Research Group

Director of Experience Workshop STEAM Network

JYU
University of Jyväskylä
Finland

→One of the top universities in Finland

→Student recruitment across Finland and internationally

→The cradle of modern Finnish Education with more than 150-year history
(Teacher Seminary in 1863)

→Architecturally and environmentally unique campus near the city centre

[We are JYU! https://youtu.be/DbIltG2-BMQ](https://youtu.be/DbIltG2-BMQ)

JYVÄSKYLÄN YLIOPISTO

Strategic core fields of research at the JYU

In full correspondence with the thematic emphasis of the EU Skills & Competences for Life Long Learning.

Basic natural phenomena and mathematical thinking

The Accelerator Laboratory and the interdisciplinary Nanoscience Center at the JYU are unique research environments in Finland.

Information technology and the human in the knowledge society

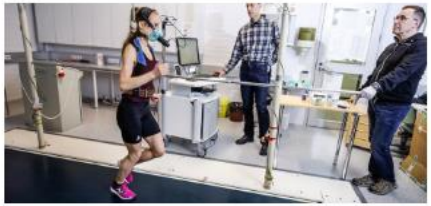
The study of scientific computing and developing services promote the digitalisation of society and help to understand society better.

Language, culture and society

Various language subjects at the Faculty of Humanties and Social Sciences focus on applied language studies. In the social sciences, the emphasis is on the success of communities and societies, participation and social equality.

Learning, teaching and interaction

JYU is known for its unique expertise and data sets in multidisciplinary research on learning, teaching and interaction combined with a broad range of widely acknowledged teacher education programmes, and research



Physical activity, health and wellbeing

Research at the Faculty of Sport and Health Sciences, the only one of its kind in Finland, focuses on the interaction and promotion of physical activity and health.

Sustainable business and economics

School of Business and Economics has been one of the global pioneers in sustainable business research, especially in business ethics, stakeholder management, and corporate environmental management.

Jyväskylä Teacher Seminary seen from Lake Jyväsjärvi.
The Museum of Central Finland

History

1863 Jyväskylä Teacher Seminary

1912 Summer University

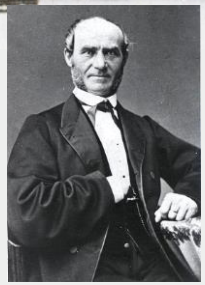
1912 Scientific Library

1918 Jyväskylä University Association

1934 Jyväskylä College of Education

1966 University of Jyväskylä

2018 156-year history, 84 years as a higher education institution



Uno Cygnaeus (1810–1888)
The Father of Finnish Elementary School

5.1.2023

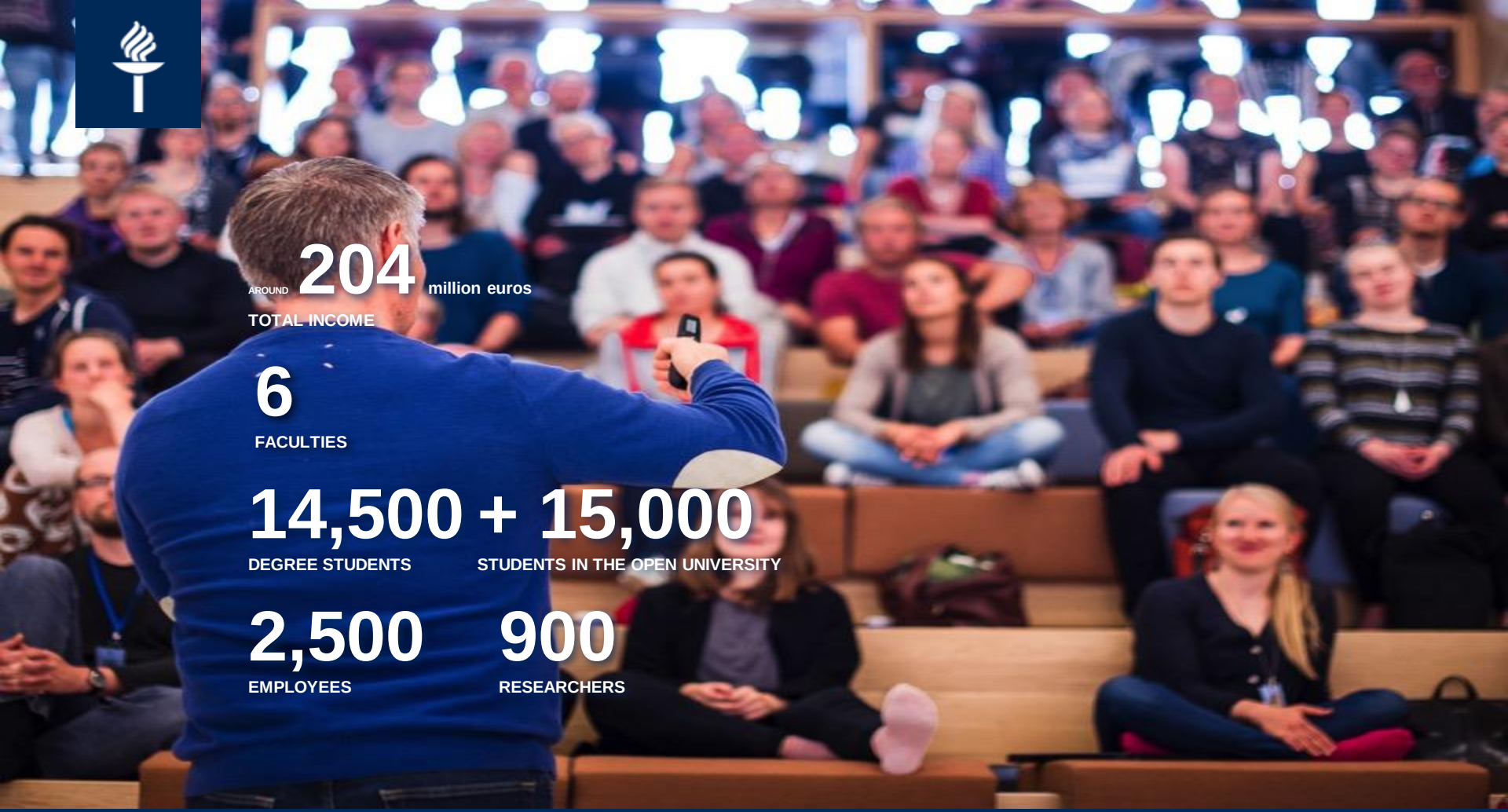
Architects

ALVAR AALTO
(1898–1976)

CONSTANTIN KISELEFF
(1834–1888)

ARTO SIPINEN
(1936–2017)

5.1.2023


AROUND 204 million euros
TOTAL INCOME
6
FACULTIES
14,500 + 15,000
DEGREE STUDENTS
STUDENTS IN THE OPEN UNIVERSITY
2,500
EMPLOYEES
900
RESEARCHERS

Faculties

A multidisciplinary research university

- Faculty of Education and Psychology
- Faculty of Humanities and Social Sciences
- Faculty of Information Technology
- Faculty of Mathematics and Science
- Faculty of Sport and Health Sciences (the only one of its kind in Finland)
- Jyväskylä University School of Business and Economics

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

JYU online

www.jyu.fi


instagram.com/uniofjyvaskyla


facebook.com/JyvaskylaUniversity


twitter.com/uniofjyvaskyla


youtube.com/JyvaskylaUniversity

MAPPING JAM

Exploring / Making New Paths

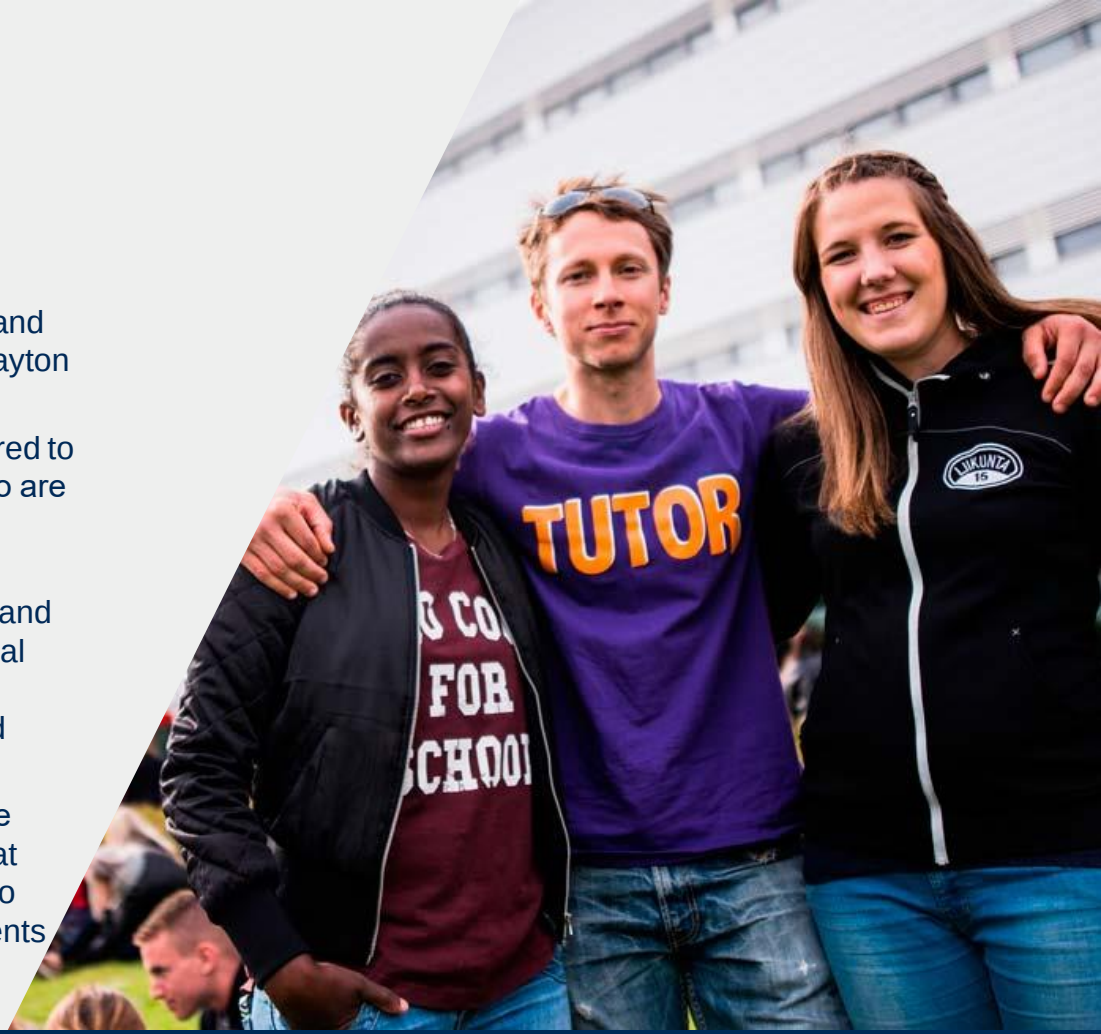
Self-Awareness

Self-awareness refers to the ability to assess one's feelings, interests, values, and strengths accurately, and to maintain a well-grounded sense of self-efficacy (Payton et al., 2008).

In the classroom context, teachers are not only required to understand one's own attitudes and opinions, but also are expected to recognize the limitations of self and how different self-aspects influence their teaching.

Socially and emotionally competent teachers understand that their behaviors are influenced by multiple personal factors, such as their background experiences, personality, emotions, knowledge base, opinions, and attitudes.

They also are aware that their students' behaviors are influenced by equally distinct personal factors and that teachers must bridge differences with their students to build strong interpersonal relations and engage students in learning.



Self-Management

Emotion regulation is often defined as the ability to manage emotional arousal successfully and possessing the skill to change emotions, including the valence, intensity, or time course of the emotions (Gross, 1998).

Although the expressions of positive and negative emotion are both regulated, the need for managing emotion is the greatest when negatively valenced emotions occur (Barrett, Gross, Christensen, & Benvenuto, 2001).

Teachers, like other adults, do not experience the same emotion under the same social situation and vary in their ability to regulate such emotion. For example, one teacher may be furious and show anger when a child does not do the work, while another teacher may feel sad but does not display it. They also may use different strategies when regulating their emotions. Because teachers are expected to regulate their own emotions and emotional displays as well as the emotions of their students constantly, teachers with higher emotional regulation capacity may be better equipped to handle the emotion-provoking demands of teaching than teachers with a lower capacity for doing so.

Socially and emotionally competent teachers can identify their own positive and negative emotions in interactions with students, parents, and colleagues, and manage their emotions as necessary to promote classroom differences.

In particular, socially and emotionally competent teachers recognize that perspectives differ according to age, gender, and social, ethnic, educational, and economic backgrounds. They recognize and appreciate the commonalities and uniqueness that exist among their students and colleagues. They manage students' prosocial behaviors and focus on learning. They model behaviors to help students regulate their own emotions, establishing guidelines and setting boundaries for students to enable them to do this.

Social-Awareness

Social awareness refers to the awareness of others, including social perspective taking (see also Zins & Elias, 2006).

This construct involves viewing the world from another's perspective (Selman, 1971) and making inferences about other people, including their capacities, attitudes, expectations, feelings, and potential reactions.

Social awareness refers to one's ability to take the perspective of and emphasize with others and to recognize and appreciate individual and group similarities and differences.

In particular, socially and emotionally competent teachers recognize that perspectives differ according to age, gender, and social/ethnic/educational/economic backgrounds. They recognize and appreciate the commonalities and uniqueness that exist among their students and colleagues.

Relationship and Social Skills

Interpersonal skills are another important dimension of SEL. Positive social interactions flow from strong interpersonal skills.

Social skills are a specific class of behaviors that an individual exhibits to complete a social task successfully (Gresham & Elliott, 2008). They are often manifested in prosocial behaviors, cooperation, empathic responses, social engagement, respect for others, as well as the absence of problematic interactions (Cooper & Farran, 1991; Eisenberg & Fabes, 1998).

Socially and emotionally competent teachers establish and maintain healthy and rewarding relationships with students, parents, and colleagues. They are able to prevent, manage, and resolve interpersonal conflict between themselves and students, parents, and colleagues, and deal with conflict among students, through exhibiting prosocial, cooperative behaviors and respecting and being empathic to others.

Responsible Decision Making

Decision making is a process in which an individual scans an array of options and tries to decide which option is the best way to produce some desired outcome.

Teachers must often make split- second, in-the-moment decisions that govern their interactions with students and reactions to other factors inside and outside of the classroom. Decision making is a multistep process, which in classrooms is often enacted in the moment as teachers consider and process clues, draw information from long-term memory, and make a “decision” that is “enacted” through words and behavior.

One influence of teachers’ decision-making process is their ability to “attend to the needs and behaviors of an entire classroom while also trying to remember and implement a lesson plan” (Feldon, 2007, p.123). Feldon’s analysis of several studies of veteran and novice teachers suggests that veteran teachers retain the capacity to filter out extraneous stimuli and focus on pertinent social cues (Swanson, O’Connor, & Cooney, 1990).

Socially and emotionally competent teachers use multiple forms of evidence to make decisions about instruction, classroom management, and interactions with students, students’ parents, and colleagues. They objectively consider the well-being, needs, and academic goals of individual students and of their class(es) as a whole, and they balance awareness of students’ emotional and academic needs when making both long-term plans and in-the-moment decisions.

Self-Assessing Social and Emotional Instruction and Competencies

A Tool for Teachers

AIR
American Institutes for Research

Teacher Social and Emotional Skills

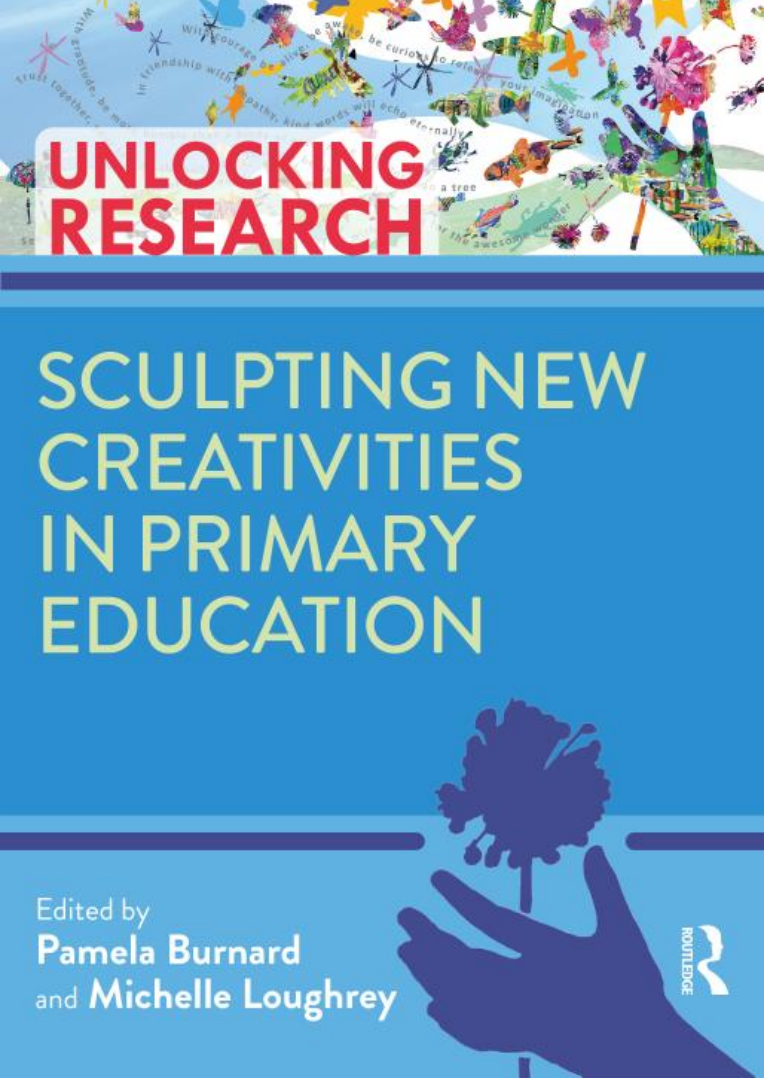
- Self-awareness
- Self-management
- Social awareness
- Relationship skills
- Responsible decision making

Social Teaching Practices

- Student-centered discipline
- Teacher language
- Responsibililty and choice
- Warmth and support

Instructional Teaching Practices

- Cooperative learning
- Classroom discussions
- Self-assessment and self-reflection
- Balanced instruction
- Academic press and expectations
- Competence building



CHAPTER

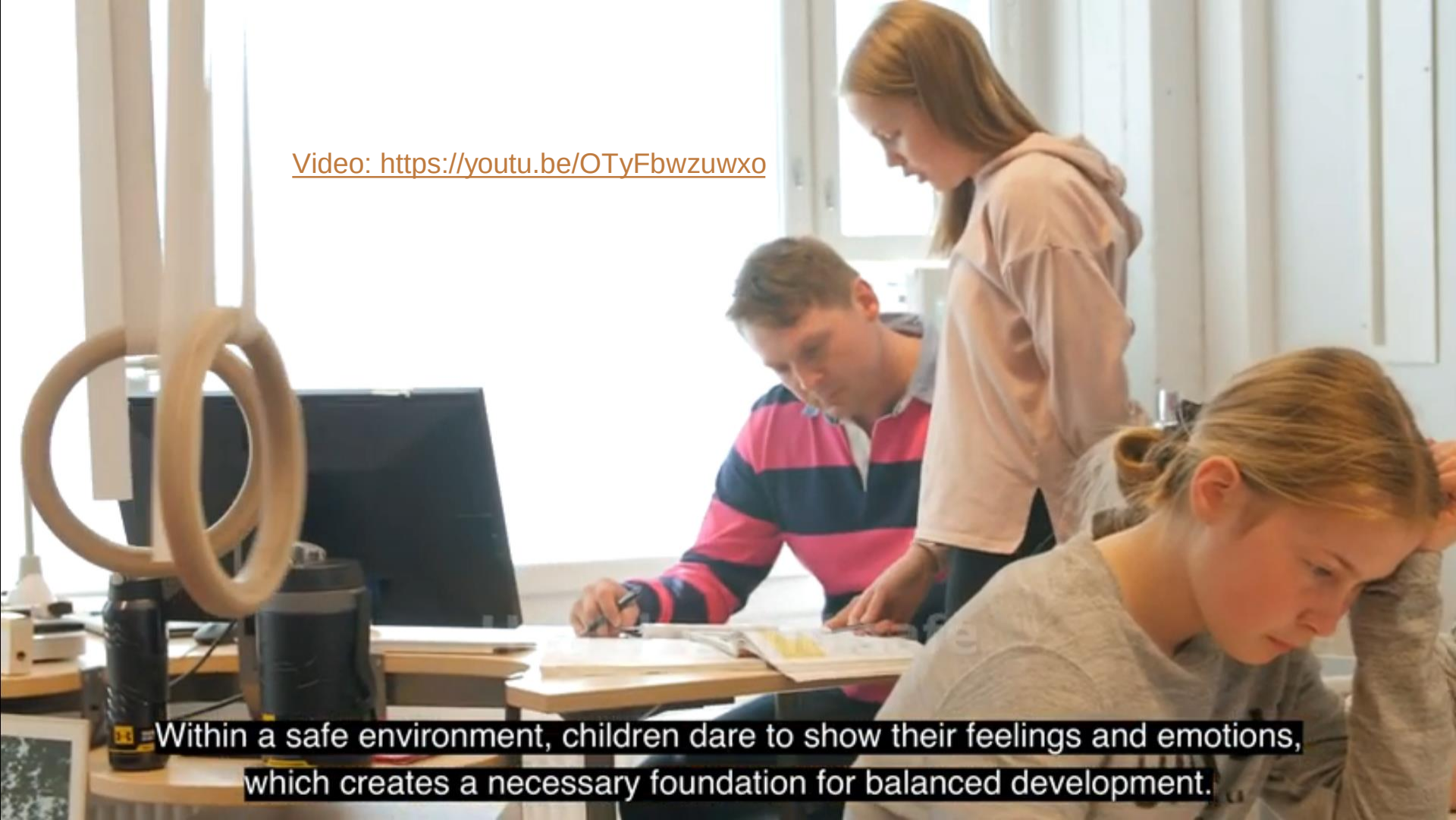
8

Activating creativities by emphasising health and wellbeing: a holistic pedagogical practice from Finland

Kristóf Fenyvesi, Christopher S. Brownell, Jukka Sinnemäki and Zsolt Lavicza

Unlocking research in practice: provocations for group discussion

Jukka Sinnemäki's holistic approach to learning, including the acknowledgement of students' need for physical activity, has helped him become an innovative and risk-taking teacher. His efforts to establish his practice-oriented holistic pedagogy for health and wellbeing has led to several innovations and is having an impact in wider and wider circles. Sinnemäki's students are unlocking multiple creativities, which can contribute to enhancing their positive attitudes towards maintaining healthy and sustainable ways of life and greater achievements in learning.


Video: https://youtu.be/OTyFbwzuwxo
Within a safe environment, children dare to show their feelings and emotions,
which creates a necessary foundation for balanced development.

Innovative Learning Environments

Finnish Institute For Educational Research

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

ILE is a research and education group that focuses on the advancement of children's and young people's 21st Century Skills. The field includes especially user-driven design and study of learning technologies and spaces for enhancement of learning and wellbeing, analyses of innovative teaching and learning practices, technology-enhanced learning, and evaluation and comparison of ICT use in education. When applicable, the research can also be directed to other phases of human life for the study of citizen's knowledge society capabilities.

Team members

Marja Kankaanranta | Kati Clements | Kristof Fenyvesi | Tiina Mäkelä | Piet Sikström

Saana Mehtälä | Mikko Muilu | Mimmu Alanko | Matias Mäki-Kuutti | Takumi Yada

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

STEAM UPGRADE
Upgrading pre- and in-service teachers' digital skills with online STEAM hands-on training modules

free 3D
A FRAMEWORK FOR EFFICIENT AND ENGAGING HYBRID EDUCATION IN LOWER-SECONDARY SCHOOLS

JYULearn

"Co-designing learning environments with teachers and learners"

Ministry of Education and Culture

"Assessment of transversal skills in formal and informal learning environments"

kaks.fi
KUNNALLISALAN KEHITTÄMISSÄÄTIÖ

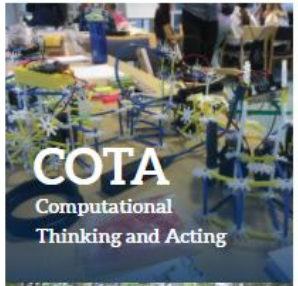
Digiloping Teachers:
Digital competences development and mentoring for teachers

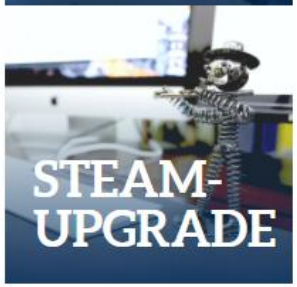
https://www.jyu.fi/it/en/research/research-areas/cognitive-science-and-educational-technology/ile

Projects

https://www.jyu.fi/it/ile

On-going projects





EXPERIENCE WORKSHOP

www.experienceworkshop.org

STEAM:

integration between subjects of Science, Technology, Engineering, Arts and Mathematics

EXPERIENCE WORKSHOP

www.experienceworkshop.org

STEAM & WELL-BEING FOR BOOSTING COLLABORATIVE CREATIVITES

PHENOMENON-BASED LEARNING
IN CREATIVE COMMUNITIES
FROM FINLAND FOR THE CHILDREN, TEACHERS
AND PARENTS AROUND THE WORLD

https://youtu.be/XNPDtbIbSts

5.1.2023

Finnish Institute for Educational Research

Innovative Learning Environments Research Group

STEAMnet Education Network

STEAMnet Education Network is supporting future and in-service teachers in Finland and worldwide.

Multidisciplinary and phenomenon-based learning for developing transportable skills and key competencies are becoming increasingly important in Finland and around the world.

Our goal is the creative and collaborative, methodological and material enhancement of the integrated approach of Science-, Technology-, Engineering-, Arts- and Mathematics learning, known as STEAM.

STEAMnet's Services

STEAMnet is

- **developing cooperation** between teachers and experts in all of the STEAM-areas
- **upgrading curricula** through innovative **STEAM-projects, -tools and creative pedagogical methods** and approaches
- **coordinating STEAM communities** through several programs and events
- **conducting research & educational projects** focusing on STEAM

STEAMnet's Online Groups and Communities

Join right away to the

- International Coalition of STEAM Educators Google Group
- Math-Art-Learning Google Group
- GeoGebra Arts & STEAM Facebook Group

COLEGIO HACIENDA
LOS ALCAPARROS

Bogota, Colombia

Project video: https://youtu.be/oTbnBRDPvks

LEONARD SOMMER

HOW TO FOSTER CREATIVITY IN 21ST CENTURY EDUCATION

CLASSROOM THINKTANK

18. The Experience Workshop STEAM Network

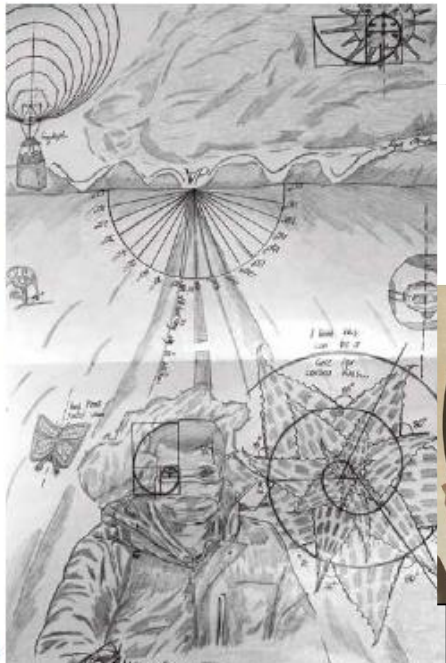
Kristóf Fenyvesi

Kristóf Fenyvesi, Ph.D. is a researcher of the Integrated Education of Science, Technology, Engineering, Arts and Mathematics (STEAM). He works in the Finnish Institute for Educational Research in the University of Jyväskylä. He started Experience Workshop STEAM Network (www.experienceworkshop.org), a global community of teachers, scholars, artists, students and parents in 2008.

The COVID-19 crisis made learners of us all. In the ensuing era of social distancing, we have had to be more creative and innovative than ever. One huge task is to provide social and emotional support to all children and teachers who have felt left on the sidelines amid the pandemic. According to UNESCO's statistics, more than 1.6 billion children and youths were affected by school closures at the peak of the COVID-19 crisis in May 2020. This means more than 80% of the total enrolled learners in almost 160 countries.

We need multiple, diverse creativities to rebuild the lost trust, to fix the broken responsibility, and to reinvent social and emotional bonds. We need to learn, both individually and collectively, how to embrace uncertainty. Humanity has to show, perhaps as never before, that original ideas can spread faster, and can mutate and grow stronger than any virus. We have to add up each other's creativities and innovations to ensure bright, new futures through learning for all.

The COVID-19 crisis caused several disruptions in education worldwide. The fragility of educational policies, frameworks, and daily practices has been experienced on various levels. Society is facing dramatic consequences. When we analyze the weaknesses and failures of current practices, and the consequences of our loss, we must recognize several examples for collective creativities emerging simultaneously in the context of 'creative ecologies' – as creativity researchers, Pamela Burnard and Dan Harris suggest in their studies.. A higher level of trust, based on the 'creative ecology' in educational systems, institutions, situations, and community-oriented



'The World During Coronavirus' by Sipho Nelani, South African student. The Courtesy of Nelson Mandela University's Govan Mbeki Mathematics Development Centre

Experience Workshop's Geodesic Dome at Nelson Mandela University, South Africa in 2017. Photo by Natalie Wood

Over the years, we have organized countless math-art-education events, exhibitions, workshops, seminars, and training programs all over Europe and Africa, America, Asia, and Australia.

The Children and Youth Mathematical Art Exhibits were initiated in 2012 by Kristóf Fenyvesi (University of Jyväskylä – Experience Workshop) and John A. Hilgi (1943-2017), New York-based painter and educator, founder of the Jardin Children's Art Galerie. Based on the concept, several children- and youth-based Math-Art exhibits have been organized worldwide with the help of Experience Workshop members. The resulting Math-Art works have been collected and shown at international exhibitions.

The shown pictures are only a small selection of the

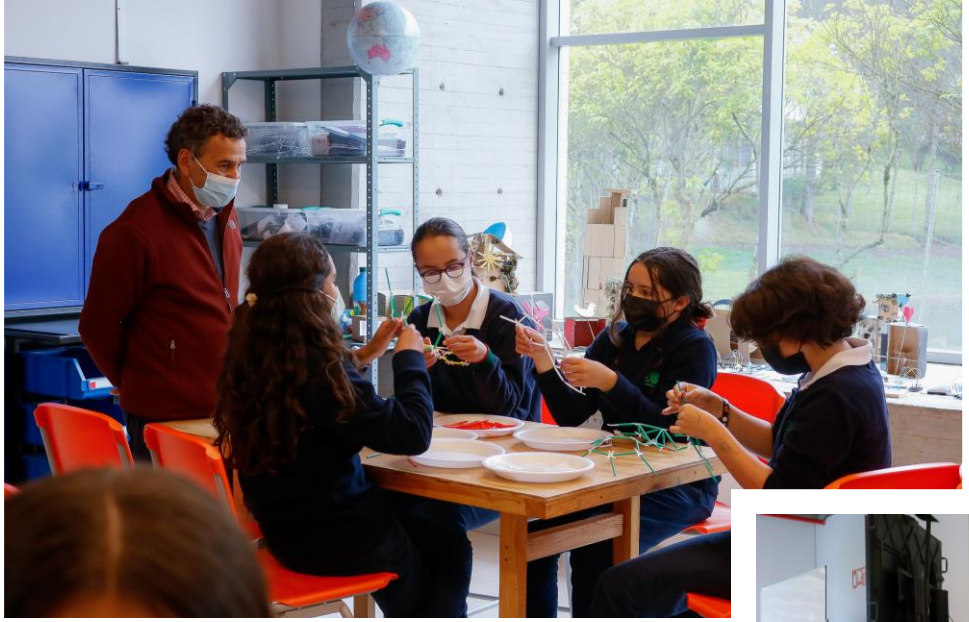
Govan Mbeki Mathematics Develo (GMMDC). The head of the Centre, ma Werner Olivier, and mathematics educa Carine Steyn, co-ordinate the South A and youth's Math-Art movement invo of children and their teachers and pare country. The movement is a spearhea African curricular reforms towards supp and gender equality, increasing students' engagement, growing the collaboration be and co-operating with parents through c programs. The Experience Workshop Network contributes to these efforts t Recently, we established a creative school program by involving further local an experts and developing innovative and c in everyday learning through math

educational leadership proved to be essential to reorganize everyday learning, even in the deepest points of the crisis. STEAM approaches in education and hybrid learning proved to be a vital combination, helping us regaining the immunity of educational practices worldwide.

This essay introduces a few practices from the Experience Workshop STEAM Network. These practices unlocked creative pedagogical resources and demonstrated the STEAM (Science, Technology, Engineering, Arts, Mathematics) integration's wide potential in developing multiplied creativity, not least during critical times.

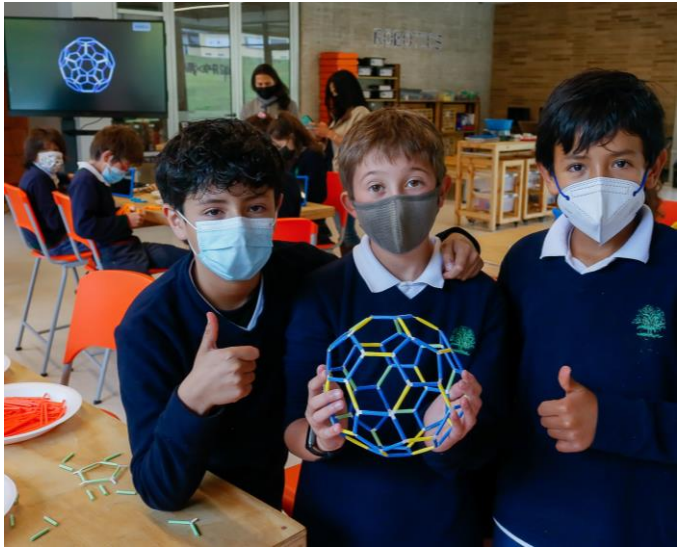
Experience Workshop was launched as t effort of mathematicians, artists, teache children in 2008. The organization's ma research and practice of STEAM educa based, co-operative, playful, and expe mathematics education through crea connecting hands-on activities with di combining science and art; implementin based and multidisciplinary learning resources for teachers, parents, and s methodological resources, scientific ar which is available open access.

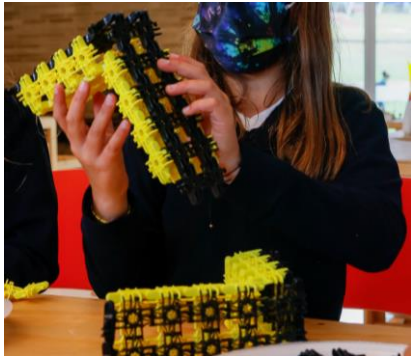
'I am because we are' by Erin Powers, South African student. The Courtesy of Nelson Mandela University's Govan Mbeki Mathematics Development Centre




Bogotá, Colombia


Bogota, Colombia



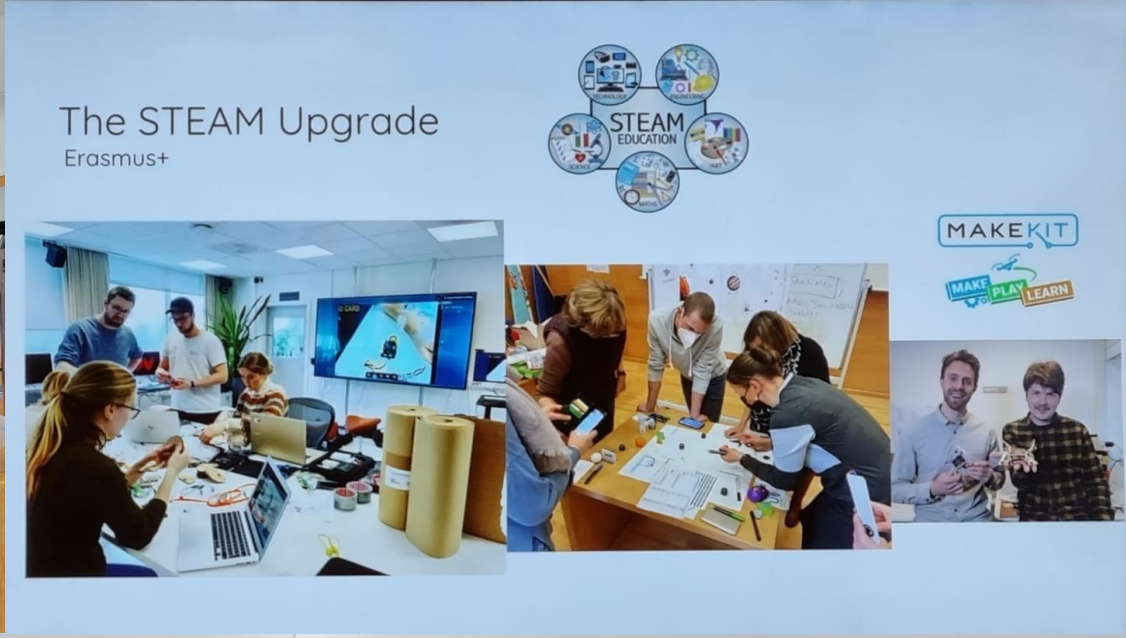


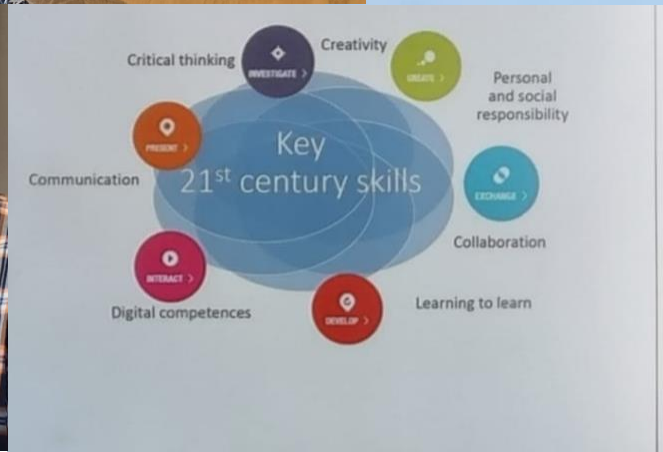

Bogota, Colombia

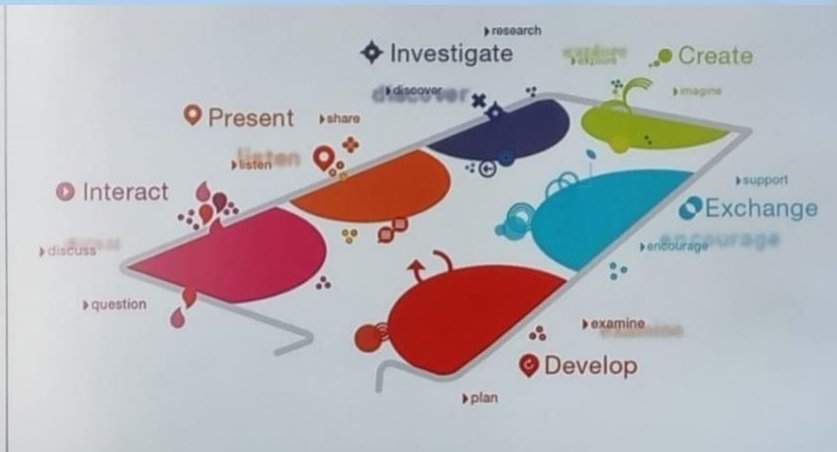

Bogota, Colombia


MATERIALS
POWER TOOLS

Stavanger, Norway







STEAM
SCIENCE TECHNOLOGY ENGINEERING DIGITAL ARTS MATHEMATICS
UPGRADE

Stavanger, Norway

PROJECT PARTNERS

TALLINN UNIVERSITY

UNIVERSITY OF JYVÄSKYLÄ
FINNISH INSTITUTE FOR EDUCATIONAL RESEARCH

JKU
LINZ SCHOOL OF EDUCATION

University of Stavanger

Universidad Rey Juan Carlos

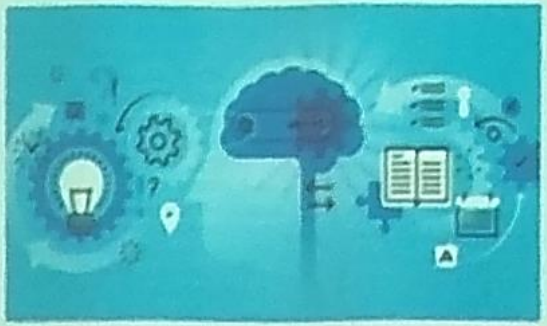
MAXWHERE

craftbot

Neuropedagogy in early childhood education in Hungary:

SOPRONI EGYETEM | BENEDEK ELEK PEDAGÓGIUM KAR

Interreg Austria-Hungary
European Union – European Regional Development Fund
BIG_inn AT-HU

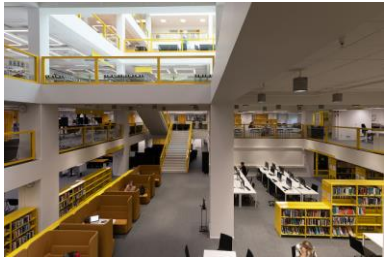


Neuropedagogy includes two vital and distinctive areas: (1) the impact of research in pediatric neurology for pedagogical practices, and (2) knowledge about learning (Howard-Jones, 2011).

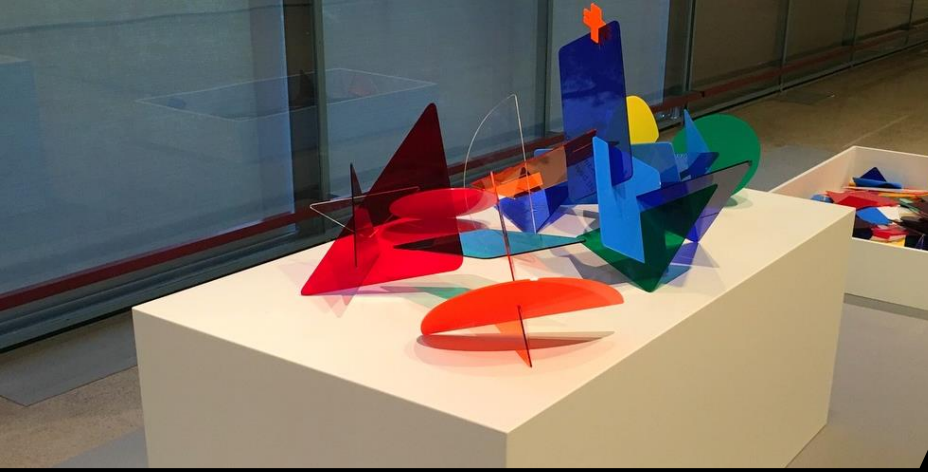
In the field of neuropedagogy, pediatric neurologists examine the neurological development of children, while teachers utilize learning strategies that are conducive to young children's learning and the utilization of brain capacity. As Csíkszentmihályi (2010) notes effective investments in early childhood leads humans to a happy life.

The International Research Team and Laboratory of Neuropedagogy (NeuPedLab) is a unique scientific institute at the Sopron University Benedek Elek Faculty of Pedagogy in Sopron, Hungary. Based on the Hungarian and international interdisciplinary scientific research in early childhood education, the institute aims to explore the avenues for applying the current results of neuroscience as they are applicable in the field of pedagogy.

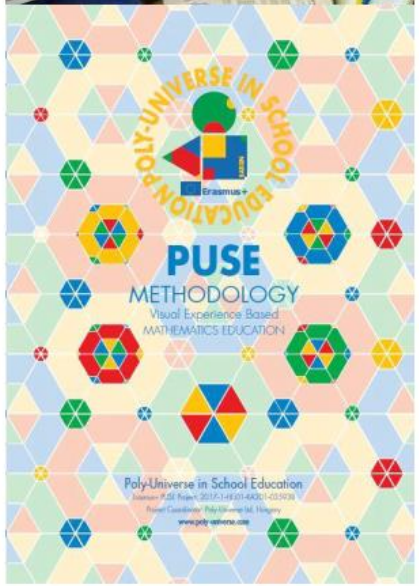
University Of Jyväskylä's OPEN SCIENCE CENTER



https://www.archinfo.fi/en/articles/jyv%C3%A4skyl%C3%A4-universitys-main-library-refurbishment-wins-finlandia-prize-for-architecture-2022



WORKSHOP 1: SHAPES AND COLORS



The Polyuniverse offers a new perspective for mathematics and art education. Mind-bending combinations made of 24 pieces each of the 3 basic shapes: the triangle, the circle and the square.

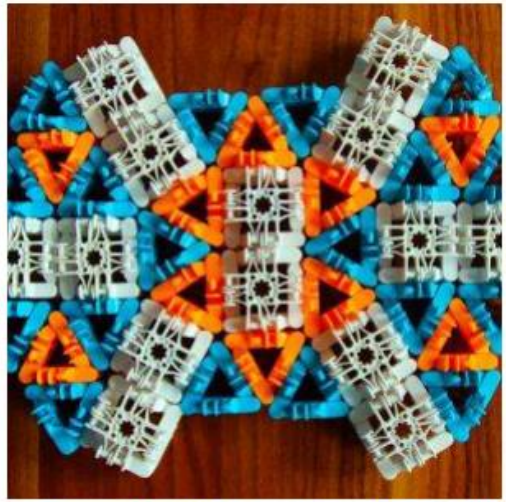
WORKSHOP 2: STRUCTURE

Make a geometrical magic carpet, tapestry or decoration inspired by various patterns, including visual illusions! Determine the colours, think about the pattern, count, and create.

WORKSHOP 3: LOGIC

MONDRIAN BLOCKS are offering cognitive challenges at the conjunction of art and mathematics. Let the flow take your mind to the next level!

WORKSHOP 4: LINKS & FLEXIBILITY



Called the “next level LEGO” by the New York Magazine, LUX is a revolution in construction. Modeled after nature at the molecular level, LUX connects through linking, instead of sticking or stacking, and therefore gives the immediate experience of the world of kinematics. Now this wonderful moving aspect of our universe can be accessed in playing and learning experience!

WORKSHOP 5: MODULARITY

The Design Award Winner Logifaces is the ANALOGUE GAME FOR DIGITAL MINDS. LOGIFACES lets you train your mind, boost your creativity and challenge yourself and your friends.

Current tendencies from Finland

Society and education in a digital world

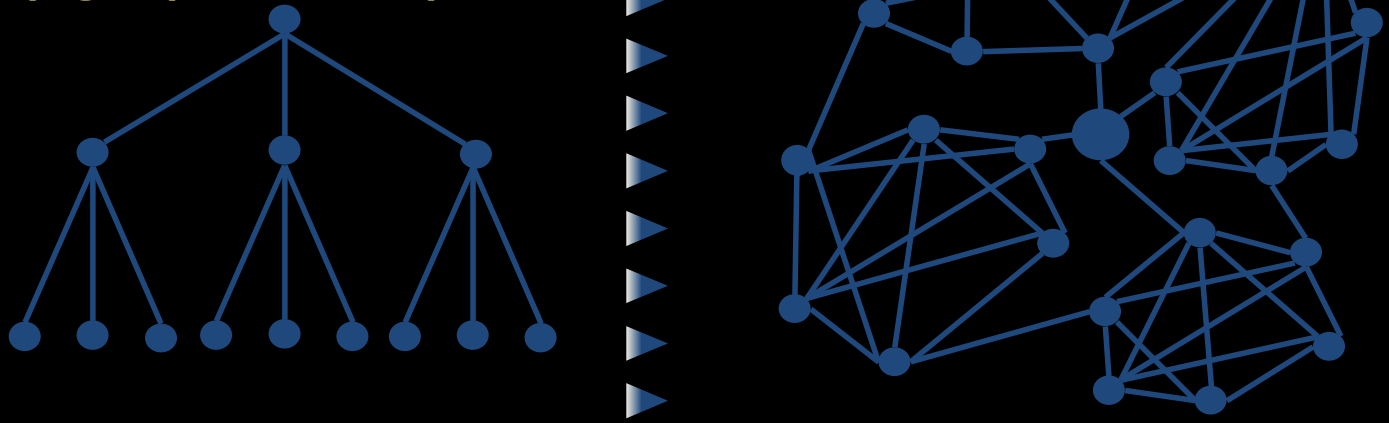
- Major changes in society, individual lives and careers take place in 1 - 5 years instead of 5 - 20 years
- Transforming from service society to self-service society: Fewer jobs, less free time
  - AI based automatic services replacing many functions
- Technologies, such as robotics (service, industrial, software):
  - Available jobs require higher and up-to-date education
- Careers consist of multiple shorter, less structured jobs
  - Employees required to respond to changes quickly.
  - Society needs to support employees in transitions of employment.
- Aging society: more demand for services and care
- Digitalization demands a more agile education system.
  - Finland is developing this system
    - goal: 50% of population with a higher education
  - Digital education and innovation required to meet modern demands.

United Nations Educational, Scientific and Cultural Organization

UNESCO Chair on Digital Platforms for Transforming Economies, University of Jyväskylä, Finland

Organizational aspects in Finland: theoretical approach

Recently, the leadership paradigm changed. The focus moved from top-down leadership to distributed and shared leadership, that requires a group of people to collectively perform the leadership tasks (Yukl, 1999). This may enhance the effectiveness of organizations
(e.g., Spillane, 2006).



Takumi Yada & Mika Risku, University of Jyväskylä

Organizational aspects in Finland: pragmatic approach

Schools are confronted with an increasing pressure towards collaboration to achieve school goals with a wide variety of people involved in their educational endeavor (Vangrieken et al., 2015)

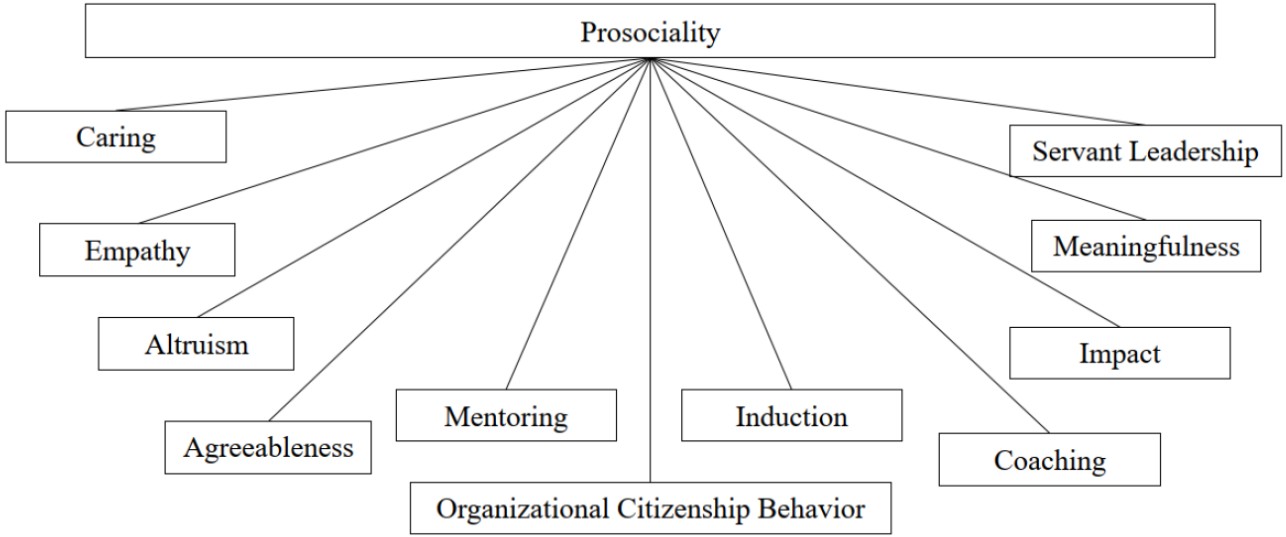
Takumi Yada & Mika Risku, University of Jyväskylä

Organizational aspects in Finland: pragmatic approach

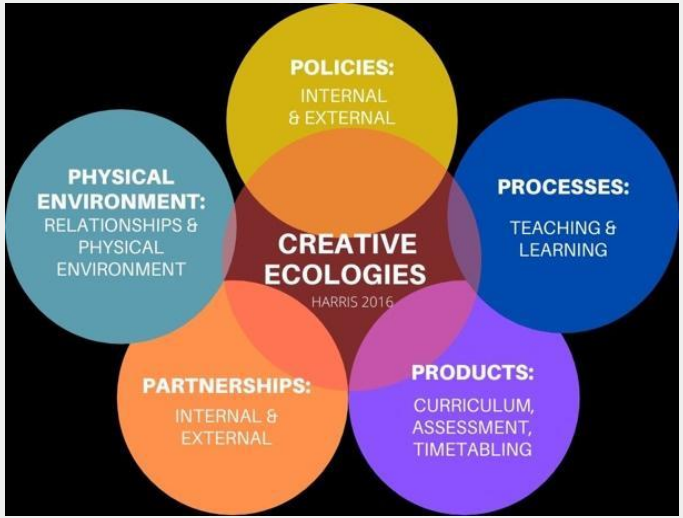
Schools are surrounded by the situation that are getting more complexing and difficult (Vangrieken et al., 2015)

Takumi Yada & Mika Risku, University of Jyväskylä

Yada, T., and Jäppinen, A-K. (2019) A Systematic Narrative Review of Prosociality in Educational Leadership. *Educational Management Administration & Leadership* 47(6), 980–1000



Creative ecological model



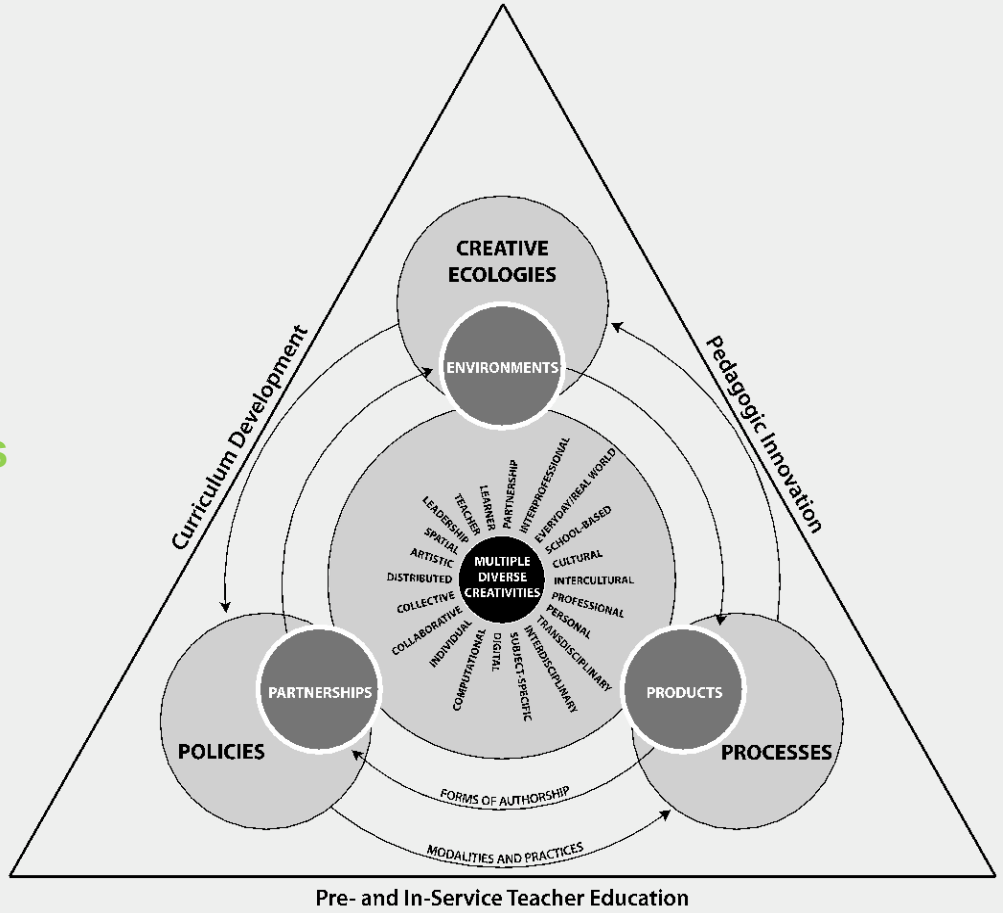
- Multiple/diverse creativities entangle with one another and produce different solutions in learning communities
- Emphasises dynamic processes and contextual factors in creativity

Creative Ecologies model by Anne Harris.

Source: Szabó, T. P., Burnard, P., Harris, A., K. Fenyvesi, Soundararaj, G. & Kangasvieri, T.: Multiple creativities put to work for creative ecologies in teacher professional learning: A vision and practice of everyday creativity. *Forthcoming.*

Harris, A. (2016a). Creativity and Education. London/NY: Palgrave Macmillan.
Harris, A. (2016b). Creative Ecologies: Fostering Creativity in Secondary Schools. Retrieved from: http://creativeresearchhub.com
Harris, A. (2018). Creative Agency / creative ecologies. In Snepvangers, K., Thomson, P. and Harris, A. (Eds.), Creativity Policy, Partnerships and Practice in Education (pp. 65–87). London: Palgrave Macmillan.

Creative ecologies, multiple, diverse creativities (Pamela Burnard)



Szabó, T. P., Burnard, P., Harris, A., K. Fenyvesi, Soundararaj, G. & Kangasvieri, T.: Multiple creativities put to work for creative ecologies in teacher professional learning: A vision and practice of everyday creativity. Forthcoming.

Knowledge	Skills	Attitudes/values/ethics
Think and work creatively and with others •Know a wide range of idea creation techniques (such as brainstorming) •Be aware of invention, creativity, and innovation from the past within and across national boundaries and cultures •Know the real-world limits to adopting new ideas and how to present them in more acceptable forms •Know how to recognize failures and differentiate between terminal failure and difficulties to overcome *Implement innovations* •Be aware of and understand where and how innovation will impact and the field in which the innovation will occur •Be aware of the historical and cultural barriers to innovation and creativity	*Think creatively* •Create **new and worthwhile ideas** (both incremental and radical concepts) •Be able to elaborate, refine, analyze, and evaluate one's own ideas in order to **improve and maximize creative efforts** *Work creatively with others* •Develop, implement, and communicate new ideas to others effectively •Be sensitive to the **historical and cultural barriers** to innovation and creativity *Implement innovations* •Develop innovative and creative ideas into forms that **have impact and can be adopted**	*Think creatively* •**Be open** to new and worthwhile ideas (both incremental and radical) *Work creatively with others* •Be open and responsive to new and diverse perspectives; **incorporate group input and feedback** into the work •View f**ailure as an opportunity to learn;** understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes *Implement innovations* •Show **persistence** in presenting and promoting new ideas

Ways of thinking: Creativity and innovation

Binkley M., Erstad, O., Herman J., Raizen, S. Ripley, M., Miller-Ricci, M., Rumble, M. (2012). Defining Twenty-First Century Skills. In P Griffin, B. McGaw & E: Care (Eds.) Assessment and Teaching of 21st Century Skills, (pp 17–66). New York: Springer.

Kids Inspiring Kids for STEAM, Erasmus+ @ European Researchers' Night. Coordinated by www.experienceworkshop.org

Kids Inspiring Kids for STEAM, Erasmus+ @ European Researchers' Night. Coordinated by www.experienceworkshop.org

Kristóf Fenyvesi and Tuuli Lähdesmäki (Editors)

Aesthetics of Interdisciplinarity: Art and Mathematics

This anthology fosters an interdisciplinary dialogue between the mathematical and artistic approaches in the field where mathematical and artistic thinking and practice merge. The articles included highlight the most significant current ideas and phenomena, providing a multifaceted and extensive snapshot of the field and indicating how interdisciplinary approaches are applied in the research of various cultural and artistic phenomena. The discussions are related, for example, to the fields of aesthetics, anthropology, art history, art theory, artistic practice, cultural studies, ethno-mathematics, geometry, mathematics, new physics, philosophy, physics, study of visual illusions, and symmetry studies. Further, the book introduces a new concept: the interdisciplinary aesthetics of mathematical art, which the editors use to explain the manifold nature of the aesthetic principles intertwined in these discussions.

ISBN 978-3-319-57257-4

9 783319 572574

▶ birkhauser-science.com

Kristóf Fenyvesi and Tuuli Lähdesmäki (Ed.)

Aesthetics of Interdisciplinarity: Art and Mathematics

Kristóf Fenyvesi
Tuuli Lähdesmäki
Editors

Aesthetics of Interdisciplinarity: Art and Mathematics

Birkhäuser

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Tiina Mäkelä, Kristof Fenyvesi, Marja Kankaanranta, Veera Kenttälä, Olli Merjovaara, Matias Mäki-Kuutti, Panagiota Christodoulou, Dimitris Pnevmatikos, Christina Haaf, Alecia Adelaide May Reid, Carlos Rioja del Rio, Noemi Serrano, Evgeniia Surkova, Juho Mäkiö, Sviatlana V. Astapchuk & Eduard V. Pavlysh

Pedagogical framework, design principles, recommendations and guidelines for a STEM learning environment design

https://jyx.jyu.fi/handle/123456789/76132

UNIVERSITY OF JYVÄSKYLÄ
FINNISH INSTITUTE FOR EDUCATIONAL RESEARCH

N

THE FRONTIERS COLLECTION

EXPERIENCE WORKSHOP

www.experienceworkshop.org

Wuppuluri · Wu (Eds.)

ON ART AND SCIENCE

Shyam Wuppuluri
Dali Wu (Eds.)

ON ART AND SCIENCE

Tango of an Eternally Inseparable Duo

With an Afterword by Sir Martin Rees

Springer

CRITICAL ISSUES IN THE FUTURE OF LEARNING AND TEACHING

Why Science and Art Creativities Matter

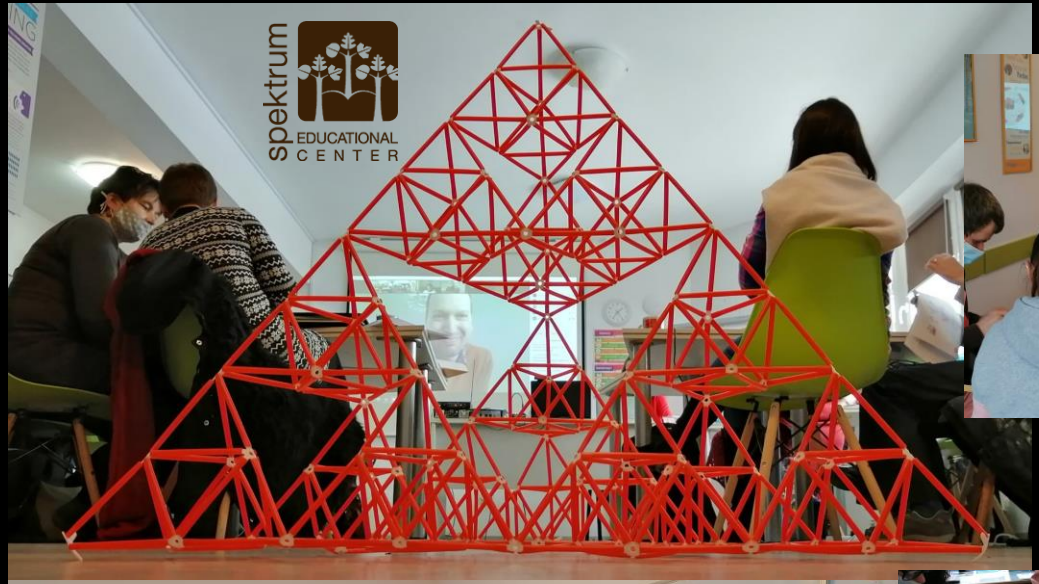
(Re-)Configuring STEAM for Future-Making Education

Pamela Burnard and
Laura Colucci-Gray (Eds.)

BRILL | SENSE

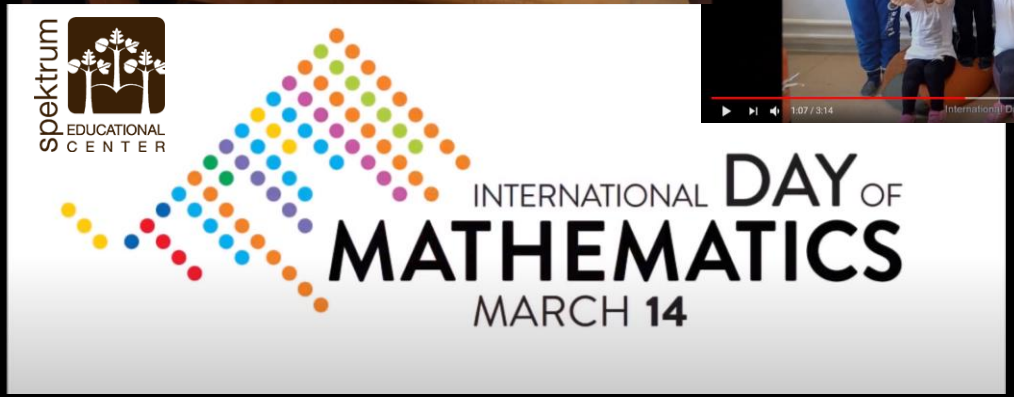
EXPERIENCE WORKSHOP

www.experienceworkshop.org



EXPERIENCE WORKSHOP

www.experienceworkshop.org



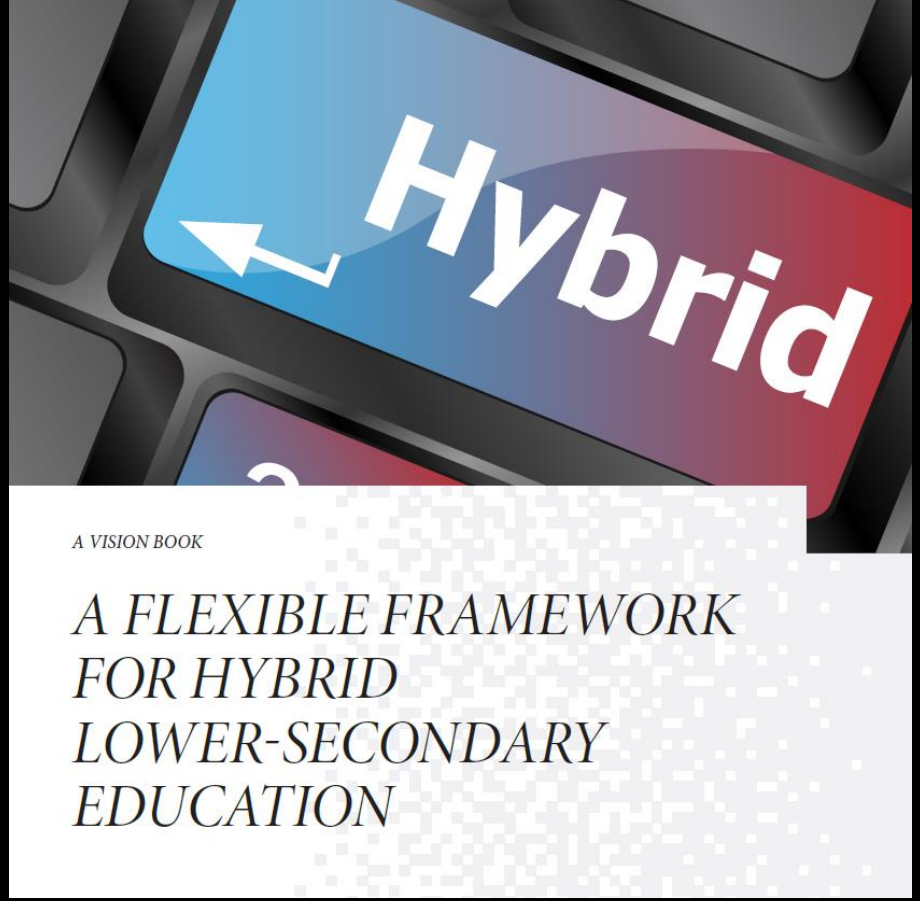
EXPERIENCE WORKSHOP

www.experienceworkshop.org

Developed between: 2021-03-01 – 2021-12-31
Lead organisation: School of Educational Sciences, TALLINN UNIVERSITY, Estonia
Media: Publications (online), Paper Brochures.

Languages: English, Romanian

Download our publication:
Education **for lower-secondary schools**



freeED

A **FRAMEWORK** FOR **EFFICIENT** AND **ENGAGING** HYBRID **EDUCATION** IN LOWER-**SECONDARY** SCHOOLS

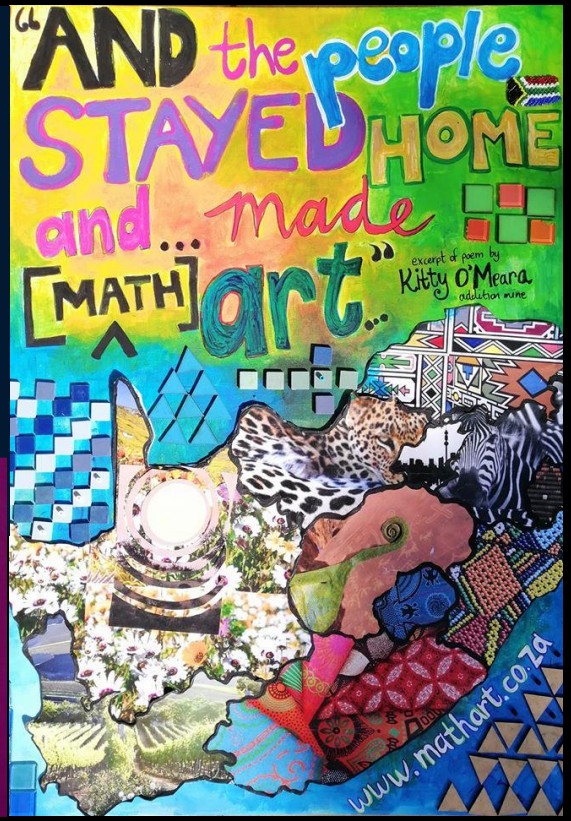
IN ADDITION TO HIGH TECH: HIGH TOUCH!

EXPERIENCE WORKSHOP

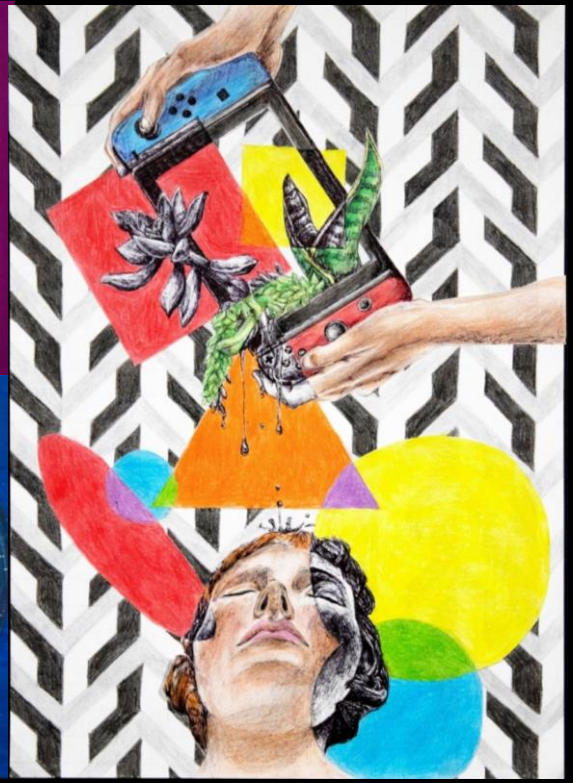
www.experienceworkshop.org

GMMDC National MathArt COMPETITION

NELSON MANDELA UNIVERSITY



IN ADDITION TO HIGH TECH: HIGH TOUCH!



EXPERIENCE WORKSHOP

www.experienceworkshop.org


EXPERIENCE WORKSHOP
THE EXPERIENCE-CENTERED
MATH/ART MOVEMENT
www.experienceworkshop.org

EXPERIENCE WORKSHOP

THE EXPERIENCE-CENTERED MATH/ART MOVEMENT

www.experienceworkshop.org

Maths-Arts Schools Competition

NELSON MANDELA UNIVERSITY

Change the World

Together with Ambassador of Finland in South Africa, Anne Lammila: Book introduction at the Finnish Embassy of South Africa, 8. 12.2022.

What topics you could discuss based on this young person's mathart work?

South African MathArt Challenge


Pendulum Painting

Pendulum Painting

- **Thinking-with** forces of motion and gravity / Newton's Law of Inertia / non-linear system
- **Making-with** velocity, acceleration, and the kinetic and potential energy of the drawing tool / oscillating and rotational motion

- Making-with "viscosity of the paint used, the flowrate of paint drip, the velocity of the paint-pendulum modelled dripper, the positions of the release point, and the stability of the dripper from the resultant force of multiple interacting forces."

Isa, N. M., Hamid, A. R., Hamid, M. F., Basmmi, A. B. M. N., Azman, A., Ahmad, M. F., ... & Tamizi, A. S. A. (2020, September). Intertwining the Arts and Sciences to Stimulate a Creative Mind. In *International Conference on Student and Disable Student Development 2019 (ICoSD 2019)* (pp. 39-44). Atlantis Press.

Pendulum Painting
in a Finnish classroom

South African MathArt Challenge

Artist Statement: *The maths that I used in my artwork is both symmetry and tessellations.* ***I also tried to use a pendulum effect to try and make my project unique from everybody else's project, but it didn't turn out how I wanted it to. Therefore I had to make the pendulum mess up a part of my artwork.***

The thing that makes my artwork special and unique is that I cut some of the tessellations out of the face to expose the background. This allows the face to be the centre of my artwork. ***Through I tried to use a pendulum effect that did not turn out the way I was hoping for, I had to make that mess up work for my art. This is why I also think that my artwork is unique as I tried something different and then made the mistake part of my artwork.***

I chose this topic as I thought that it would expand my knowledge and would allow me to be creative and go over and beyond.

Mukombo

Carine

Fruit

Bellybutton

Mukombo

Making Multi-Faceted Connections with Maths

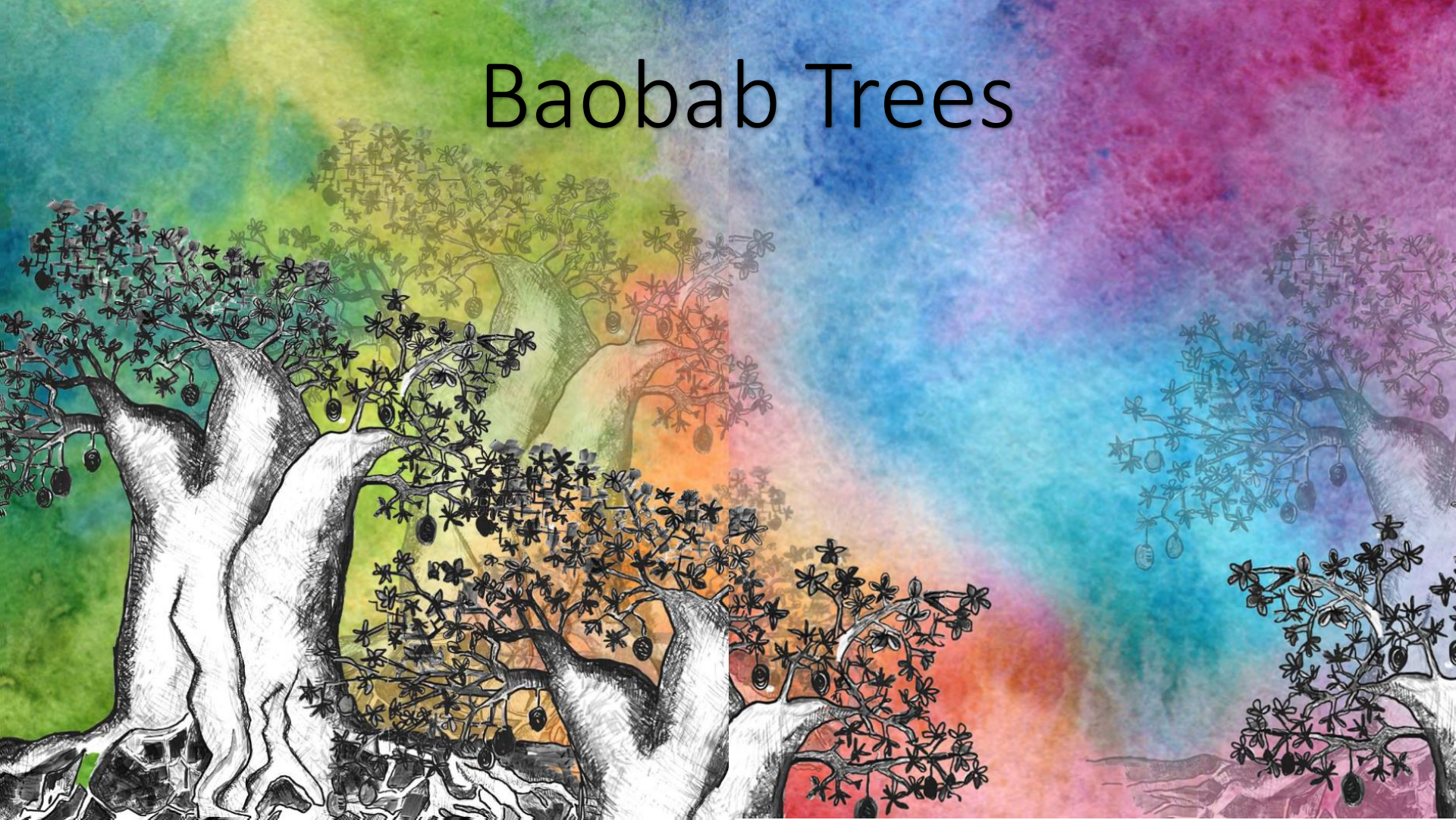
MANGO made Math fun

Sibangani Matsa

My artwork's main body is my favorite fruit, known as the "MUKOMBO" (bellybutton) in Venda Culture. It is named this because it resembles a main body, it being the stomach.

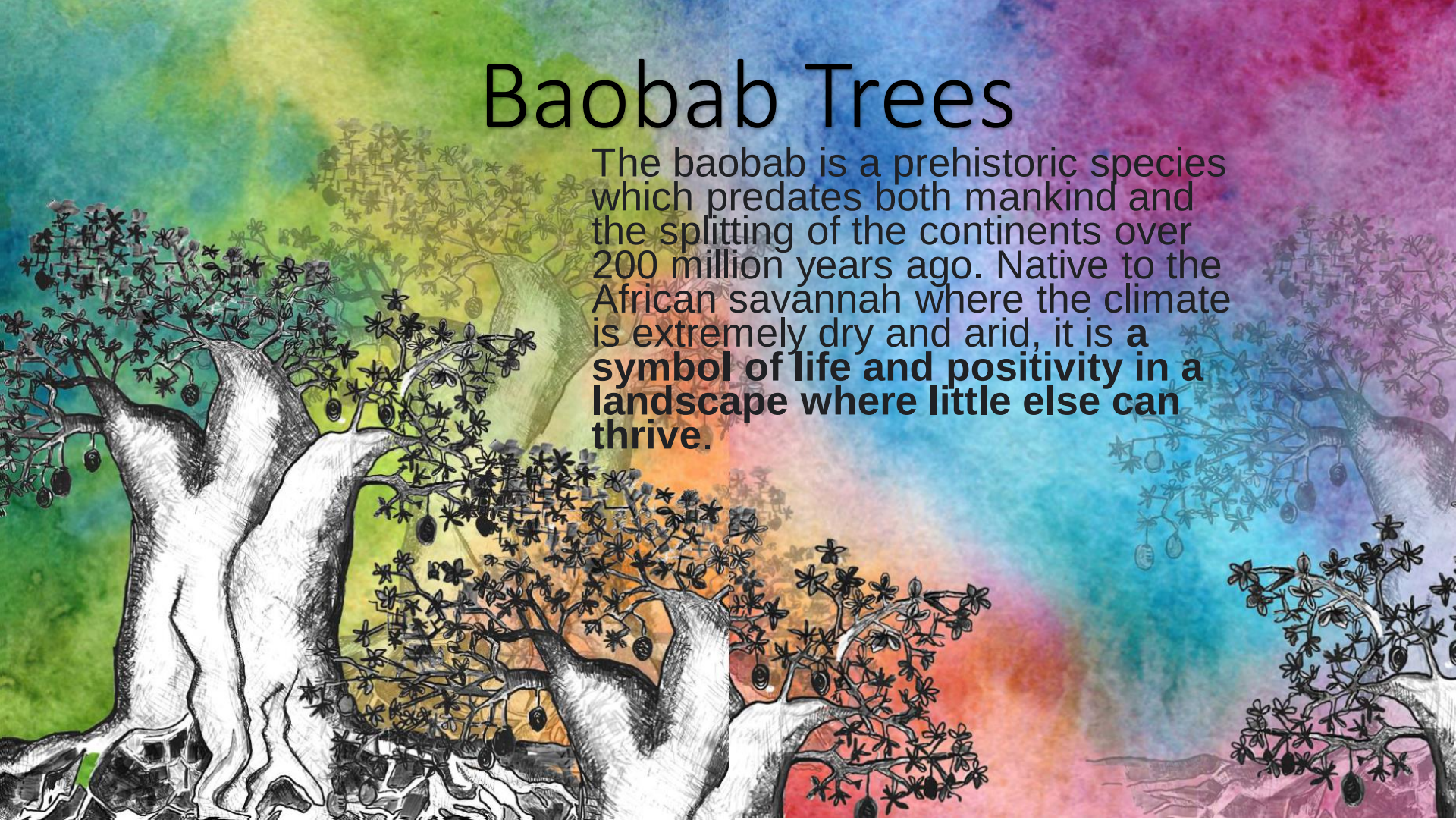
My Love for this Mango fruit paved way for me to discover the MANGO MATH Program. A program that helps Children develop a sense of Measurement Algebaic thinking Number sense Geometry Odds and Order.

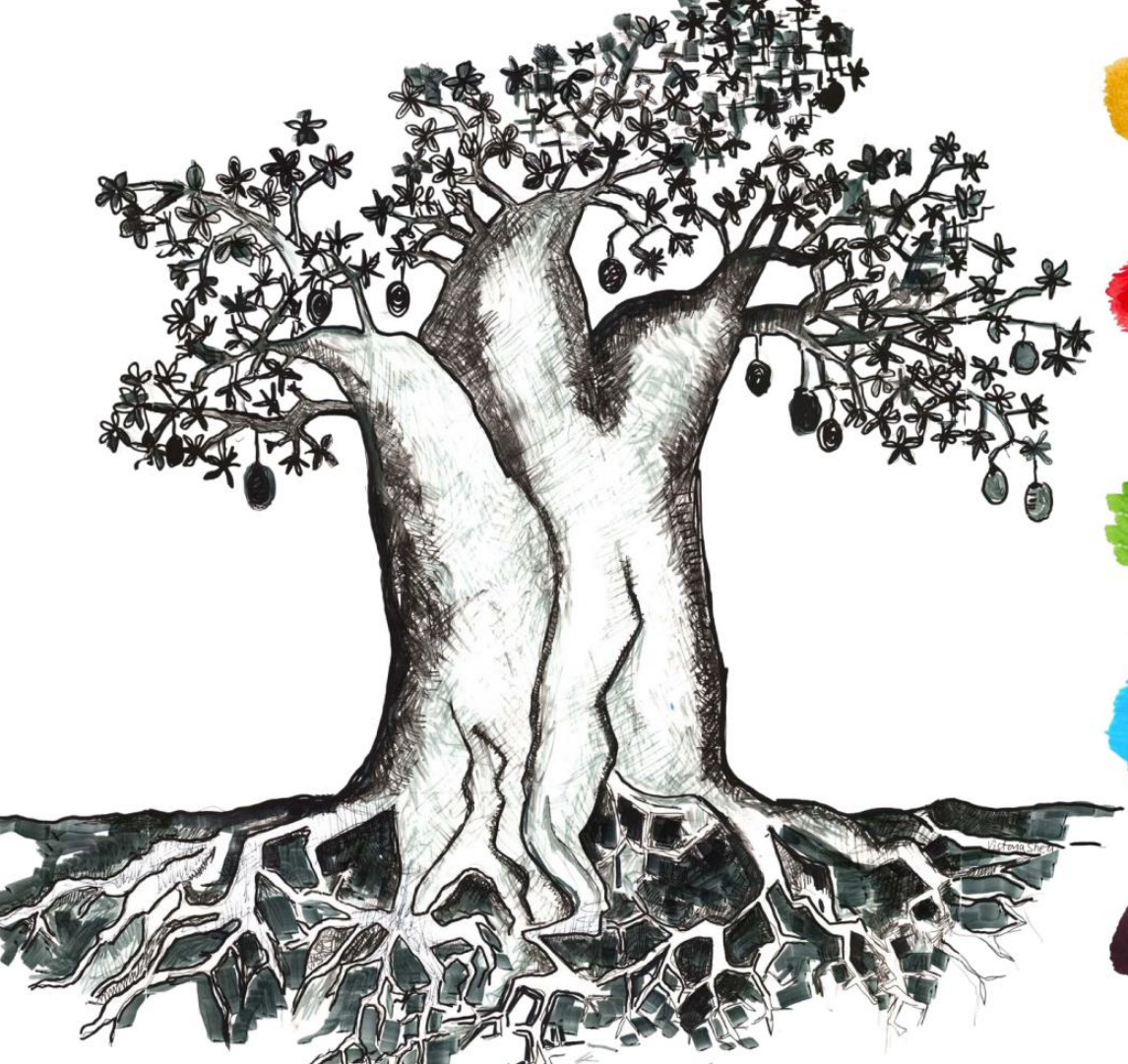
Baobab Trees



Baobab Trees

The baobab is a prehistoric species which predates both mankind and the splitting of the continents over 200 million years ago. Native to the African savannah where the climate is extremely dry and arid, it is **a symbol of life and positivity in a landscape where little else can thrive.**





reach

5 International
Educational

fruit

4 Unexpected
Outcomes

branches

3 Real life Maths
Technology
Trans-
disciplinarity

trunk

2 Maths
Art
Themes
Creativity

roots

1 Baobab
Origins
Objectives


we are beautiful
laughter helps
Boredom kills Maths
stress is debilitating
Bridges
International Reach
fun helps
fear is debilitating
don't under estimate us because we are young
everyone can do Maths
use games
Maths is Afrikan
ground breaking
Maths is alive in Africa
We know how we learn best
Maths is everywhere
I need maths
I see maths
MATHS
Art
THEMES
Creativity
STEAM
Pioneering
use humour
teachers can be creative
our teachers are important
teach us with creativity
Reforestation
We care about the planet
trans-disciplinarity to solve the world's problems
South African learners
South Africa
Teacher development
Incubator Schools Programmes
roots
Resilience
MathArt
STEAM
context
Maths + Science = Winning nation
Empowering young South African Minds
Technology
Govan Mbeki Mathematics Development
development


MATHS
ART
THEMES
creativity
trans-disciplinarity to solve the world
South African
visualise pos
attitudes towards Math
educational solutions
South Africa
Teacher development
PLNs
Incubator Schools Programmes
roots
Resilience
MathArt
Self directed learning
STEAM
context
Maths + Science = Winning


Maths is alive in ARC
we know how we learn best
Creativity
Pioneering
Reforestation
Maths
Teachers can be
Teachers are important
teach us
our
We
solve the world's Problems
South African learners
visualise possibili
Empowering young South African Minds
Technology
Govan Mbeki Mathematics Development
development


fear is debilitating
don't underestimate us because we are
fun helps
the game
ground breaking
every one can do Maths
Maths is African
can be creative
we know how we learn best
Maths is alive in ANC


Maths
Bridges
Best practice
We can learn from this
fun helps
fear is debilitating
don't


laugh
Boredom kills Maths
Stress is debilitating
fear is debilitating
trans-disciplinarity
it's all linked
we see the connections
steam history
no more silos
Technology, devices, robots
social media
internet
ground breaking
Beauty in people
Beauty in numbers

human essence
all peoples
Math
we get this
its all linked
we see the connections
no more silos
seeing differently
nature
society
proportions
constants
fourier transform
undefined
pi
einstein
fractals
Beauty in people
The cosmos
stars, planets
God creation
beautiful
technology


MATHS
ART
THEMES
creativity
STEAM
trans-disciplinarity
Encouraging Self-Expression
Wisdom is like a backpack
We know how we learn best

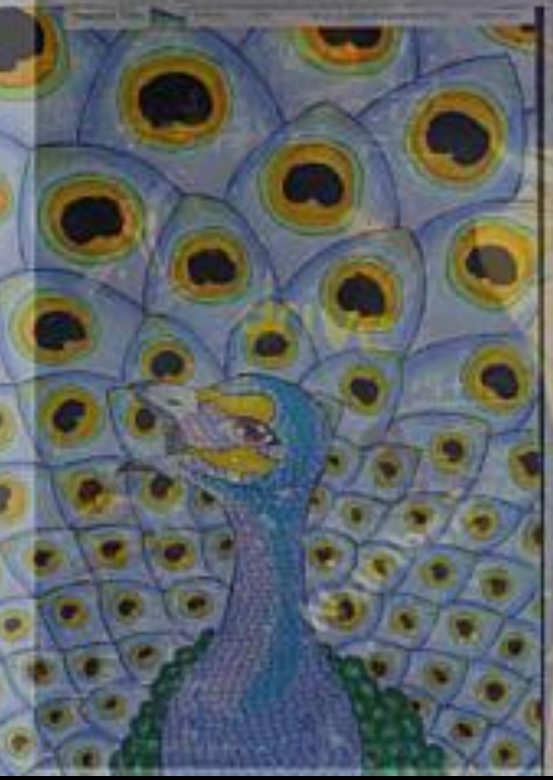

MATHS
ART
THEMES
colour
South Africa
Teacher development
Schools Programmes
Incubator
roots
Resilience
MathArt
Self directed learning
STEAM
creative problem
context
Maths + Science
Youth Tutor
South Afri
visuali

GMMDC
Govan Mbeki Mathematics Development Centre
empowering young minds

NELSON MANDELA UNIVERSITY

Numbers drive me crazy

Gr 11 Peacock Tiles



Gr 10 Number lines

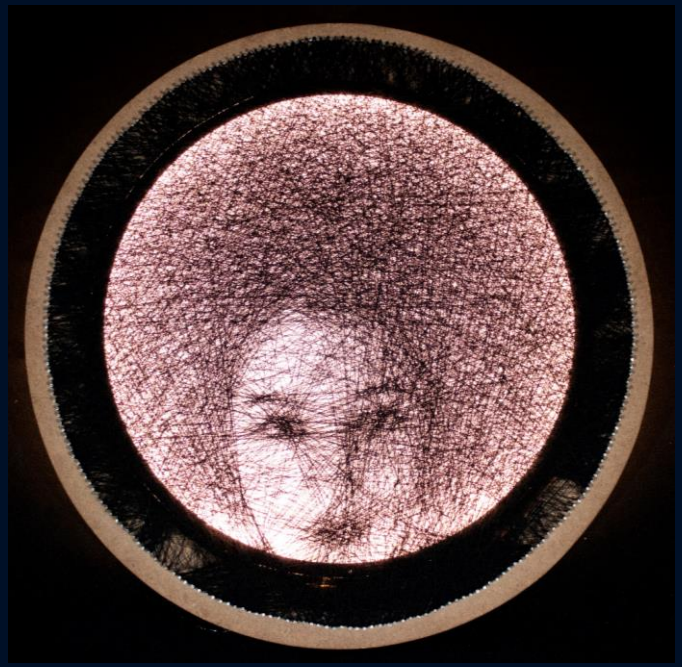
Nakedi Ntodi
Lekesha Tobie
Gr 8

Gr 10

Erin Powers

I am because we are - UBUNTU

DIOCESAN SCHOOL FOR GIRLS



Education for all

and

preparing for the future

LEARNING THROUGH PLAY

”I learn when I play”

POSITIVE PEDAGOGY

”Notice the good in me”

PARTICIPATION

“My voice matters”

PHENOMENON-BASED LEARNING

”I want to learn about topics that are connected to my world”

ALL-DAY LEARNING

“I explore and learn everywhere, all the time.”

LIFE SKILLS

“Let me learn skills for life, not for school.”

- Dr. Johan

It’s learning through play!

The upside
Finland

This article is more than 2 years old

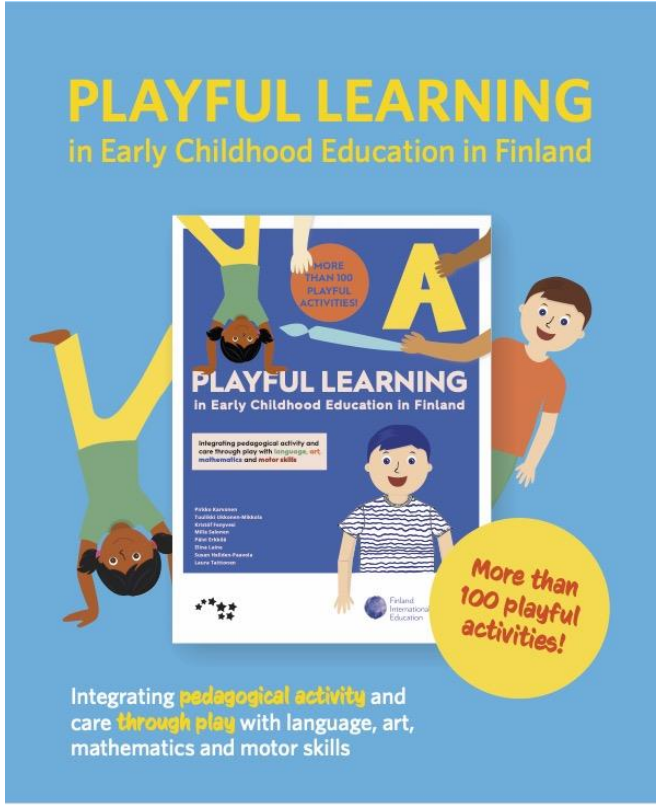
Safe, happy and free: does Finland have all the answers?

In the first of our new series, The Upside, we look at how the country went from famine to topping nearly every global social ranking

- Finland's 10 great innovations

The necessary to know of Playful Learning in Finnish Early Childhood Education

- Finnish ECEC pedagogy
- Theoretical background
- Practical methodology
- Over 100 Playful activities



Finland International Education

Otava Learning

Finland International Education

PLAYFUL LEARNING in Early Childhood Education in Finland

OTAVA

PLAYFUL LEARNING

in Early Childhood Education in Finland

Integrating pedagogical activity and care through play with language, art, mathematics and motor skills

Pirkko Karvonen
Tuulikki Ukkonen-Mikkola
Kristóf Fenyvesi
Milla Salonen
Päivi Erkkilä
Elina Laine
Susan Hellden-Paavola
Laura Taittonen

Finland International Education

PLAYFUL LEARNING in Early Childhood Education in Finland *elevates the pedagogical significance of play in learning, as well as children's holistic growth and well-being. This book encourages versatile and functional working methods that promote children's creativity, interaction and participation. Our main task is to help you provide good childhood experiences and consequently a promising future for all children.*

Pia Kola-Torvinen, Counsellor of Education, Finnish National Agency for Education

PLAYFUL LEARNING in Early Childhood Education in Finland *is a book full of various activities. The book is planned by professionals who have proved the effectiveness of these activities based on specific theories and research. The book is useful in daycare centres and is needed in teacher education. It can also be an excellent guide for parents in home education. The book guides children to participate and experience joy together. The book itself plays a valuable part in developing children's culture.*

Ulla Härkönen, professor emerita, University of Eastern Finland

Playful Learning In Early Childhood Education in Finland

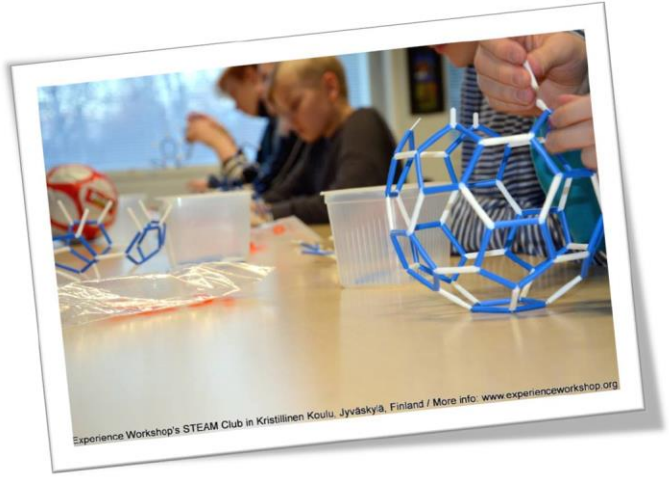
44.70 € incl. VAT

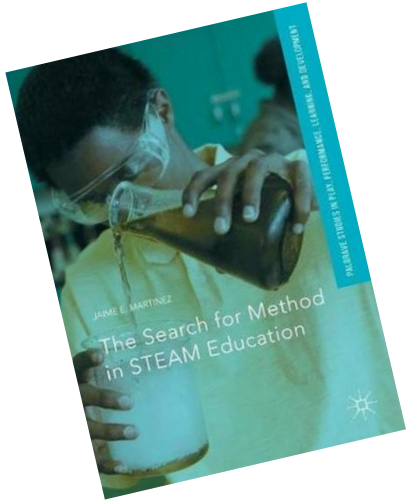
Publishers:
Otava and **Finland International Education**

Authors:
Karvonen, Pirkko; Ukkonen-Mikkola, Tuulikki; Fenyvesi, Kristof; Salonen, Milla; Erkkilä, Päivi; Laine, Elina; Hellden-Paavola, Susanna; Taittonen, Laura

This book is intended for all persons **working with children aged 0-7 years** and who do the important work, for instance, in Early Childhood Education and Care (ECEC) centres, kindergartens, nurseries or schools in all parts of the world. This book can also be used in teaching and training of the professionals of ECEC.


learning
by doing
www.learningbydoing.fi





- The **Finnish National Core Curriculum** makes recommendations to teachers and schools about the development of *student-centered*, *multidisciplinary / phenomenon-based learning* programs and collaborative teaching.

- **STEAM** provides a reasonable basis to complete this requirement, as it means the *multidisciplinary* or *transdisciplinary integration* of **S**cience-, **T**echnology-, **E**ngineering-, **A**rts- and **M**athematics learning about various topics.

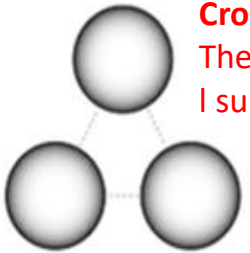
- **STEAM** is based on the collaboration between the teachers.

Configuration of disciplines in various pedagogical approaches to teaching

Intradisciplinary: One school subject

Intradisciplinary

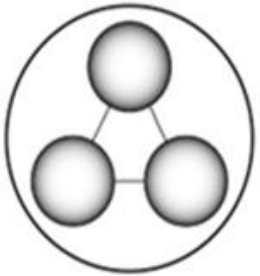
Crossdisciplinary:
The same theme in different schoo
l subjects



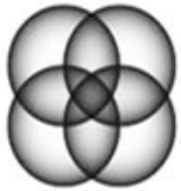
Crossdisciplinary

Transdisciplinary:
creating a unity
of intellectual
frameworks
beyond the
school subjects.

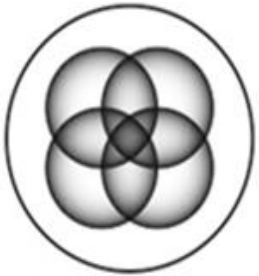
Multidisciplinary: s
chool subjects
working together,
each adding their d
isciplinary
knowledge.



Multidisciplinary



Interdisciplinary



Transdisciplinary

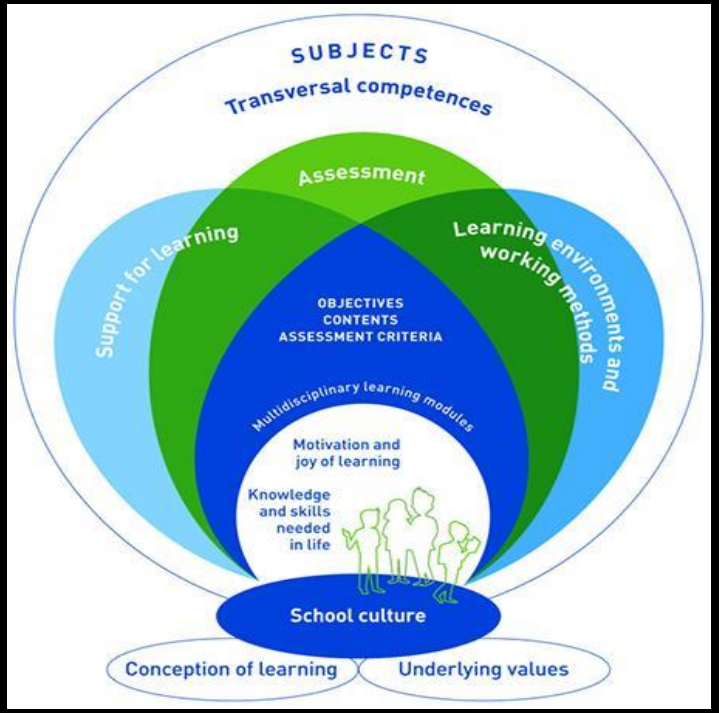
Interdisciplinary:
integrating new approaches from existing school subjects

EXPERIENCE WORKSHOP
THE EXPERIENCE-CENTERED
MATH/ART MOVEMENT
www.experienceworkshop.org

Tampereen yliopisto
Tampere University
CEA UNIVERSITY OF HELSINKI CENTRE FOR EDUCATIONAL ASSESSMENT
JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

The Finnish National Core Curriculum for Basic Education, 2014

https://www.oph.fi/english/curricula_and_qualifications/basic_education/curricula_2014

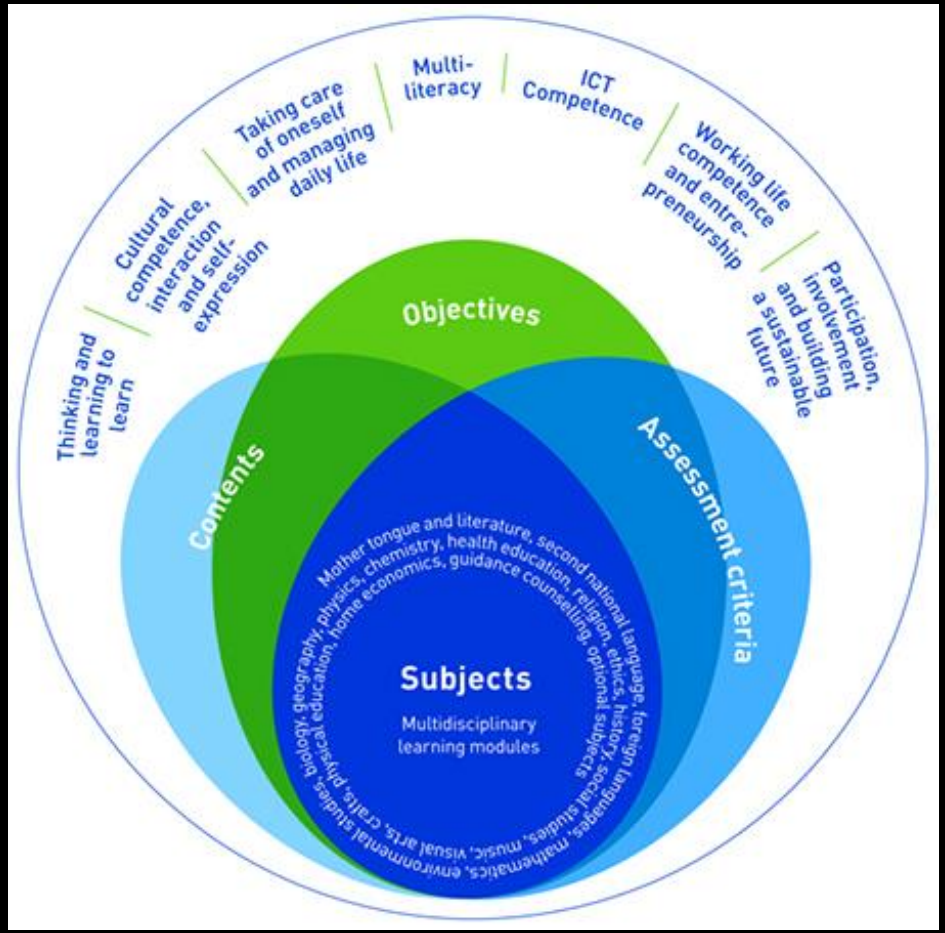


Objectives and contents described for different **school subjects** are connected to underlying values, conception of learning and school culture

Emphasis on **diversity in learning environments, methods** and **assessment**

In each school year, every school must have at least one **multidisciplinary** theme, project or course from the perspective of several schoolsubjects

The theme is connected to **everyday life phenomena** and promotes **joy of learning**



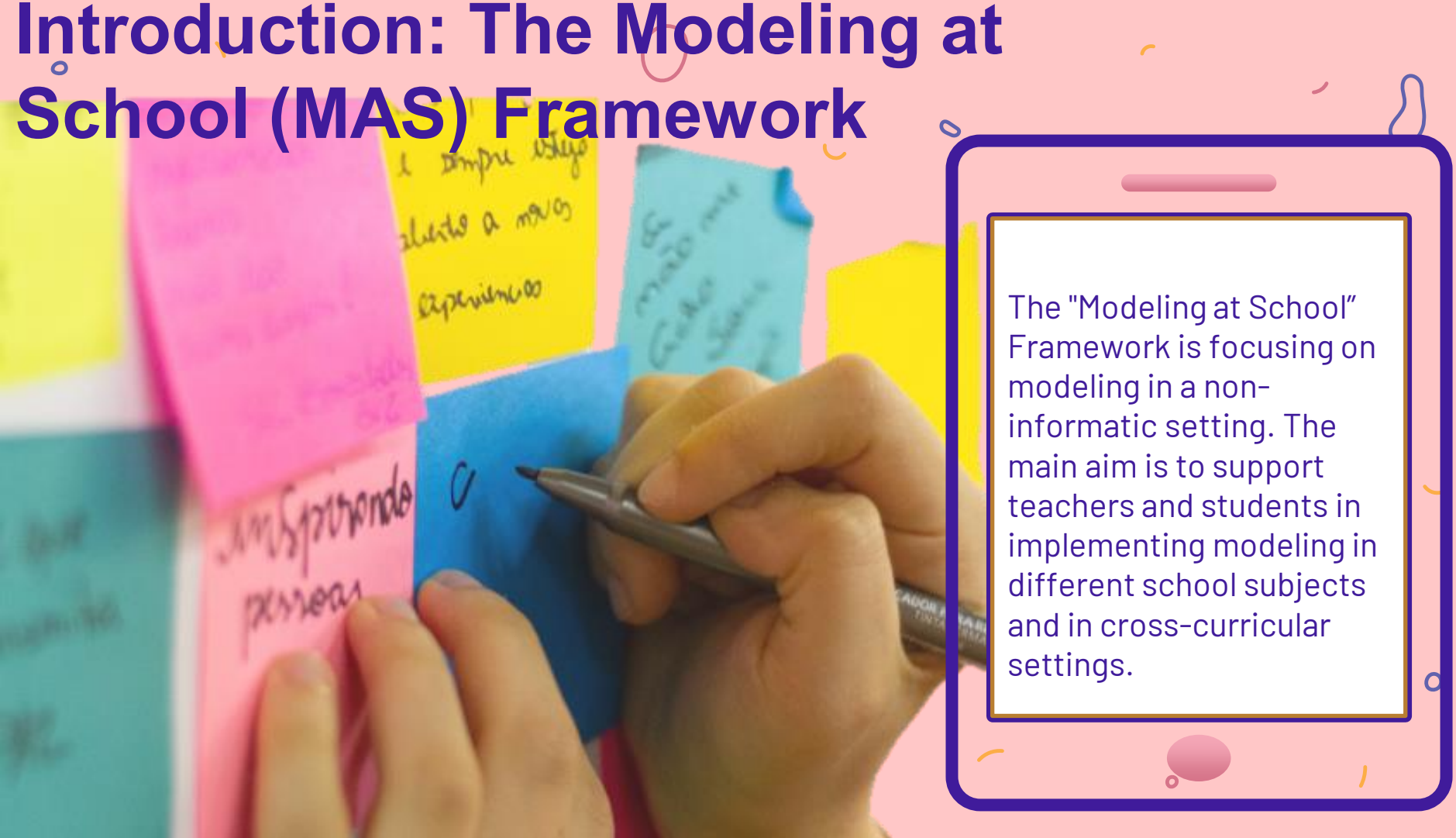
https://www.oph.fi/english/curricula_and_qualifications/basic_education/curricula_2014

https://www.oph.fi/english/curricula_and_qualifications/basic_education/curricula_2014

Computational Thinking-based Modeling In Learning Different Subjects

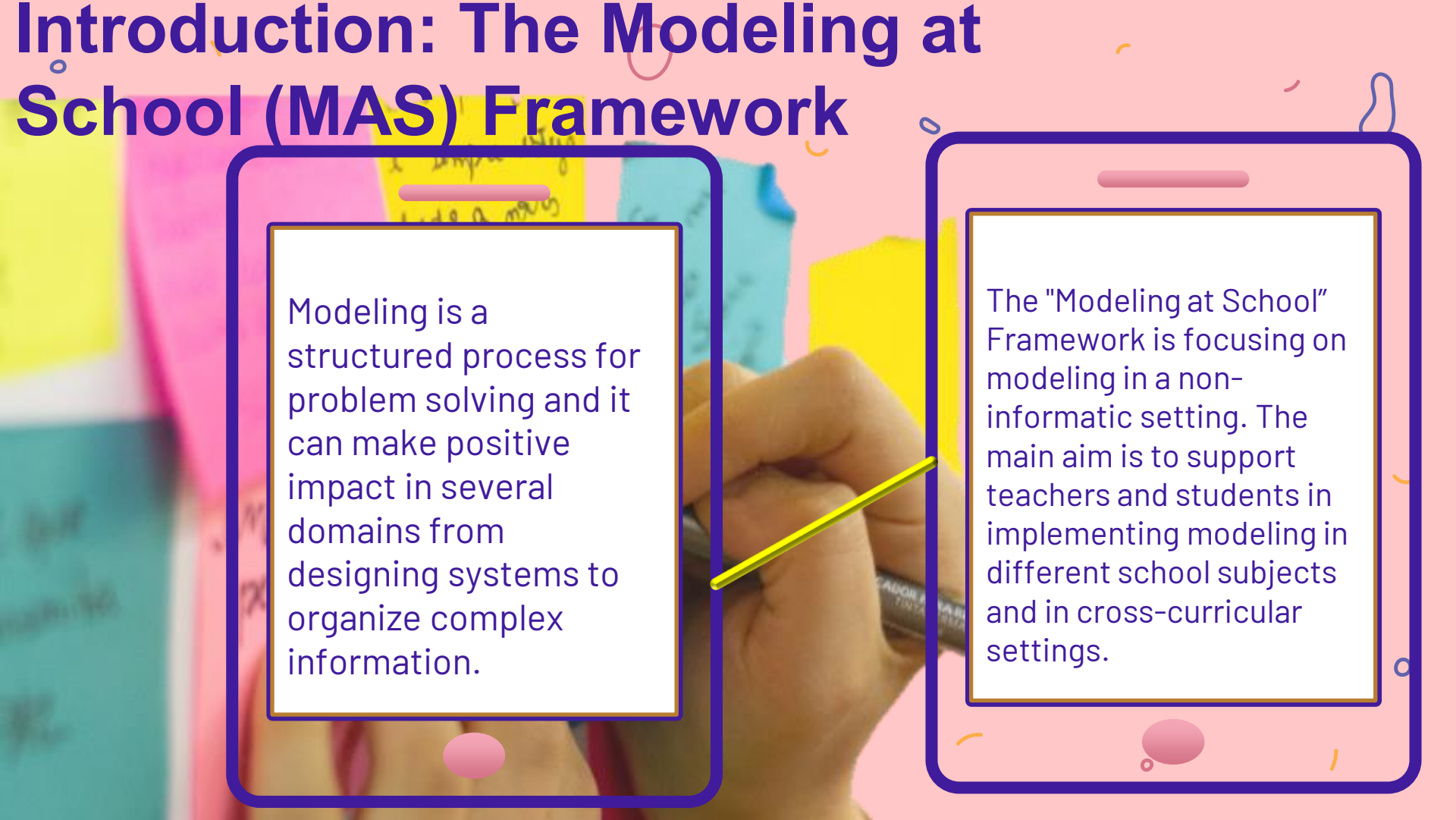
Modeling is an important concept in Computer Science, and it is applied in everyday life as well. This session introduce modeling for teachers in order to integrate it as concept and a learning tool in primary and secondary education. This approach can be useful to foster 21st century skills, problem solving, computational thinking, text comprehension in different subjects and as preparation of programming. Introducing modeling techniques in school practice provide effective teaching and learning tools suitable for all subjects and beyond, specifically for STEM and STEAM

Introduction: The Modeling at School (MAS) Framework



The "Modeling at School" Framework is focusing on modeling in a non-informatic setting. The main aim is to support teachers and students in implementing modeling in different school subjects and in cross-curricular settings.

Introduction: The Modeling at School (MAS) Framework



Modeling is a structured process for problem solving and it can make positive impact in several domains from designing systems to organize complex information.

The "Modeling at School" Framework is focusing on modeling in a non-informatic setting. The main aim is to support teachers and students in implementing modeling in different school subjects and in cross-curricular settings.

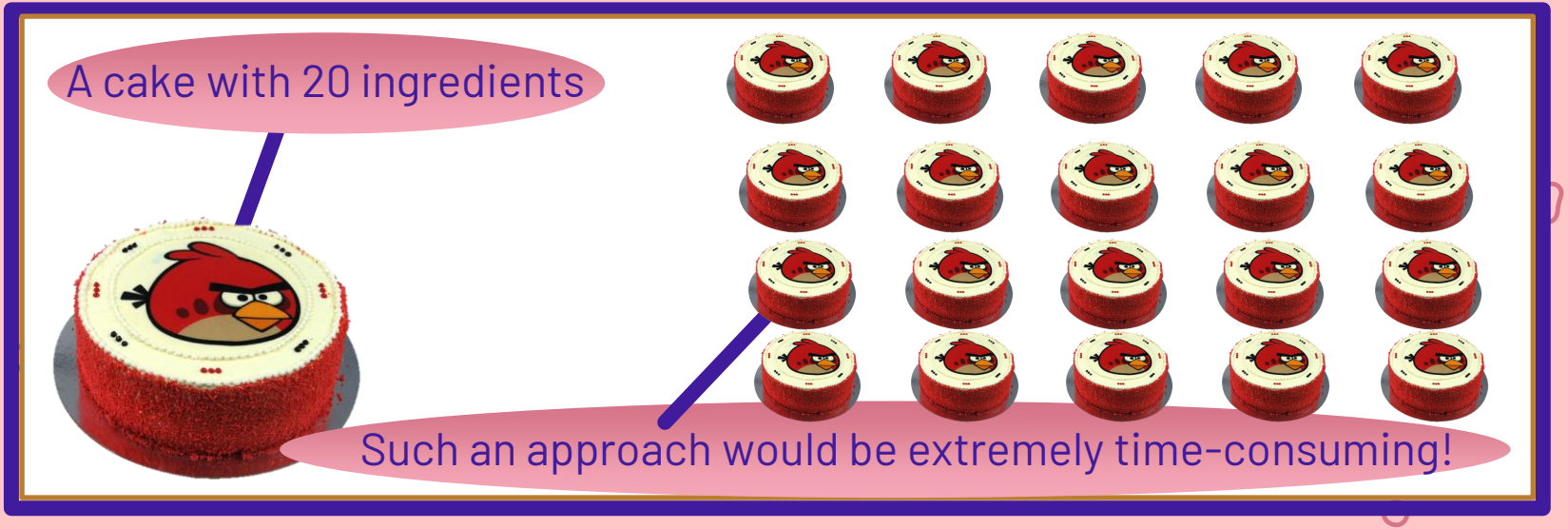
Introduction: The Modeling at School (MAS) Framework

A cake with 20 ingredients

If you want to know how each ingredient contributes to the outcome of the cake, one option would be to bake 20 cakes and leave out a different ingredient each time.

Source:
https://www.nibib.nih.gov/sites/default/files/Computational_Modeling_Fact_Sheet.pdf

Introduction: The Modeling at School (MAS) Framework



Source:
https://www.nibib.nih.gov/sites/default/files/Computational_Modeling_Fact_Sheet.pdf

Introduction: The Modeling at School (MAS) Framework

A cake with 20 ingredients

Alternatively, you could enter all 20 ingredients into a computer model, explaining to the computer what each ingredient does and how it interacts with other ingredients. You could then run a simulation in which a different ingredient is left out each time. In a matter of seconds, the computer could tell you how each of the 20 cakes would likely turn out if baked in real life.

Source:
https://www.nibib.nih.gov/sites/default/files/Computational_Modeling_Fact_Sheet.pdf

Introduction: The Modeling at School (MAS) Framework

A cake with 20 ingredients

Let's say you now want to know how changing the amount of each ingredient will affect the cake. In your computer model, you could adjust the amounts of each of the 20 ingredients any number of times until the outcome of your simulation is a cake that suits your needs (e.g. fluffy, sticky, soft, hard, etc.).

Source:
https://www.nibib.nih.gov/sites/default/files/Computational_Modeling_Fact_Sheet.pdf

Introduction: The Modeling at School (MAS) Framework

A cake with 20 ingredients

In real-life, you would need to bake:

- 190 cakes to find out the results of changing any 2 ingredients.
- 1,140 cakes to find the results of changing any 3 ingredients.
- 4,845 cakes to find the results of changing any 4 ingredients.

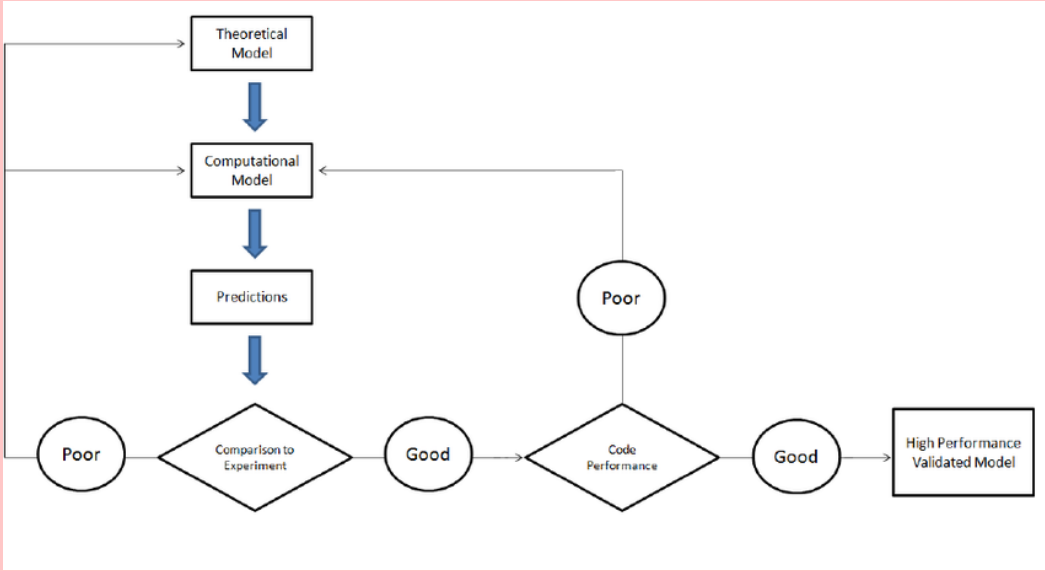
Source:
https://www.nibib.nih.gov/sites/default/files/Computational_Modeling_Fact_Sheet.pdf

Introduction: The Modeling at School (MAS) Framework

The power of computational modeling is that it allows scientists and engineers to simulate variations more efficiently by computer, saving both time, money and materials.

Source:
https://www.nibib.nih.gov/sites/default/files/Computational_Modeling_Fact_Sheet.pdf

Computational modeling is used to study a wide range of complex systems.

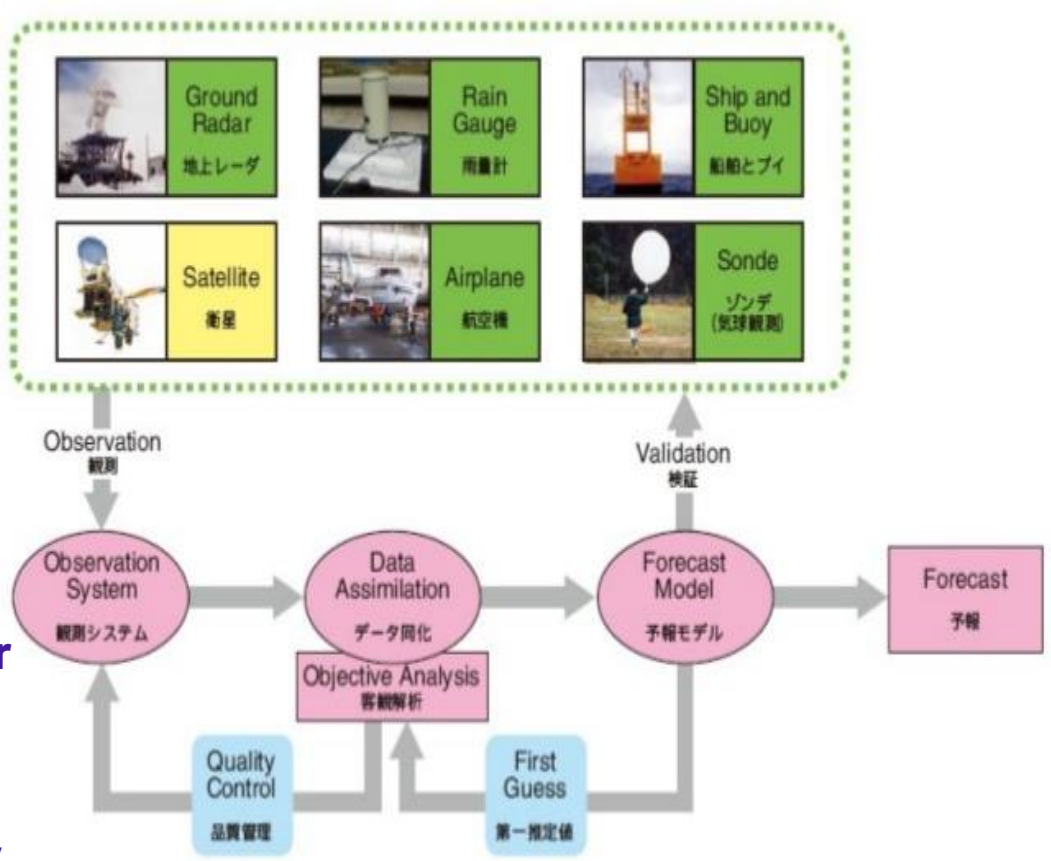


Computational modeling is used to study a wide range of complex systems.

Some examples :

Forecasting the weather

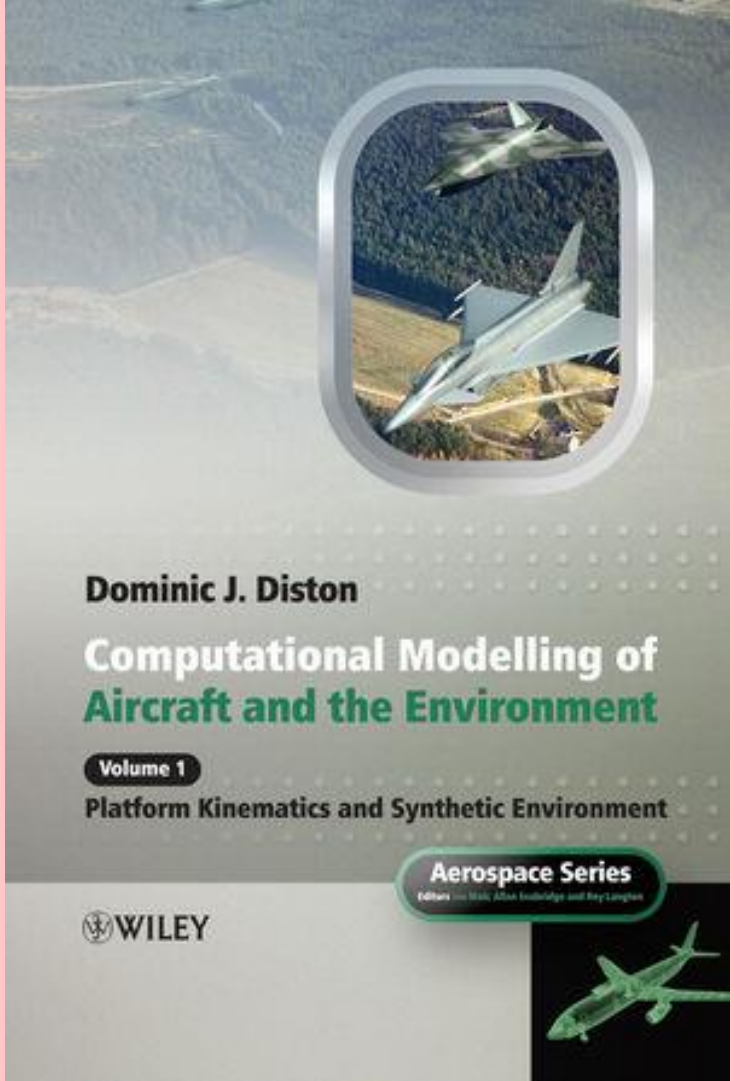
Weather forecasting uses computer models that analyze and make predictions based on numerous atmospheric factors. This is important for many reasons including protecting life, property, and crops and helping utility companies plan for increases in power demand, especially when extreme climate shifts are expected.



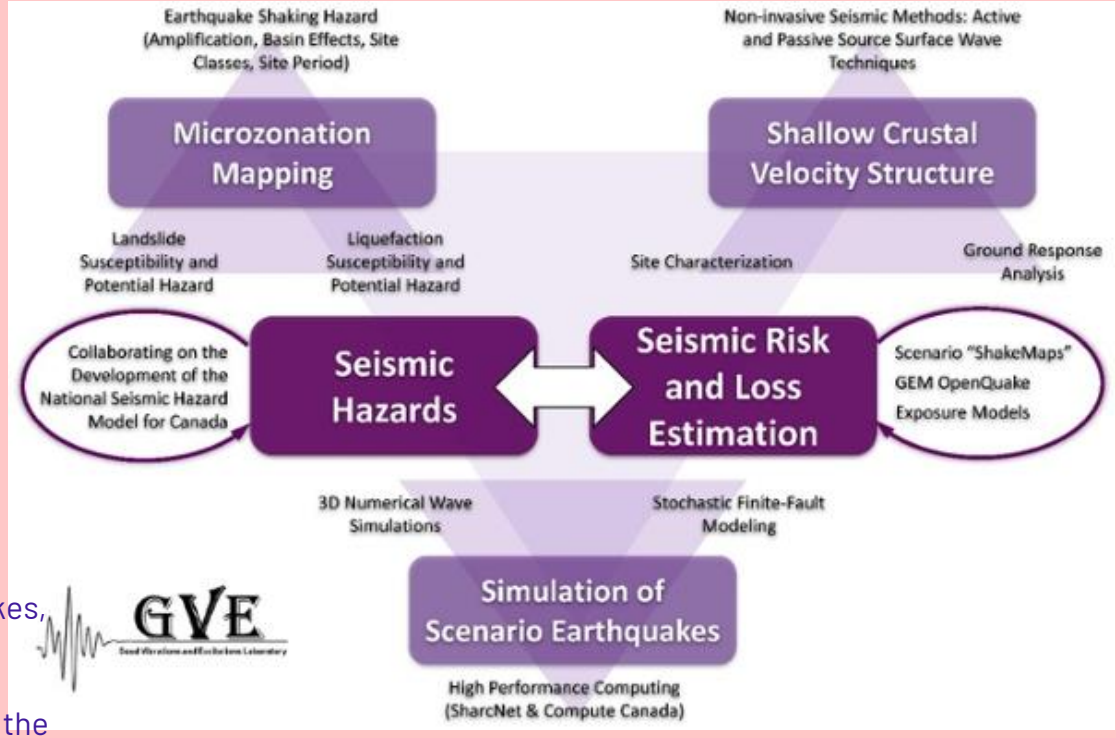
Computational modeling is used to study a wide range of complex systems. Some examples :

Building better airplanes

Flight simulators re-create aircraft flight using the complex equations that govern how aircraft fly and the reaction of the aircraft to external environmental factors such as turbulence, air density, and precipitation. In addition to being used to train pilots, flight simulators are used for the design of aircraft and research into how aircraft might be affected by different conditions.



Computational modeling is used to study a wide range of complex systems. Some examples :



Studying earthquakes

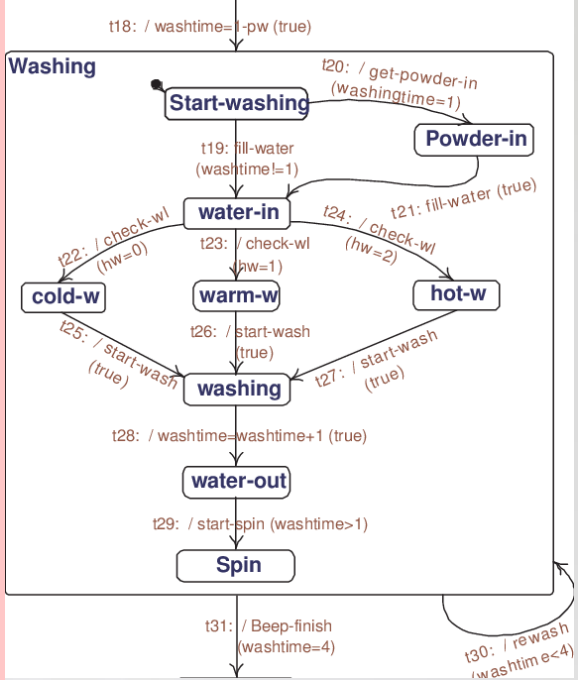
Computational modeling is used in the study of earthquakes, with the goal of saving lives, buildings, and other types of infrastructure. Computer simulations model how the construction,composition, and motion of structures, and the surfaces on which they are built, interact to affect what happens during an earthquake.

Computational modeling is used to study a wide range of complex systems.

Some examples :

Household items

Items we use in our home. For example, packaging of household chemicals (e.g. for hygiene, laundry, cleaning) and food (e.g. coffee, potato chips, cookies), production of textiles (e.g. fabric, clothes) and even designing diapers utilize many complicated mathematical methods and modeling tools.



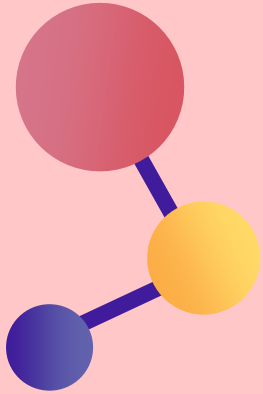
Modeling in Learning

Applying the process of modeling in everyday learning can be a powerful tool to:

- understand
- summarize
- present
- memorize

difficult contents, describe and develop processes, oversee and perform various procedures.

Modeling as an activity is contributing to the development of key competences for lifelong learning, and efficiently supporting 21st century skills.



Brushing teeth explained with an activity diagram

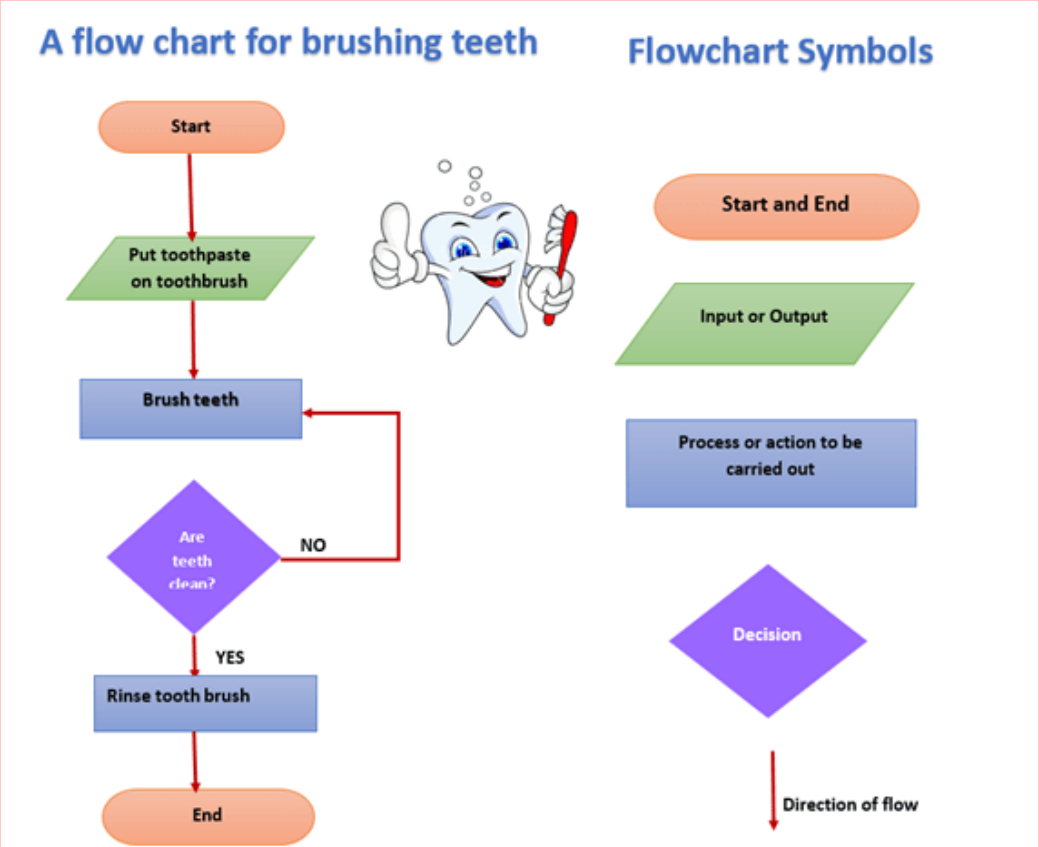


Diagram Types: Activity Diagram

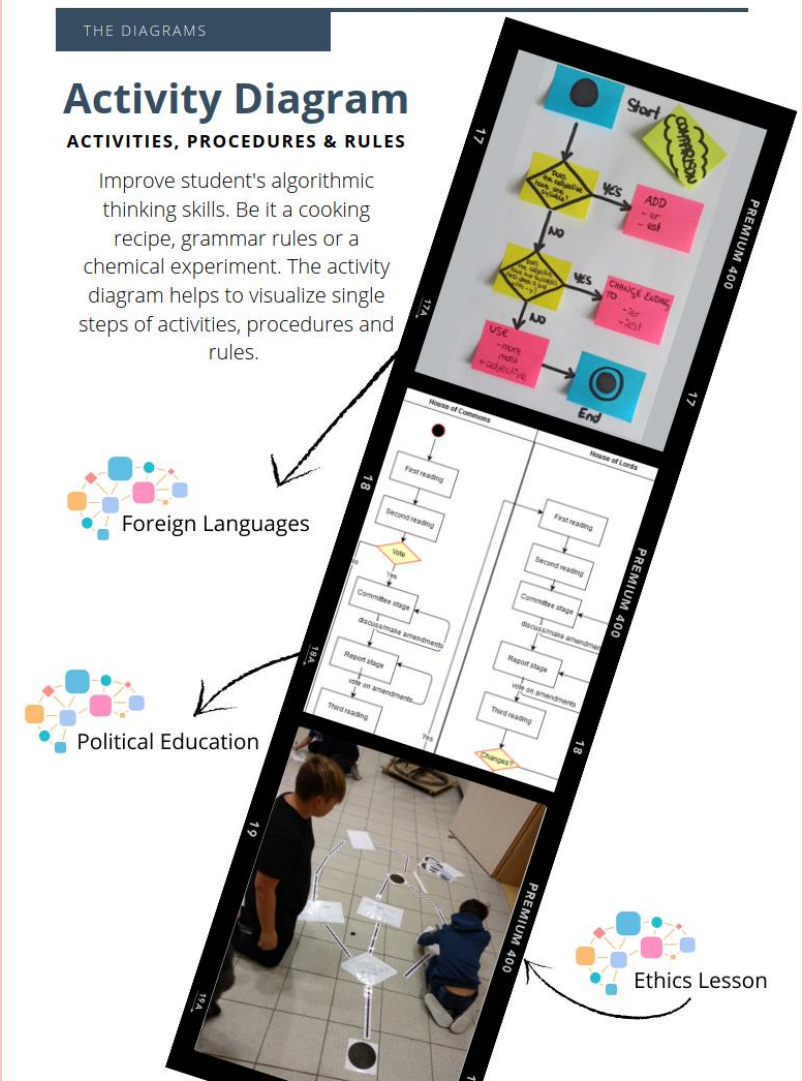


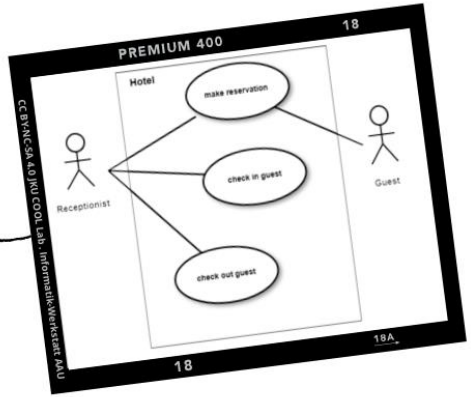
Diagram Types: Use Case Diagram

Use Case Diagram

SITUATIONS, STATES & RELATIONS: THE BIG PICTURE

Visualize how cooperation can work by focusing on the key actions of a certain process.

Physical Education



Economics

Diagram Types
Class & Object Diagram

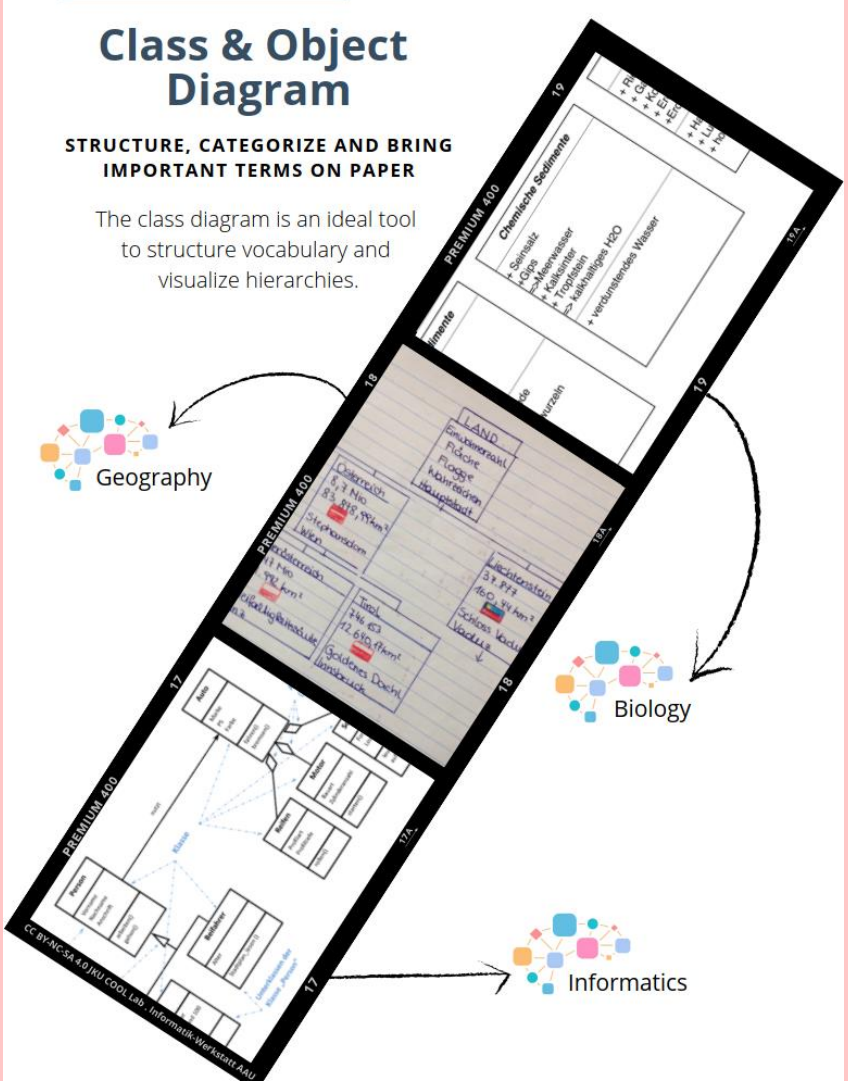
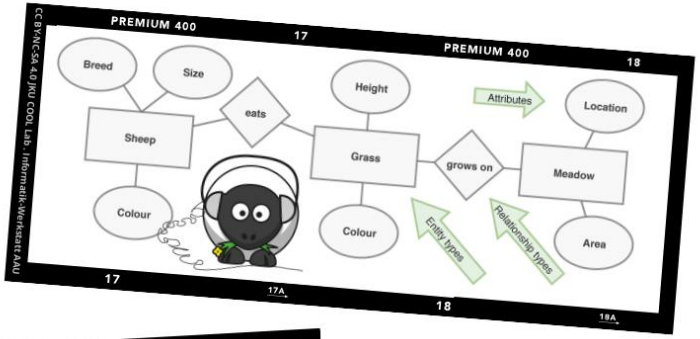


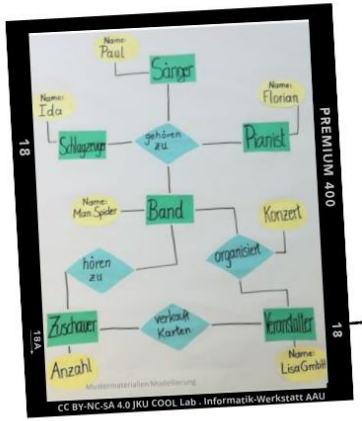
Diagram Types: Entity-Relationship Diagram

Entity-Relationship Diagram

VISUALIZE SITUATIONS, STATES & RELATIONS

Entity-relationship diagrams are perfect to begin with modeling. With just a few shapes, it is easy to acquire and helps to remove complex syntax by visualizing the most important elements of a text.



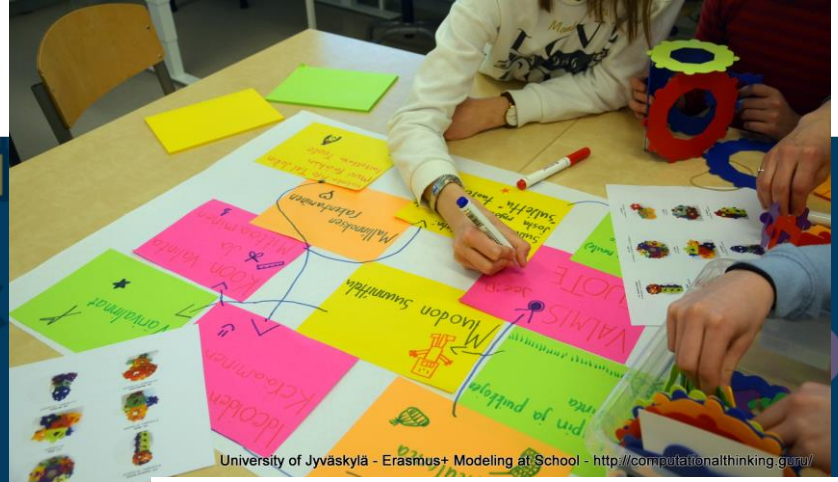


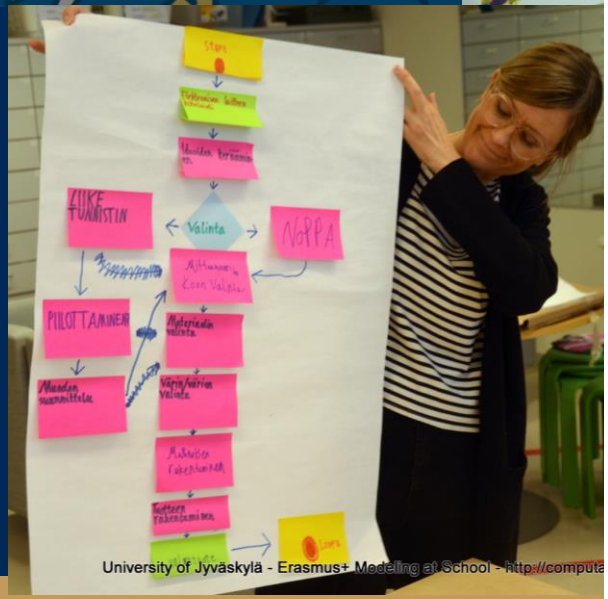
Co-funded by the Erasmus+ Programme of the European Union

MODELING AT SCHOOL

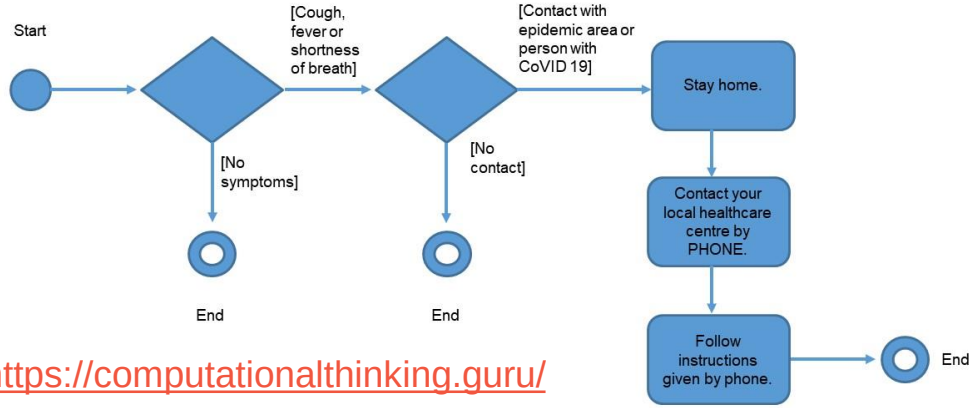
Modeling at School

Learn more about our project.





If you suspect having Corona virus (CoVID 19) infection



https://computationalthinking.guru/

PRODUCT DESIGN

Brief description: Students in the handcraft class can discover how algorithmic thinking can support the process of product design. In this example, the students design a hat based on geometrical modules. They use a hands-on modeling toolkit and they organize their product design and manufacturing process with the help of activity diagrams.

Target group: 6th grade
Subject: Crafts
Background: Computational Thinking
Duration: ~90min.
Diagram type: Activity diagram
Language: English

MODELING AT SCHOOL

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

SAFE CANDY EATING

Brief description: the students prepare an activity diagram that explains to a "human robot" how to eat candy safely in a public place during the COVID-19 pandemic.

Target group: 4-6th grade
Subject: Mathematics, Social Studies, Science, Environmental Education
Background: Computational Thinking, Haptic Learning, Real-Life Learning
Duration: ~45min.
Diagram type: Activity diagram
Language: English
Materials needed: One candy for each child. For each group, one small hand sanitizer bottle (or, children can wash their hands), one A3 or bigger paper, a pile of post-it notes, colored pencils/pens. Remember to consider children's allergies when picking out the candy. Candy can also be replaced with something else that the children enjoy eating. To speed things up, you can organize children into groups with the equipment before starting the class.

MODELING AT SCHOOL

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

"The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein."

CC BY-NC-SA 4.0 JKU CCOOL LAB .

HUMAN ROBOT

Brief description: Students give written directions for their pairs. The idea of the exercise is that students learn how to give simple and unambiguous instructions. Instructions have to be given in a certain order, or the human-robot won't do the task correctly.

Target group: 3rd-6th grade
Subject: Mathematics, Physical Education
Background: Computational Thinking, Haptic Learning, Real-Life Learning
Duration: ~ 2 x 45min.
Diagram type: Activity diagram
Language: English
Materials needed: There is a lot of movement in this exercise and some space is needed. If the classroom is small, the exercise can be held in the gym or even outdoors.

MODELING AT SCHOOL

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

"The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein."

CC BY-NC-SA 4.0 JKU CCOOL LAB .

CHILDREN'S RIGHTS

Brief description: Students study the United Nations Convention on the Rights of the Child by moving around on its' poster with the help of algorithms.

Target group: 4-6th grade
Subject: Ethics, Mathematics, Social Studies, Science,
Background: Computational Thinking, Real-Life Learning
Duration: ~45min.
Diagram type: Activity diagram
Language: English
Materials needed: UN's Children Right poster and small figures.

MODELING AT SCHOOL

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

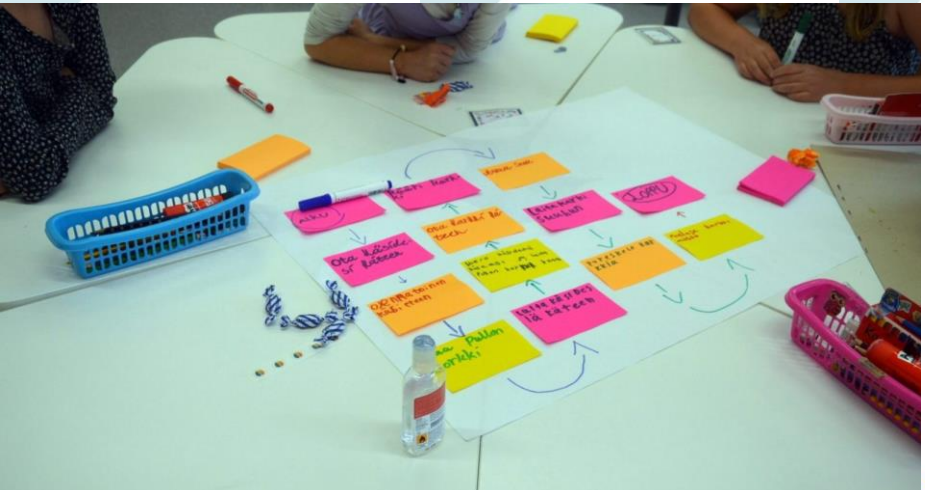
"The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein."

CC BY-NC-SA 4.0 JKU CCOOL LAB .

CHILDREN'S RIGHTS

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

CC BY-NC-SA 4.0 JKU CCOOL LAB



PRODUCT DESIGN AT CRAFTS CLASS

*The students were using **post-its, color markers, and large-sized flip-chart papers** to speed up and support the collaborative diagram design process.*

PRODUCT DESIGN AT CRAFTS CLASS

The ITSPHUN 3D modeling toolkit was used to test the product development diagrams in practice.

CHILDREN'S RIGHTS

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

CC BY-NC-SA 4.0 JKU CCOOL LAB

MODELING AT SCHOOL

DIAGRAM GURU ONLINE CHALLENGE

computationalthinking.guru

Prizes await our winners!

WWW.COMPUTATIONALTHINKING.GURU

JOHANNES KEPLER UNIVERSITY LINZ

Universidad Rey Juan Carlos

JYVÄSKYLÄN YLIOPISTO UNIVERSITY OF JYVÄSKYLÄ

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

MODELING AT SCHOOL

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

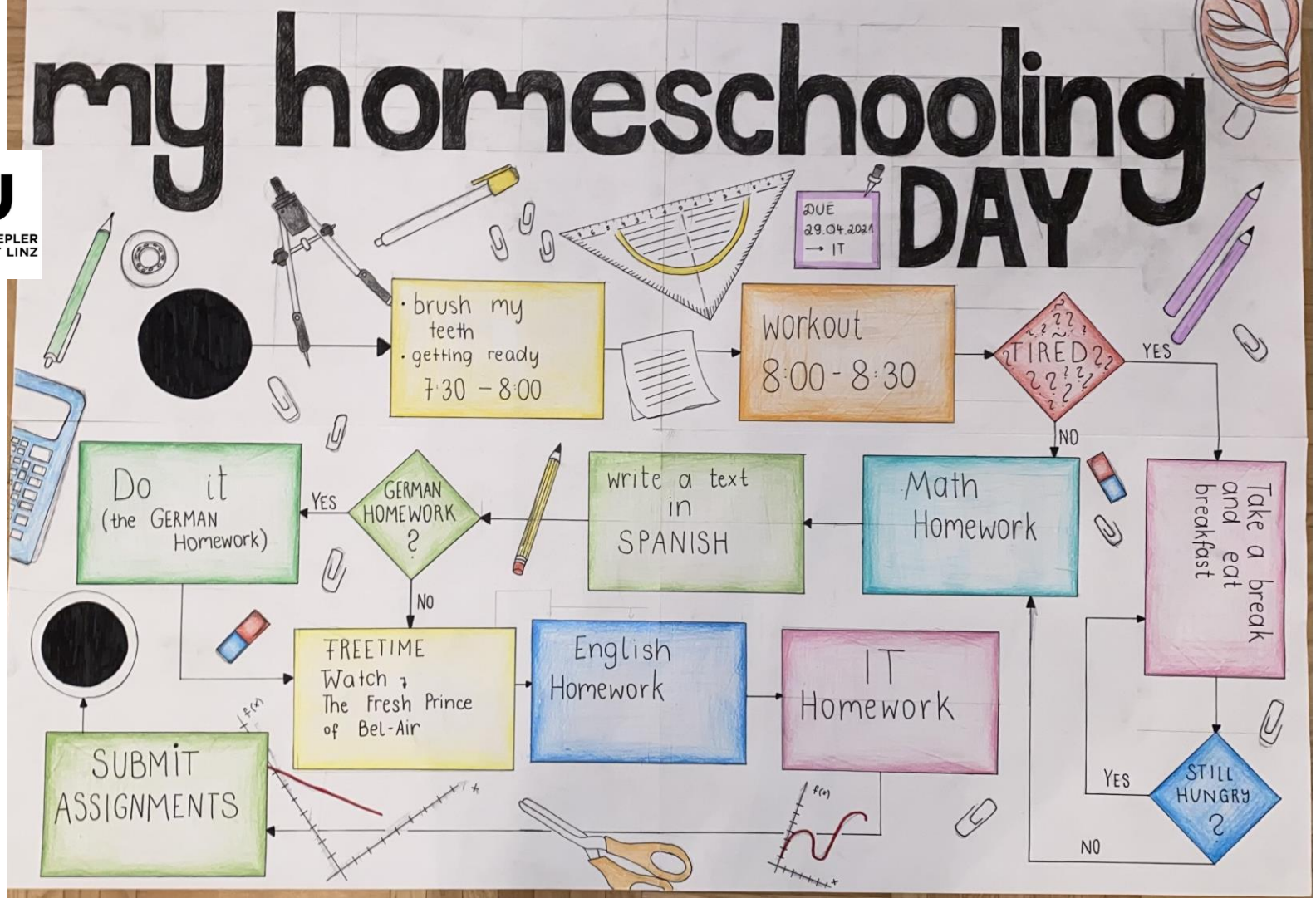
DIAGRAM GURU ONLINE CHALLENGE

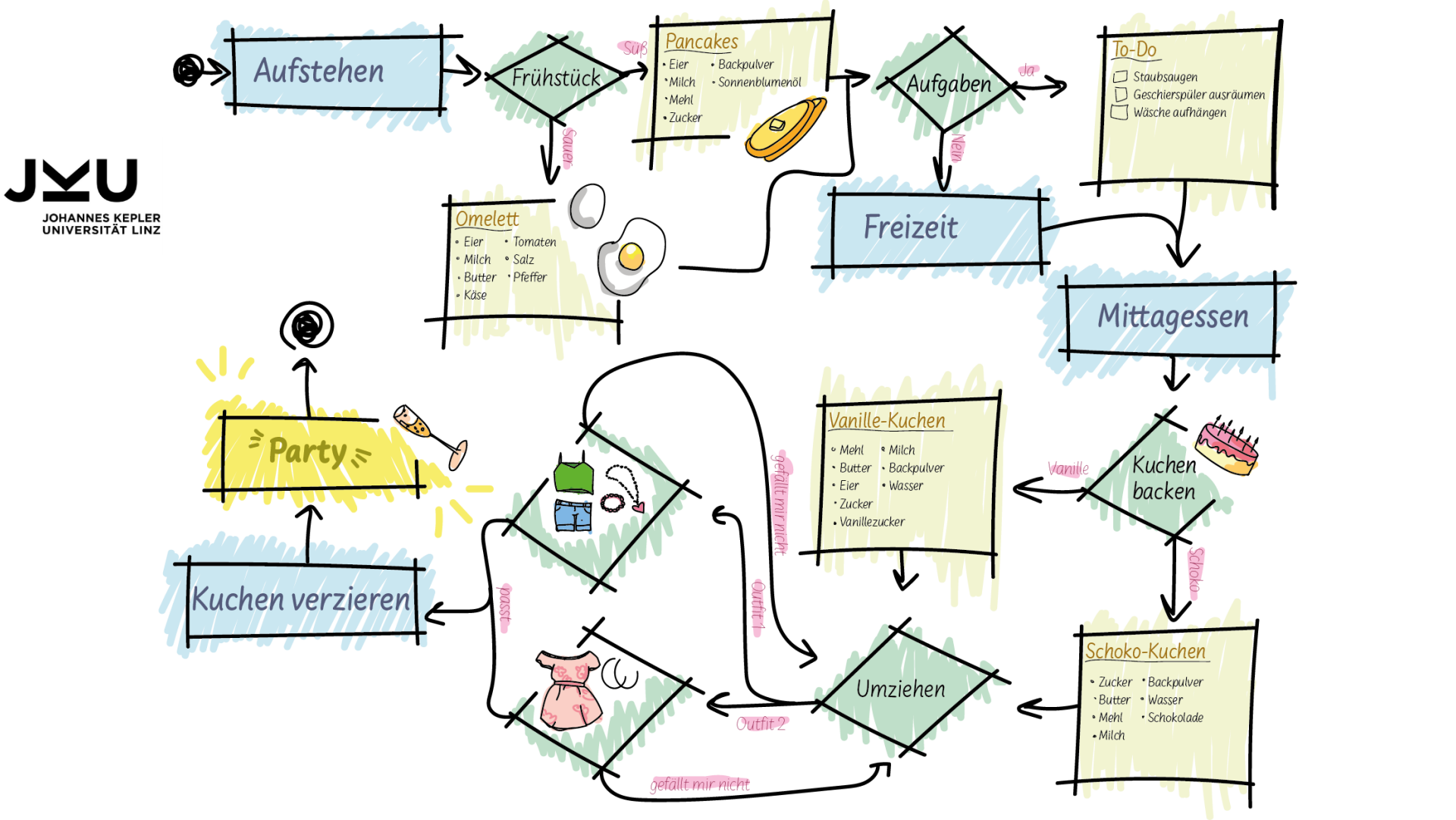
Teach me exciting topics with the help of diagrams!

FIND OUT MORE ON

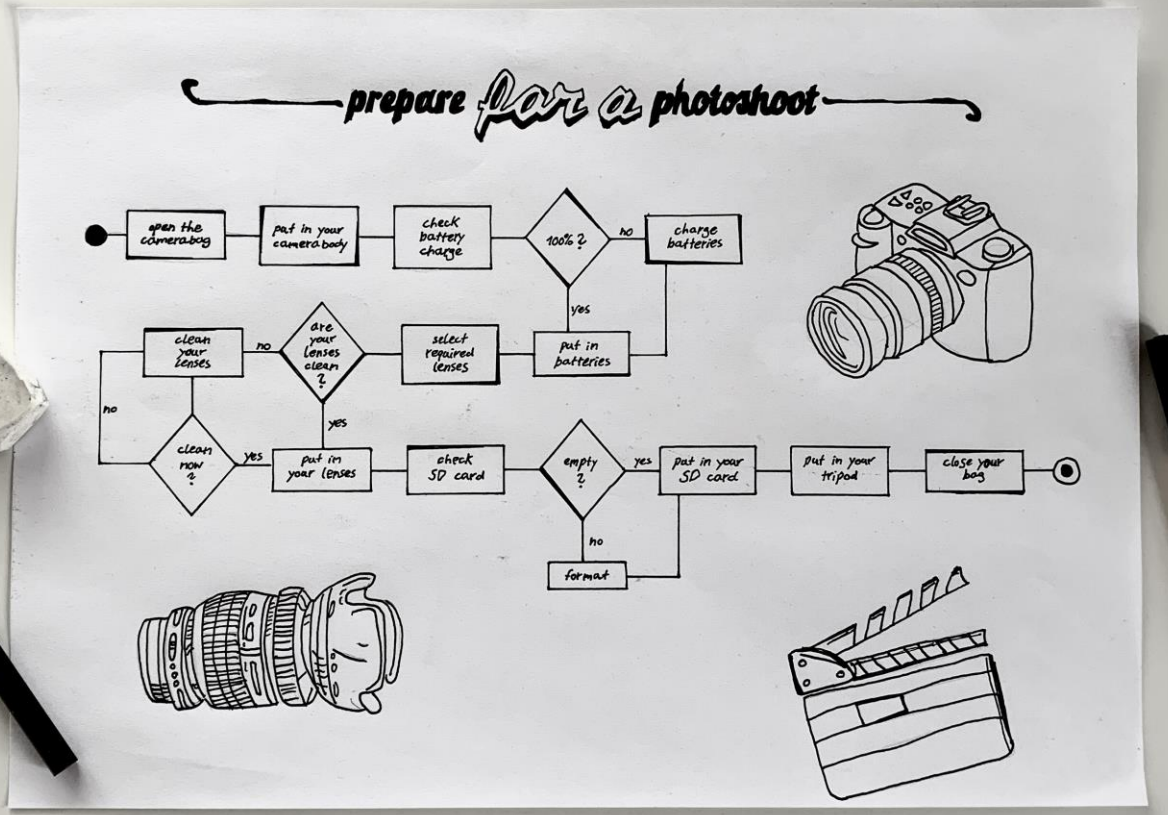
computationalthinking.guru

JOHANNES KEPLER UNIVERSITÄT LINZ

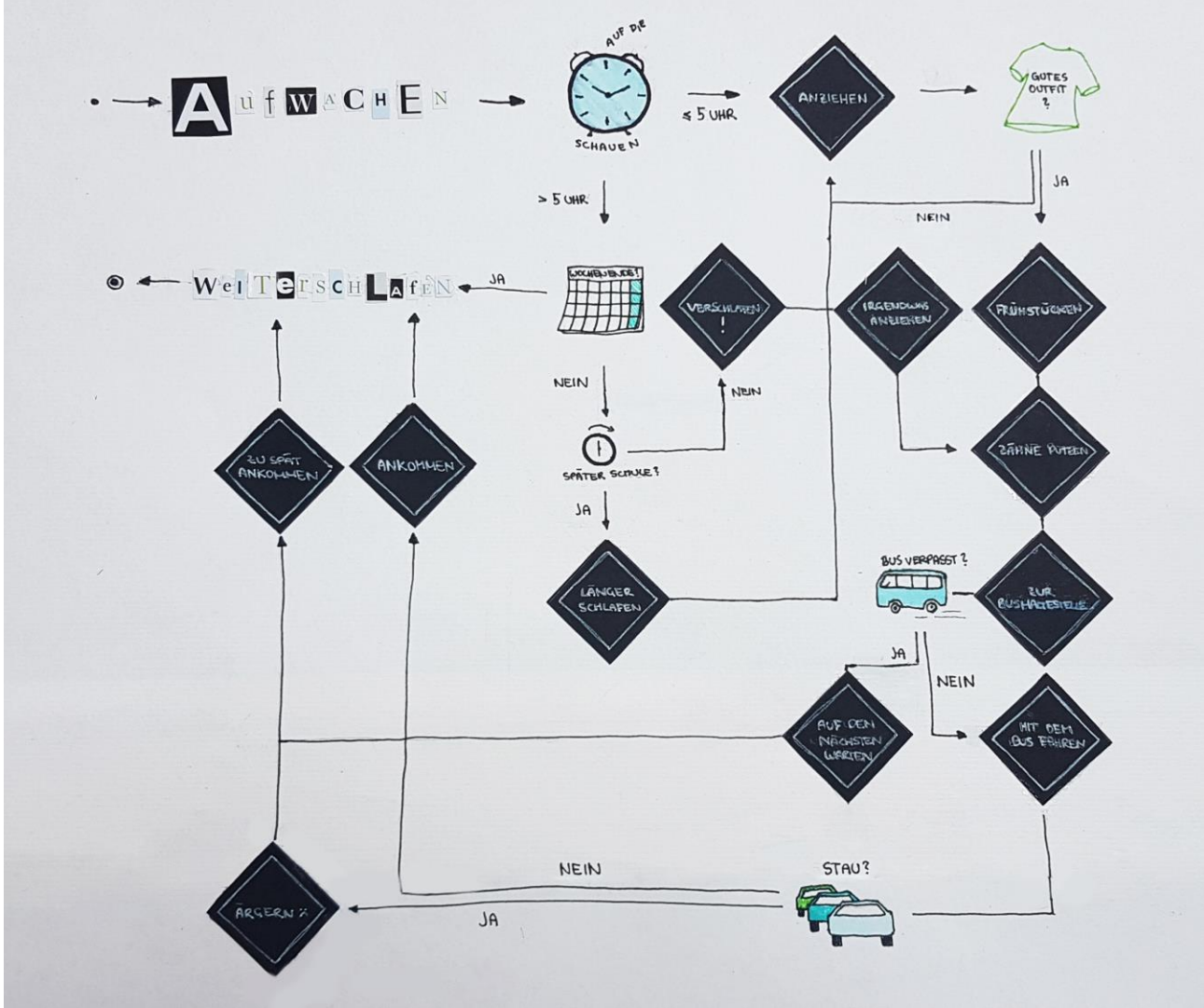



Aufstehen
Frühstück
süß
sauer
Pancakes
• Eier
• Milch
• Mehl
• Zucker
• Backpulver
• Sonnenblumenöl
Aufgaben
ja
nein
To-Do
Staubsaugen
Geschierspüler ausräumen
Wäsche aufhängen
Omelett
• Eier
• Milch
• Butter
• Käse
• Tomaten
• Salz
• Pfeffer
Freizeit
Mittagessen
Party
Kuchen verzieren
passt
gefällt mir nicht
Outfit 1
Outfit 2
gefällt mir nicht
Umziehen
Vanille-Kuchen
• Mehl
• Butter
• Eier
• Zucker
• Vanillezucker
• Milch
• Backpulver
• Wasser
Vanille
Kuchen backen
Schoko
Schoko-Kuchen
• Zucker
• Butter
• Mehl
• Milch
• Backpulver
• Wasser
• Schokolade

JOHANNES KEPLER
UNIVERSITÄT LINZ

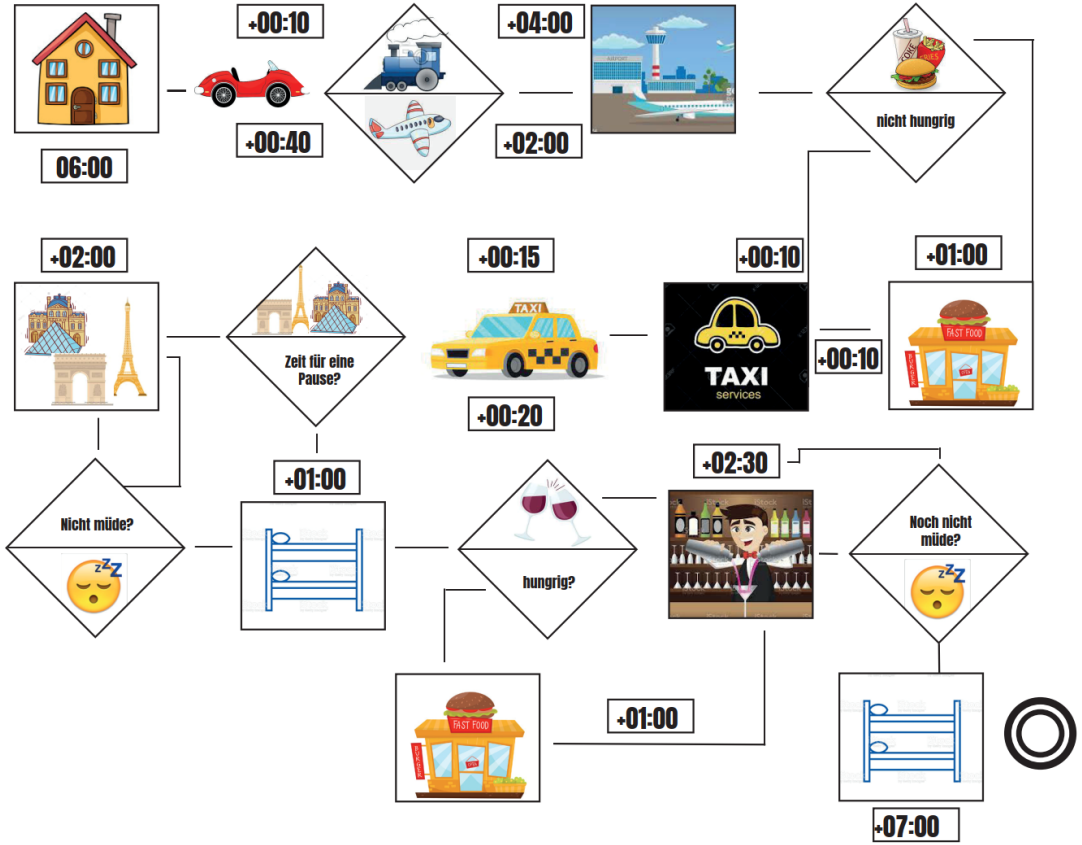


JOHANNES KEPLER
UNIVERSITÄT LINZ



A trip to PARIS...

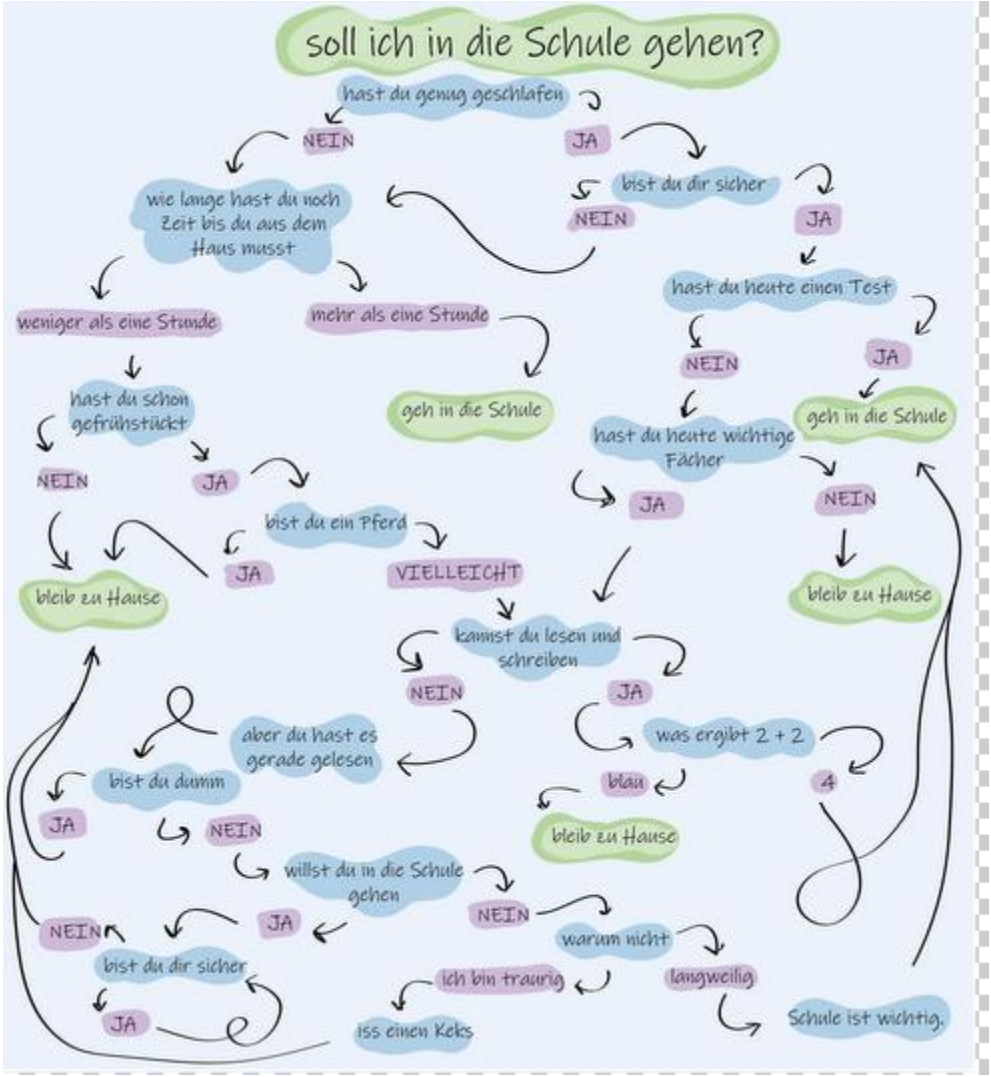
JOHANNES KEPLER UNIVERSITÄT LINZ



Hier wohnt *Paul.*

Paul will seinen Urlaub in Paris verbringen. Da er aber nur eine Woche frei hat, muss er diese so zeiteffizient und billig wie möglich gestalten. Begleite Paul an seinem 1. Urlaubstag und entscheide, welche Transportmittel er benutzt, wann er etwas isst und rastet und ob er lieber Sightseeing am Nachmittag macht oder am Abend ausgeht... Errechne dabei, wann er, je nach deiner Auswahl, am nächsten Tag aufwacht, und überlege, wie der Tag am wenigsten kostenspielige wäre.

JOHANNES KEPLER
UNIVERSITÄT LINZ



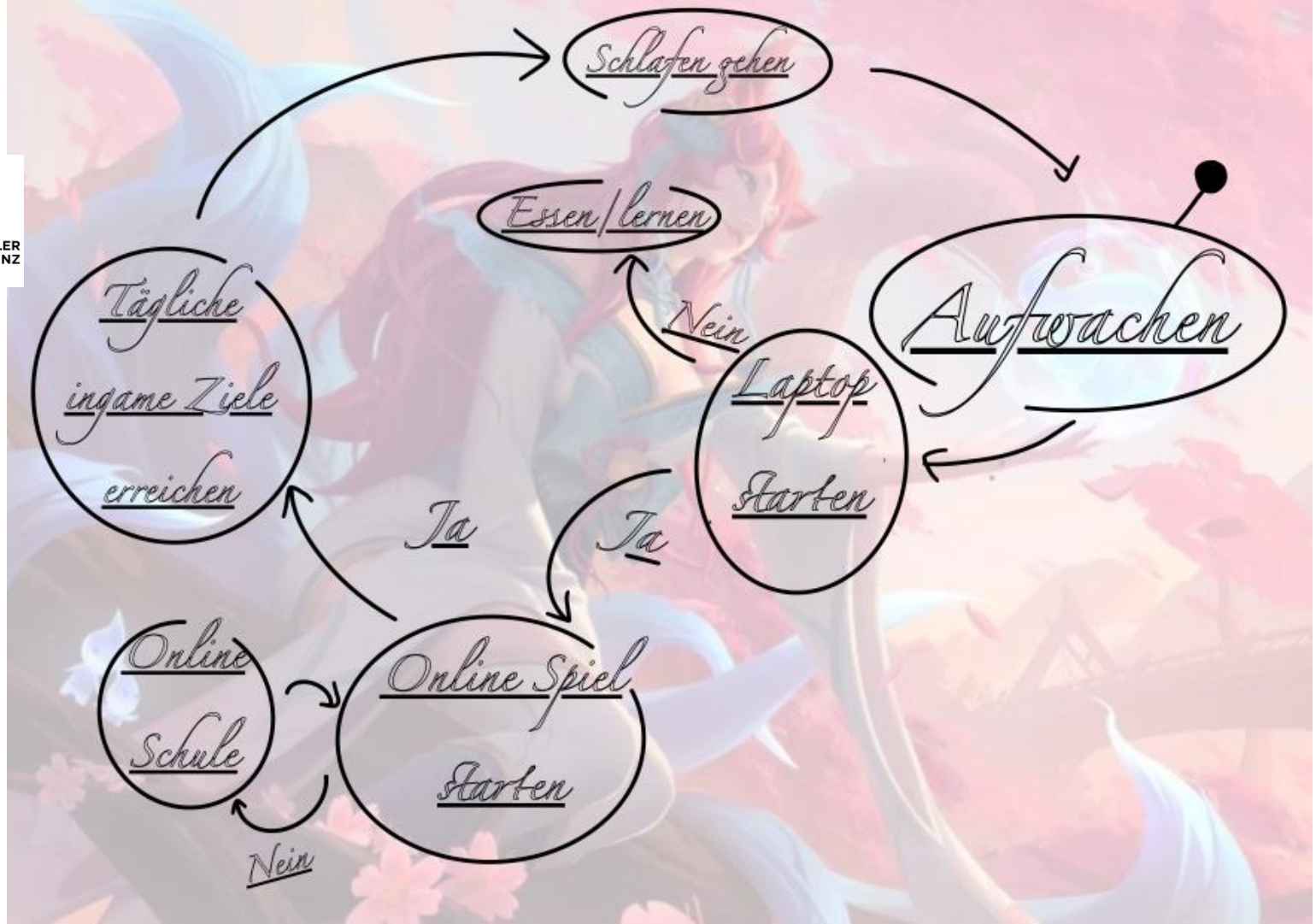
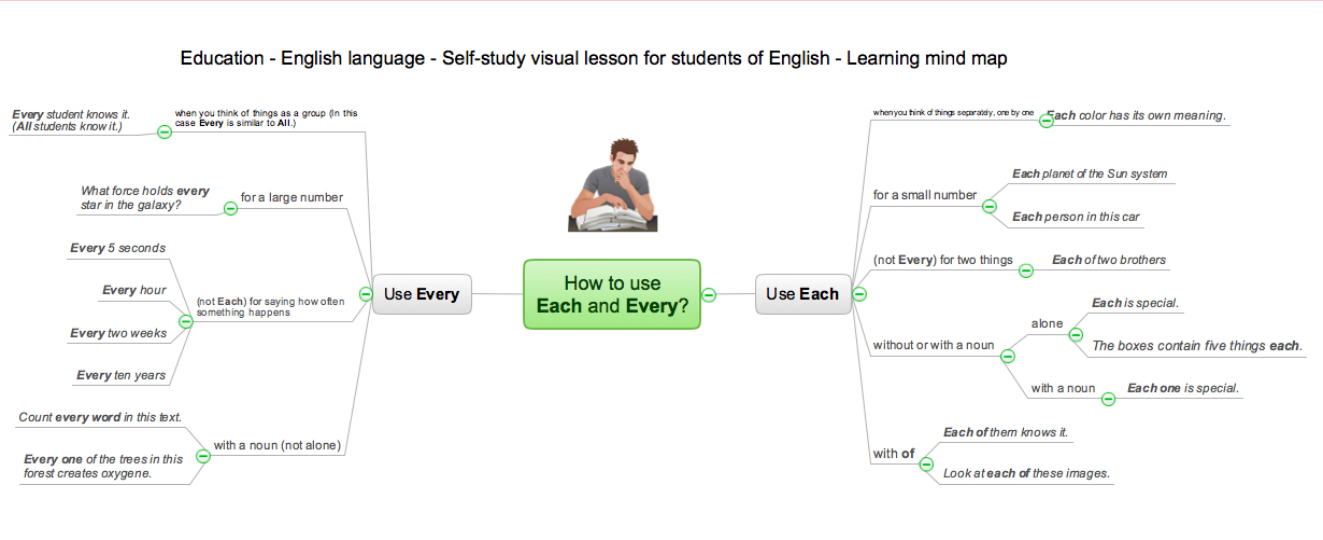

Schlafen gehen
Aufwachen
Laptop Starten
Nein
Essen/lernen
Tägliche ingame Ziele erreichen
Ja
Ja
Online Spiel Starten
Online Schule
Nein

Diagram Types: Entity-Relationship Diagram



Education - English language - Self-study visual lesson for students of English - Learning mind map

How to use Each and Every?

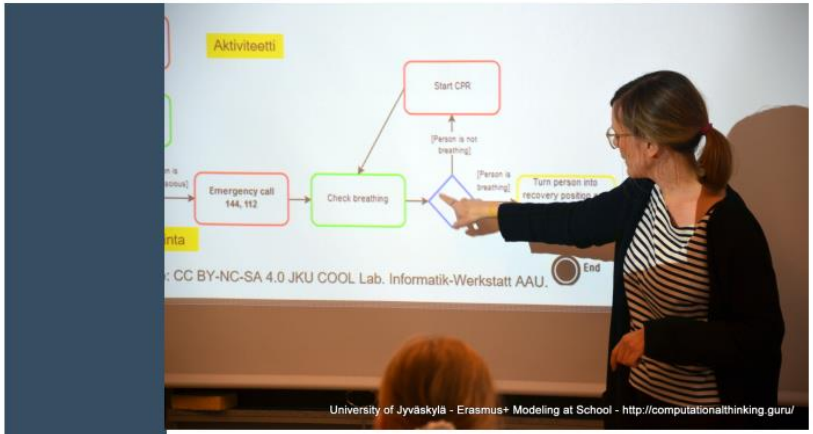
Use Every

- when you think of things as a group (In this case **Every** is similar to **All**.)
  - ***Every*** *student knows it. (**All** students know it.)*
- for a large number
  - *What force holds **every** star in the galaxy?*
- (not **Each**) for saying how often something happens
  - ***Every*** *5 seconds*
  - ***Every*** *hour*
  - ***Every*** *two weeks*
  - ***Every*** *ten years*
- with a noun (not alone)
  - *Count **every word** in this text.*
  - ***Every one*** *of the trees in this forest creates oxygene.*

Use Each

- when you think of things separately, one by one
  - ***Each*** *color has its own meaning.*
- for a small number
  - ***Each*** *planet of the Sun system*
  - ***Each*** *person in this car*
- (not **Every**) for two things
  - ***Each*** *of two brothers*
- without or with a noun
  - alone
    - ***Each*** *is special.*
    - *The boxes contain five things **each**.*
  - with a noun
    - ***Each one*** *is special.*
- with **of**
  - ***Each of*** *them knows it.*
  - *Look at **each of** these images.*

MODELING IN ALL SCHOOL SUBJECTS



Models serve as a base for solving complex problems in different school subjects and in cross-curricular projects. Here you can find an overview of various reasons for using modeling.

Part of the Curriculum

+ Formalization
+ Abstract thinking
+ Problem-solving

Effective teaching & learning strategy

+ Graphical organizer
+ Diagrams
Summarize content
+ Keep essential information

Integrative computational thinking in practice

+ "Mother tongue" of Computer Science
+ Ideal for inter-disciplinary learning

“London”
“Human Robots”

E:\01MyTemp\ElmenyMuhelyAnyagok\ExperienceSuomi\2023\01Bekescsaba\COTA-PhysicalComputing

https://experienceworkshop.org/svenska-dagen-swedish-day-keljonkangas-koulu-jyvaskyla/


KIDS INSPIRING KIDS IN STEAM!
www.kiks.unican.es


Erasmus+
UC
UNIVERSIDAD DE CANTABRIA


Kids Inspiring Kids for STEAM, Erasmus+ @ European Researchers' Night. Coordinated by www.experienceworkshop.org

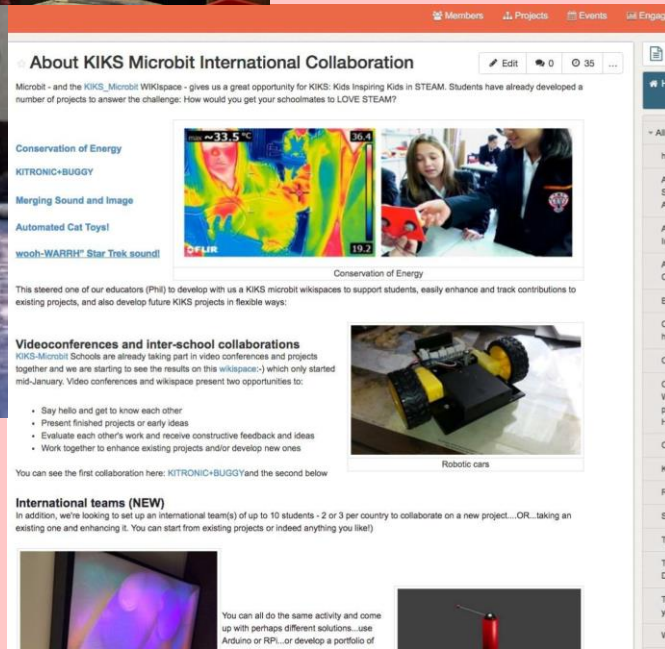
The Kids Inspire Kids in STEAM project

The goal of the Kids Inspiring Kids in STEAM (KIKS) project was to raise students' awareness towards the multi- and transdisciplinary connections between the STEAM subjects (Science, Technology, Engineering, Arts & Mathematics), and make the learning about topics and phenomena from these fields more enjoyable.

The Kids Inspire Kids in STEAM project

To achieve these goals, KIKS project has popularized the STEAM-concept by projects based on the students inspiring other students-approach and by utilizing new technologies, tools, open educational resources, and everyday items and materials. Through the students-inspiring-other-students-approach, we have aimed to get participating students developing STEAM activities for other students in their own local context and in a wider European physical and virtual community. English, Finnish, Hungarian and Spanish children were participating in the project.

The goal of the Kids Inspiring Kids in STEAM (KIKS) project was to raise students' awareness towards the multi- and transdisciplinary connections between the STEAM subjects (Science, Technology, Engineering, Arts & Mathematics), and make the learning about topics and phenomena from these fields more enjoyable.



Artistic documentation of a spectacular experiment by the Mankola School, Jyväskylä: water freezing in midair at -20ºC. / Wind Tunnel Development for aircraft wing test by English KIKS students from the Linton Village School, Cambridge. / KIKS WIKI SPACES for International collaboration.

Physics Goes to Shadow Theater

STEAM projects can be implemented not only with the purpose of science learning, but also to create art with the help of science. 7th grader Finnish students, in the KIKS project have written, directed and produced a theater performance. The physics of light has also got a special role in the play.

Motivation: COMPLEX CHALLENGE

Challenge 1

According to the school's tradition, it is always the 7th graders providing a performance for the school's Christmas show.

1

2

3

Challenge 2

There are some shy students in the class. Therefore they started to think about a performance, which does not require that everybody directly appears on stage.

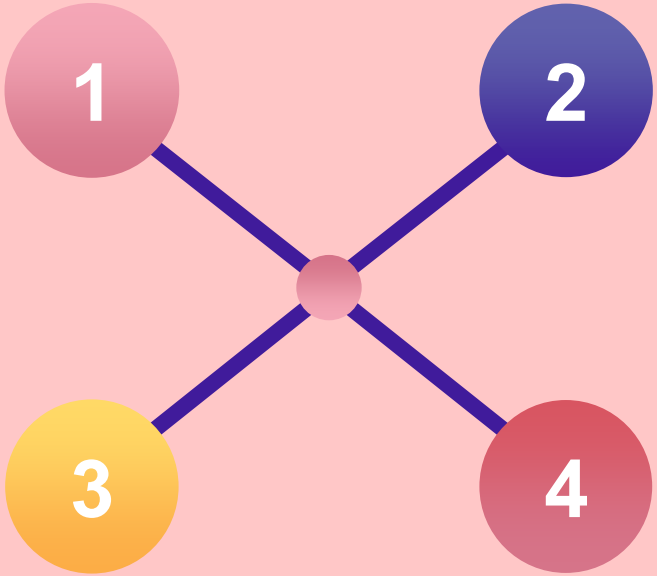
Challenge 3

The preparation and realization of the performance is part of a STEAM learning project to fulfill the requirement of multidisciplinary learning project in the curriculum.

Motivation: COMPLEX CHALLENGE

Challenge 1

According to the school's tradition, it is always the 7th graders providing a performance for the school's Christmas show.



Challenge 2

There are some shy students in the class. Therefore they started to think about a performance, which does not require that everybody directly appears on stage.

Challenge 3

The preparation and realization of the performance is part of a STEAM learning project to fulfill the requirement of multidisciplinary learning project in the curriculum.

SOLUTION: SHADOW THEATER!

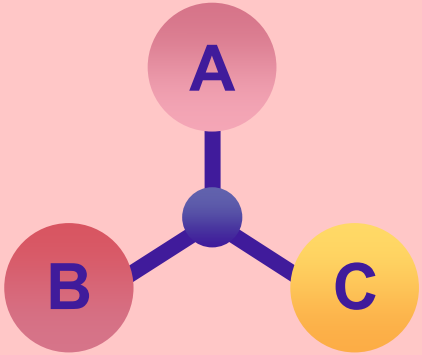
Engagement:
IDEATION & PROBLEM-SOLVING & CO-CREATION

Shadow theater in the cultural tradition and contemporary performance art

Collecting Inspiration

Analytic Approach, Scinetific Inquiry

Physics of Light, Physics of Visual Illusions, Dramatic / Performance Arts (collaborative play-writing: story, dialogues; stage techniques; director, actors; marketing)



Artistic, Creative Process & Practical Realization

Involving experts (teachers of various subjects, physicist scholar, professional theater director, craft artist, local newspaper, etc.)

Collecting Inspiration: Shadow theater in the cultural tradition and contemporary performance art

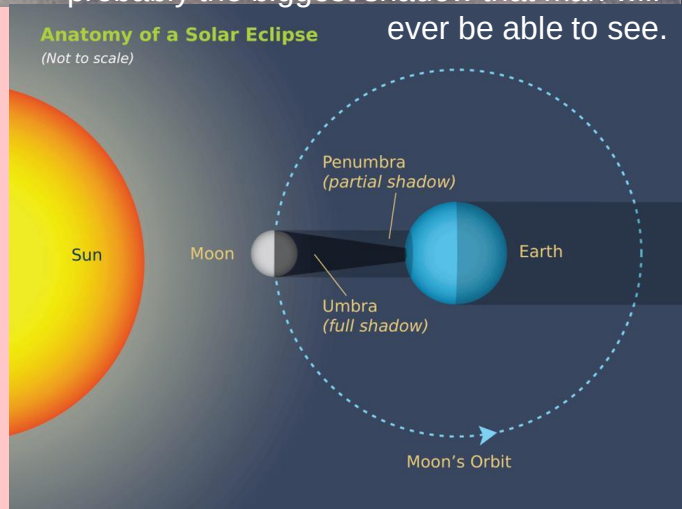
Chinese Shadow Puppetry – UN's Intangible Cultural Heritage: https://ich.unesco.org/en/RL/chinese-shadow-puppetry-00421#:~:text=Chinese%20shadow%20puppetry%20is%20a,cloth%20screen%20illuminated%20from%20behind.

Collecting Inspiration: Shadows in Science

Eclipse of the moon in July 1999 as seen from a station orbiting around the Earth probably the biggest shadow that man will ever be able to see.

First observations:

- natural sunlight cannot be seen
- it only makes objects visible, i.e. bodies which block its path
- if there is no obstacle to light there is no way of knowing that there is light.
- An object is a necessary prerequisite to reveal light and thus make it possible for us to see a shadow.
- In shadow theatre we would need a puppet, the body of an act or or just one part of an actor's body.
- There must be another body or object for the shadow to be revealed. For example we would never see the shadow of the Moon lit up by the Sun if there were no Earth.



Collecting Inspiration: Shadows in the cultural tradition, science and contemporary performance art

First observations:

- Next factor is another object unconnected to the first and whose distance from the first can vary. This factor could be the wall of a room, the back of a stage or in shadow theatre: the surface of the screen.
- The role / position of the spectator.

Collecting Inspiration: Philosophy, History

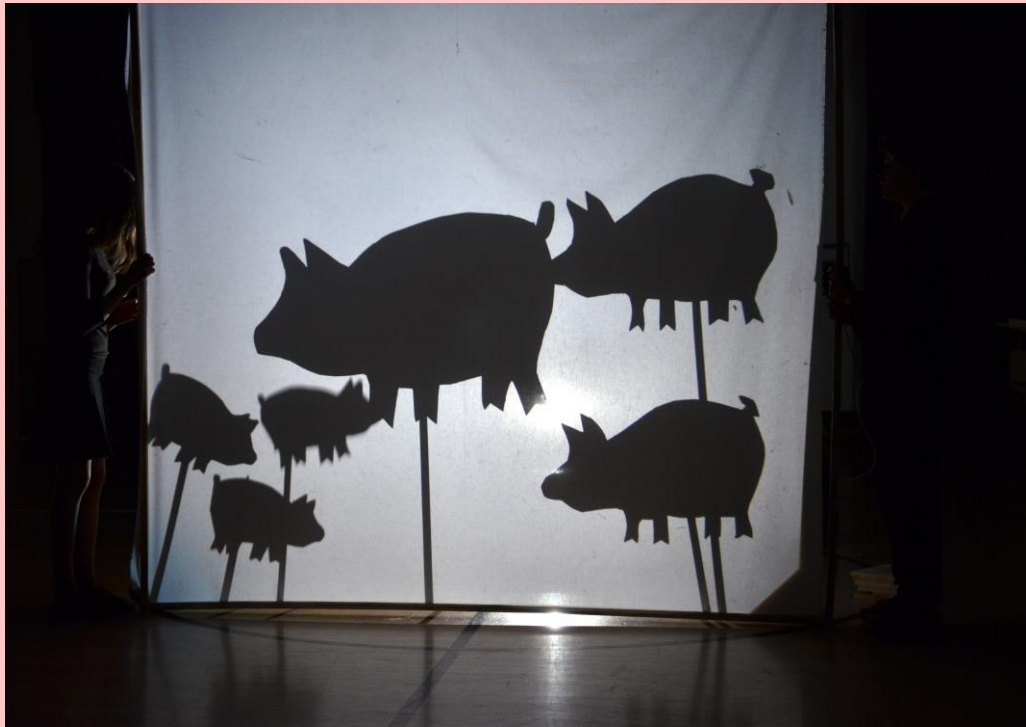
Plato’s Allegory of the Cave as an epistemological / cognitive interpretation.

https://www.youtube.com/watch?v=UQfRdl3GTw4

Analytic Approach, Scinetific Inquiry

To explore visual illusions and the physics of shadow theater, the students

- made a scientific research concerning the development of visual effects, which they have implemented in the play.
- In addition to their teachers of all related subjects (art, crafts, physics, literature) they involved a physicist, who has helped the group's scientific research.
- They involved a local theater director, who helped in the dramaturgy and staging the play.

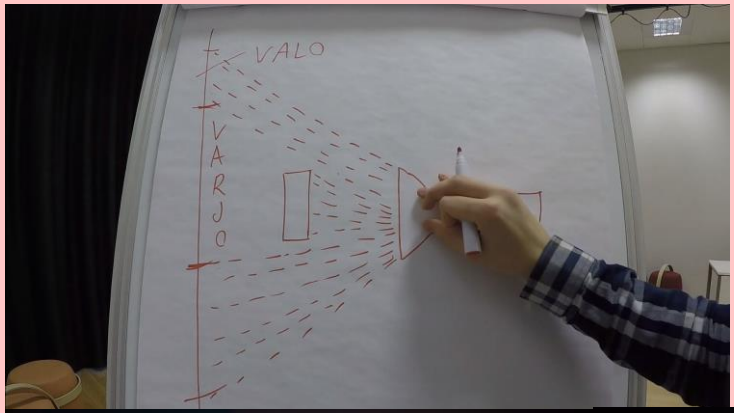


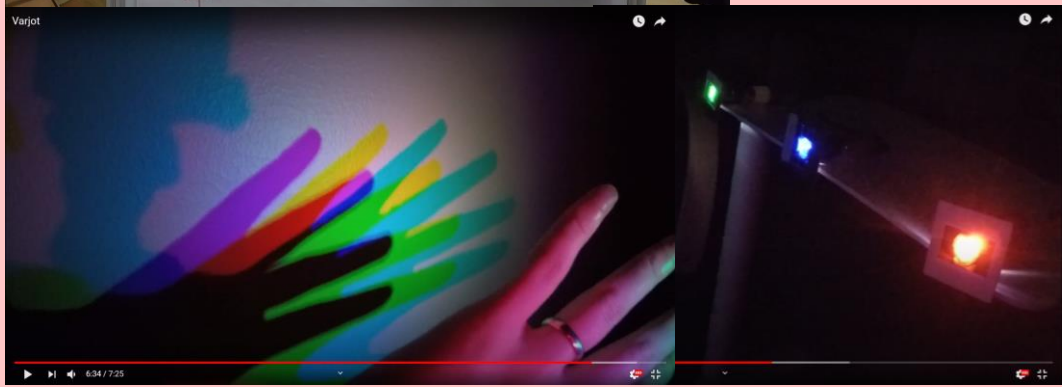
Analytic Approach, Scinetific Inquiry

With the help of the physicist, the students got an insight, not only the physics of light, but also understood the basics of several visual effects:

- How to make objects larger and smaller?
- What if using Red, Green and Blue lights? An exciting opportunity: create colorful shadows!

https://youtu.be/Lw83oKUzxW4

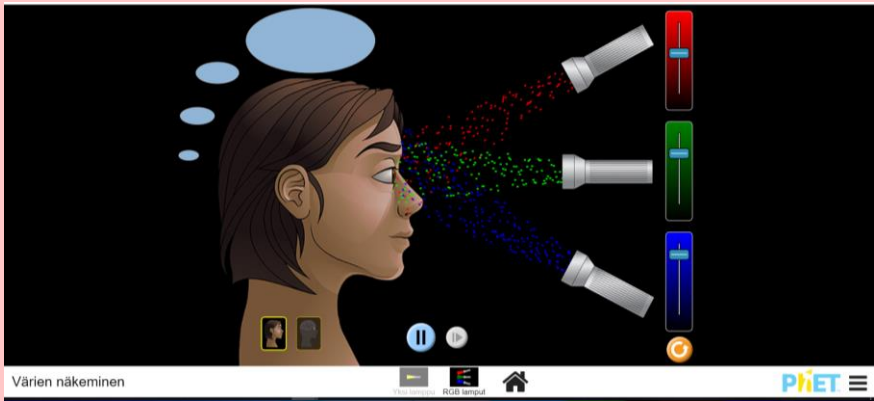




Analytic Approach, Scinetific Inquiry

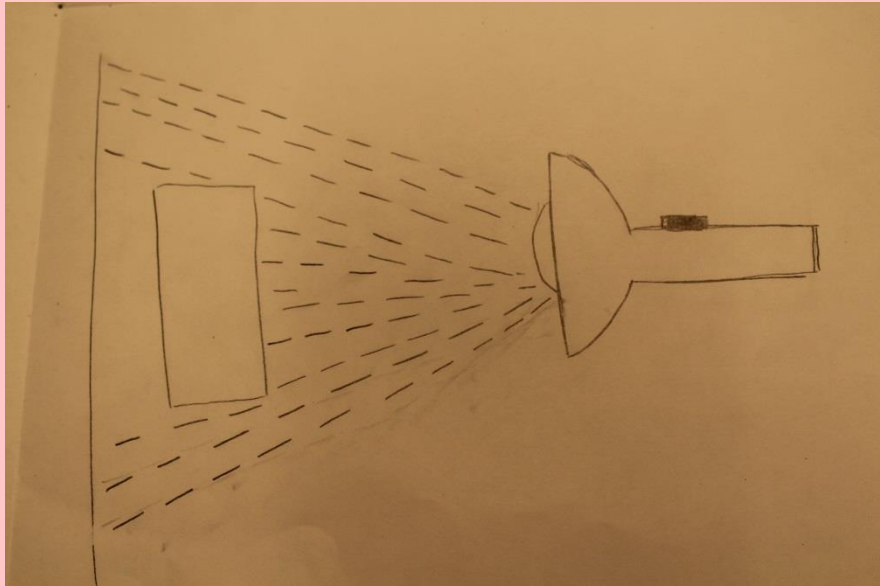
Creating shadows of various colors seemed to be an exciting opportunity worth for further research:

- The students collected more material on the topic: https://www.youtube.com/watch?v=eKj1EwJ7THU
- Made digital experiments: https://phet.colorado.edu/sims/html/color-vision/latest/color-vision_fi.html
- Collected in the school the required equipment: colorful lights by involving the janitors
- Made real experiments



Analytic Approach, Scinetific Inquiry

- The show uses a big wall to which shadows are projected.
- The wall has wooden frames and a white sheet.
- Overhead projector together with big green, red and blue lights is used too.
- One reason to use shadow theatre is that, if the audience does not see the actor, it makes acting easier.



Analytic Approach, Scinetific Inquiry

How shadows are made?

- A shadow is formed behind an object which does not pass light.

What affects the size of a shadow?

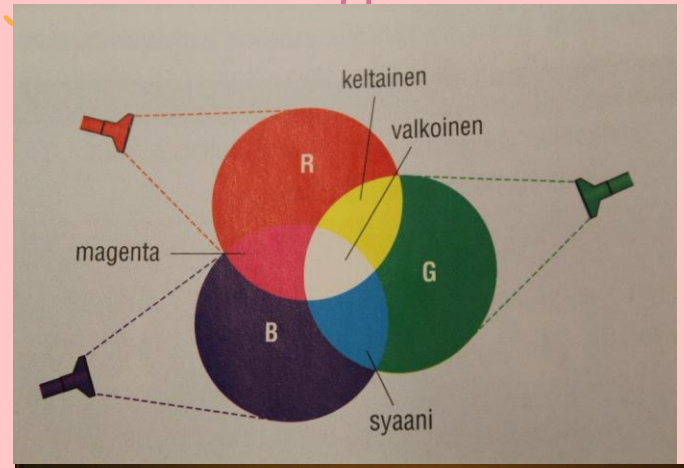
- The closer the object is to the light source, the bigger the shadow is. The farther the object is, the smaller the shadow is.
- The show used different sizes of shadows, for example, in the scene where the elves were painting dolls and when the police puts the janitor to jail.
- Testing how different sizes of shadows are done.

Analytic Approach, Scinetific Inquiry

The colour of the shadow

- First the students used the overhead projector: The light is white and the shadows black.
- Then they tested different colours of light and looked for the colours of the shadows. The coloured light gives coloured shadows.

In the final scene of the theatre coloured lights and shadows were used. When the light comes from three different directions, is looks like there many people behind the wall, although there really is only one. Combining different main colours produces shadows in different colours.



Artistic, Creative Process & Practical Realization

The students

- collaboratively created the main storyline of the play
- then distributed the roles
- Had several hours of rehearsals

Story of the Play

- Father Christmas (“Joulupukki” in Finnish) is coming back home to his village, Korvatunturi from one of his busy journeys before Christmas. On the way, he meets with his caretaker, who is responsible for all the buildings and animals in Korvatunturi.

Story of the Play

- Father Christmas (“Joulupukki” in Finnish) is coming back home to his village, Korvatunturi from one of his busy journeys before Christmas. On the way, he meets with his caretaker, who is responsible for all the buildings and animals in Korvatunturi.

- The caretaker tries again to ask for higher payment, but Father Christmas is too busy to listen. When Father Christmas arrives at home, he checks everything with his telescope. He sees that his elves are helping him to pack the billions of gifts to all children of the world.

Story of the Play

- Then he turns his telescope towards his piggery and dreaming about of eating "The Pig Number Six", as his favorite traditional Finnish Christmas-ham for Christmas dinner.

- The caretaker is frustrated, because she has too much snow-work and other things to do in Korvatunturi. She also has a big family of her own, 16 children, and they don´t have money to buy food. She is also dreaming about the big swine, the Pig Number Six in Father Christmas piggery. While Father Christmas is sleeping, she steals the swine.

Story of the Play

- Father Christmas hears something, wakes up and checks with his telescope if everything is in order. He finds out that his biggest swine is missing. He calls the police. Policemen come to arrest the Caretaker and put her in a prison.

- When Father Christmas sees with his telescope that the Caretaker is in prison, he changes his mind. He finds it is not right that the poor Caretaker is in the prison and her big family cannot have Christmas. He goes and gets the Caretaker out of prison and gives her job back.

Story of the Play

- He asks if the Caretaker would like to join Father Christmas on the Christmas dinner. He also asks if she would like to have a pay rise. Father Christmas and Caretaker think together that this will be a best Christmas ever and they start a party.

STEAMteach Erasmus Meeting at the Finnish Institute for Educational Research-University of Jyväskylä

WHY TEACHERS' TRAINING

Most teachers are subject-specific

New curricula promote the development of STEM / STEAM competences / sometimes equivalent to Science Literacy – but can it be more?

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

STEAMTeach

HOW WE HAVE PROMOTED STEAM EDUCATION

STEAM PROJECT-BASED LEARNING

Student-centred methodology that promotes the integration of content, the definition of problems and the devise of strategies for solving them.

KIKS FORMAT (Kids Inspiring Kids in STEAM)

Format that promotes Project dissemination and student interaction with a variety of audiences.

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

STEAMTeach

PRINCIPLES TO BE INCLUDED

KNOWLEDGE ABOUT LEARNING METHODOLOGIES

Teachers may find difficulties in implementing activities requiring long periods of time

Training them on learning methodologies that adapt to different periods of time

Students and/or families may be reluctant to implement active learning methodologies

Providing them with knowledge to highlight the benefits of active methodologies over a traditional approach

Problem-centred

Collaborative

Play-based / Expeirence-oriented

Inquiry-based

Project-based

Design-based

PRINCIPLES TO BE INCLUDED

DEVELOPING TEACHERS' SOFT SKILLS

COLLABORATION

Teachers may find difficulties in dealing with content in which he/she is not a specialist

Teachers may not have a strong knowledge on the context in which the activity is framed

Teachers are able to promote high cognitive demands from the disciplines in which he/she is a specialist

Teachers | Professionals | Researchers

Offering a learning community (Open STEAM Group) to be supported

PRINCIPLES TO BE INCLUDED

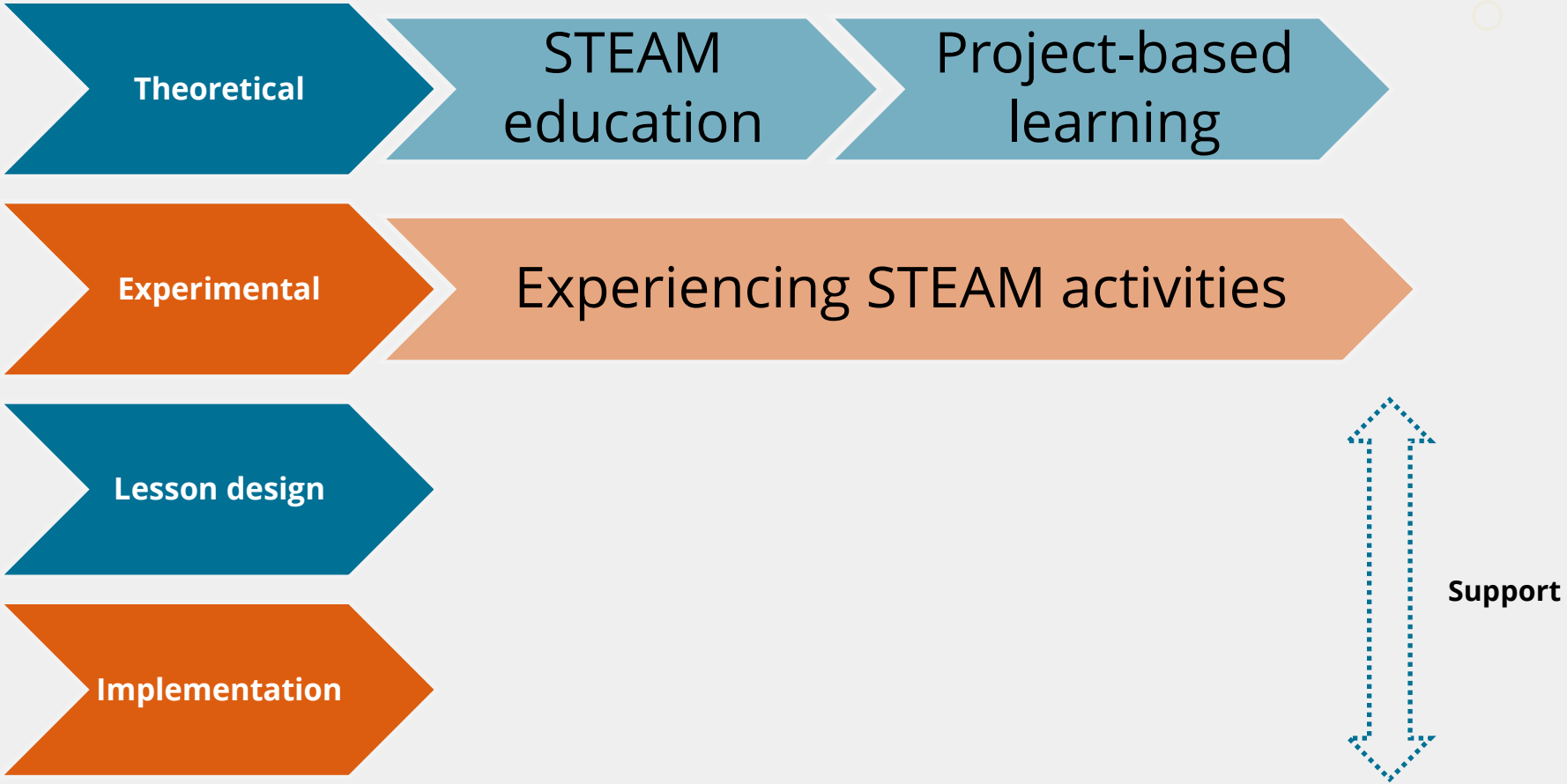
GUARANTEE TEACHERS' SUPPORT

Supporting teachers' in the design and implementation of STEAM activities

Offering teachers the opportunity to train periodically

Offering a learning community (Open STEAM Group) to be supported

INITIAL DESIGN OF OUR PD PROGRAM



THEORETICAL DIMENSION

STEAM PROJECT-BASED LEARNING

CONTENT INTEGRATION

PROBLEM-BASED LEARNING

INQUIRY-BASED LEARNING

DESIGN-BASED LEARNING

COLLABORATIVE LEARNING

Good practices

Recommendations

(Thibaut et al., 2018)

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

STEAMTeach

EXPERIMENTAL DIMENSION

CONTENT INTEGRATION

PROBLEM-BASED LEARNING

INQUIRY-BASED LEARNING

DESIGN-BASED LEARNING

COLLABORATIVE LEARNING

(Thibaut et al., 2018)

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

STEAMTeach

LESSON DESIGN

- Reflect on the relationship between the project and the curriculum
- Supporting teachers on the design through collective and individual meetings
- Establishing links between theachers and professionals in the project area
- Offering templates for lesson design

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

STEAMTeach

IMPLEMENTATION

Supporting teachers in the implementation through collective and individual meetings

After implementing the project, reviewing the document to share it with others in an open repository

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

STEAMTeach


Taukojumpan aika
https://www.youtube.com/watch?v=l7xy5vuibJs

STEAM JAM

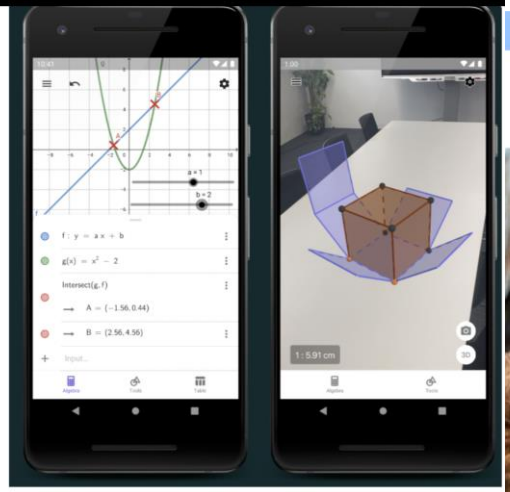
LUX:

https://www.youtube.com/watch?v=mEi9EQuXyc0
https://www.luxblox.com/pages/video-instructions

4D Frame:
https://www.youtube.com/watch?v=VEtwXUxUd-k&list=PL35RWcGPoXVsy1qDYjTMMaJxzIISH3A7B&index=7

Itsphun: https://www.itsphun.com/polygon

https://www.youtube.com/watch?v=2AtGgi7sG6I

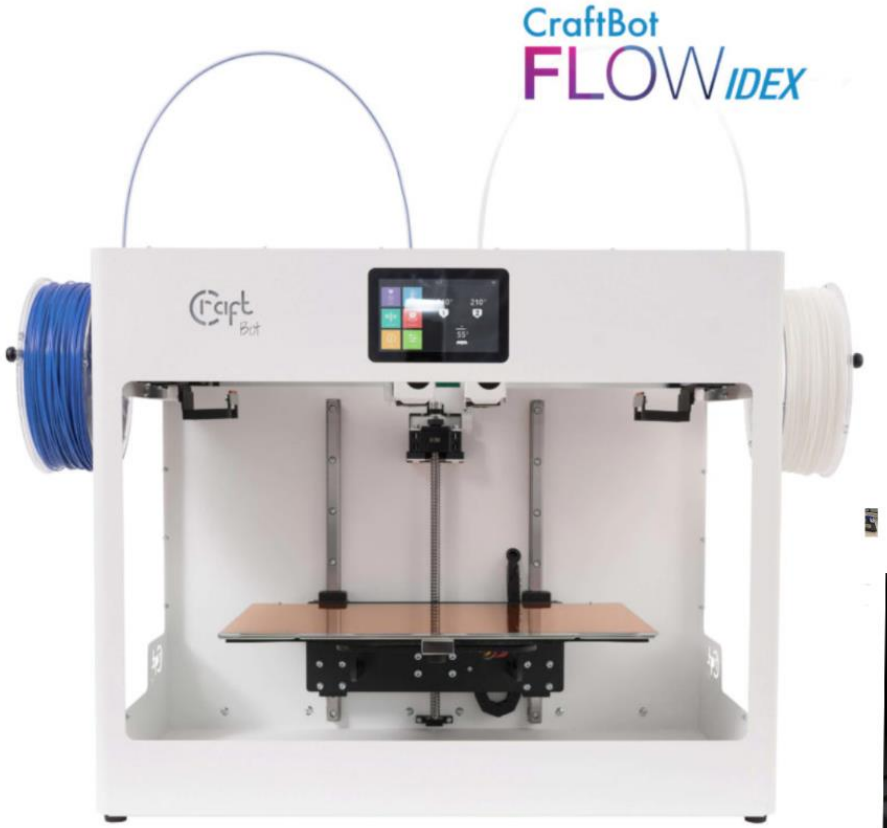


Augmented Reality

Ben Haas, Luxembourg
& many other students/colleagues

Prezi

GeoGebra 3D Printing



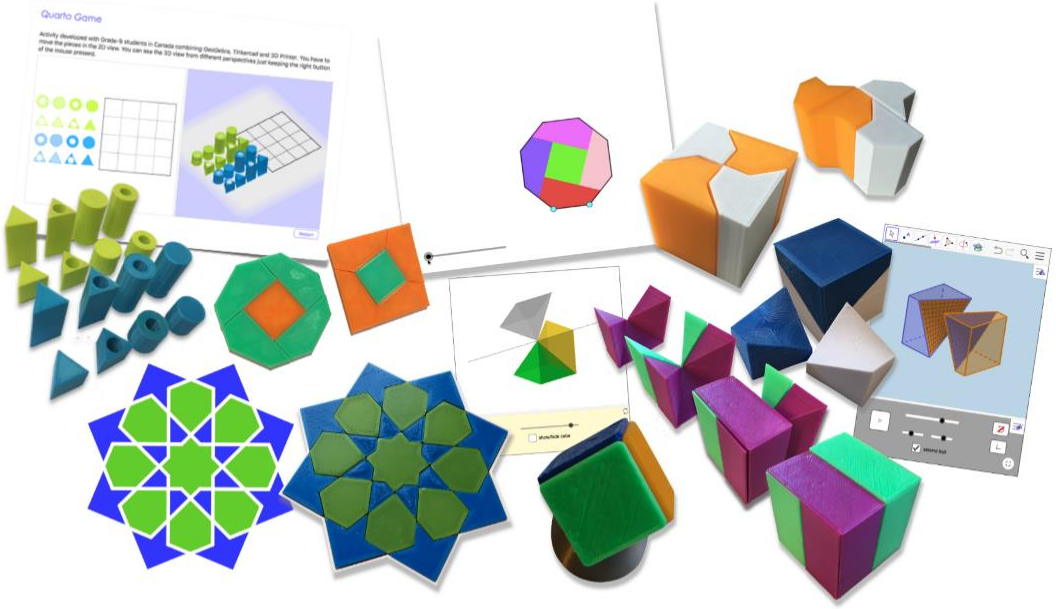
Diego Lieban

PHYSICAL & DIGITAL CONNECTION

DIEGO LIEBAN

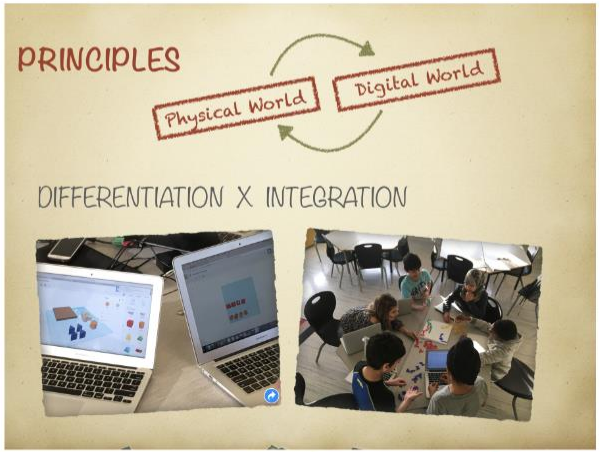
MAKING STEAM MORE PLAYABLE

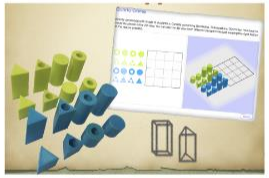
GEOGEBRA + 3D PRINTING = GAME DESIGN & PUZZLES

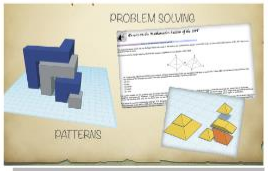


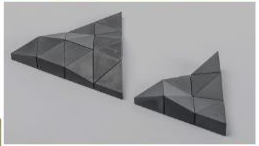
Diego Lieban, Brazil

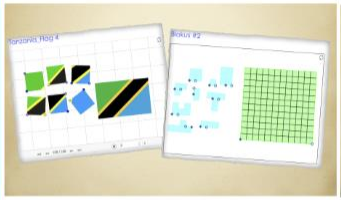
Gamification, Game deisgn, physical-digital connection





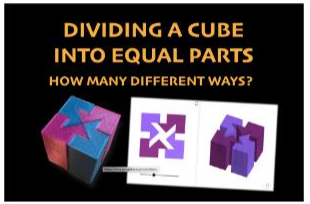






Diego Lieban, Brazil

Digital Sculpturing, 3D Printing, Games

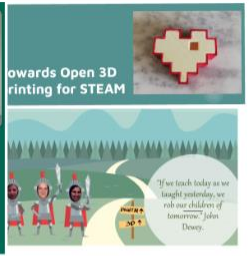


Diego Lieban, Brazil

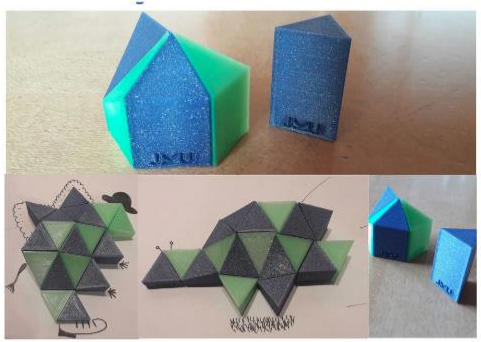
JKU

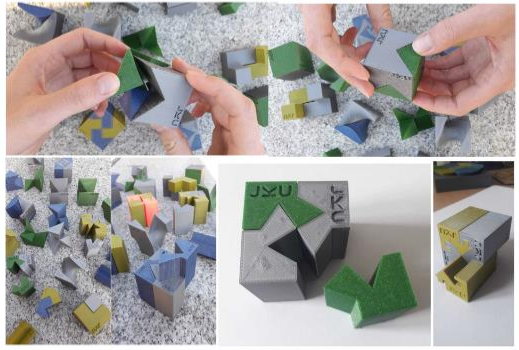
LINZ INSTITUTE OF TECHNOLOGY

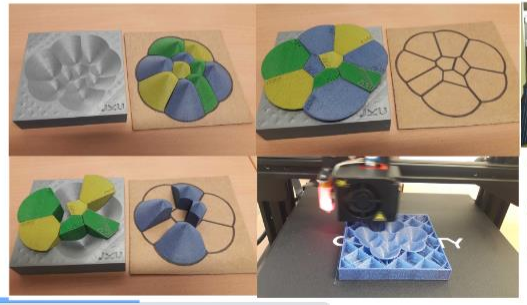
GeoGebra

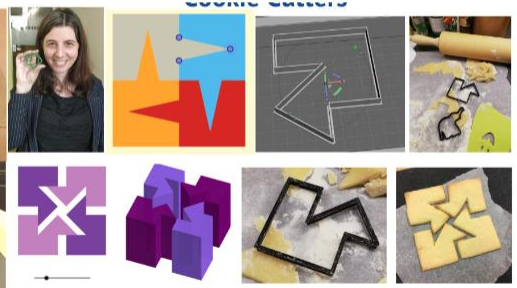


Eva Ulbrich, Julia Handl, Eva Bauer-Öppinger, Alex Thaller, Shereen El Bedewy









Prezi

Processing request...

Physical and Digital Transformation using Augmented Reality and 3D Printing

Research Question

What are the design principles to visualize the data transformation from physical to digital forms (and vise versa) using augmented reality in architectural construction ?

Physical

3D Scanning

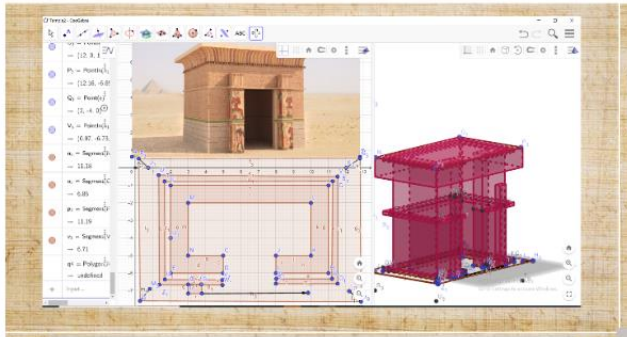
Digital (AR)

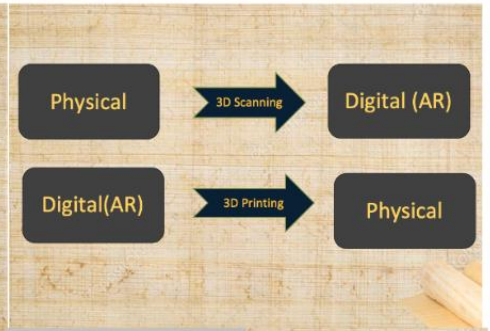
Digital(AR)

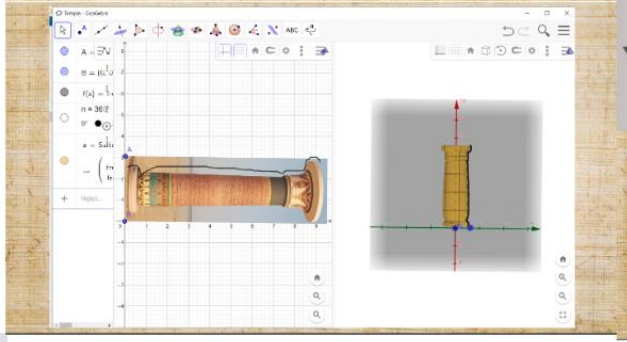
3D Printing

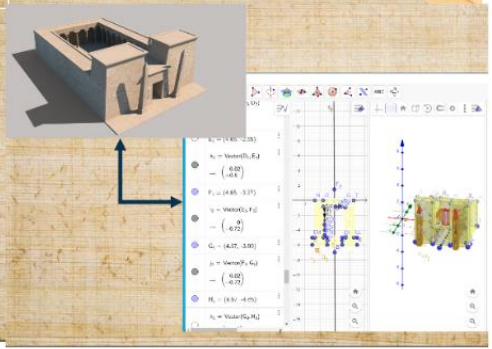
Physical

Application of Transformations on Architectural Models

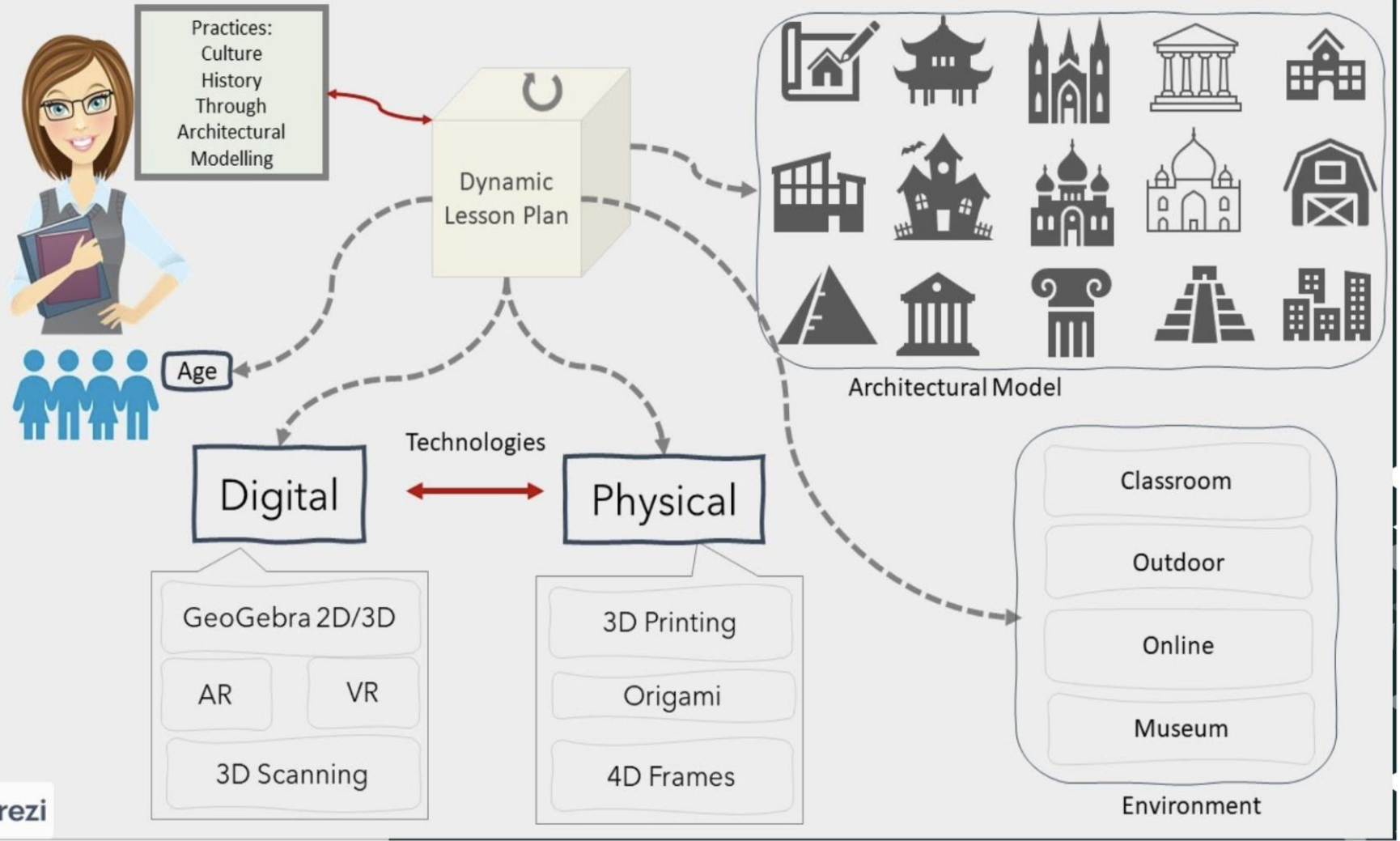


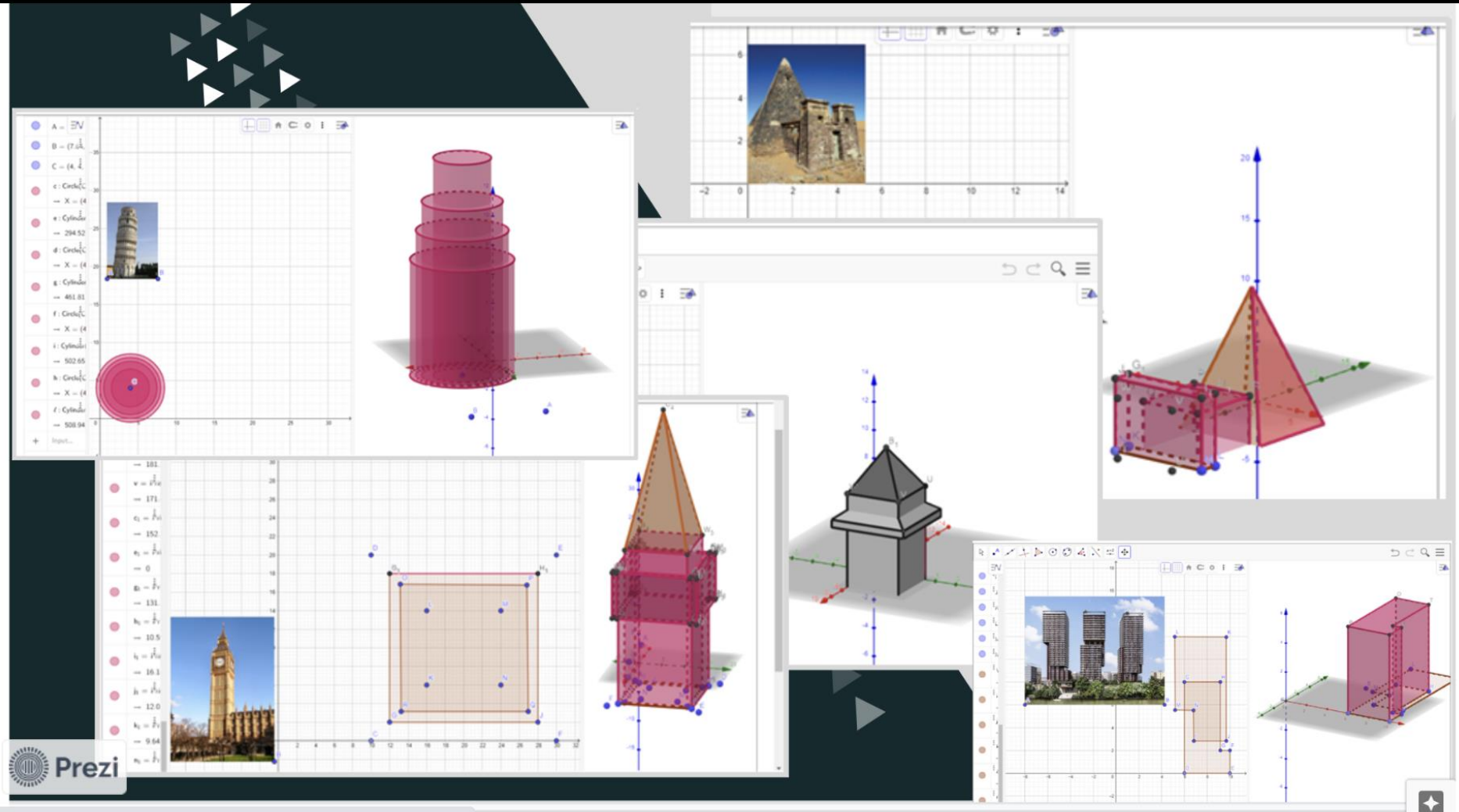


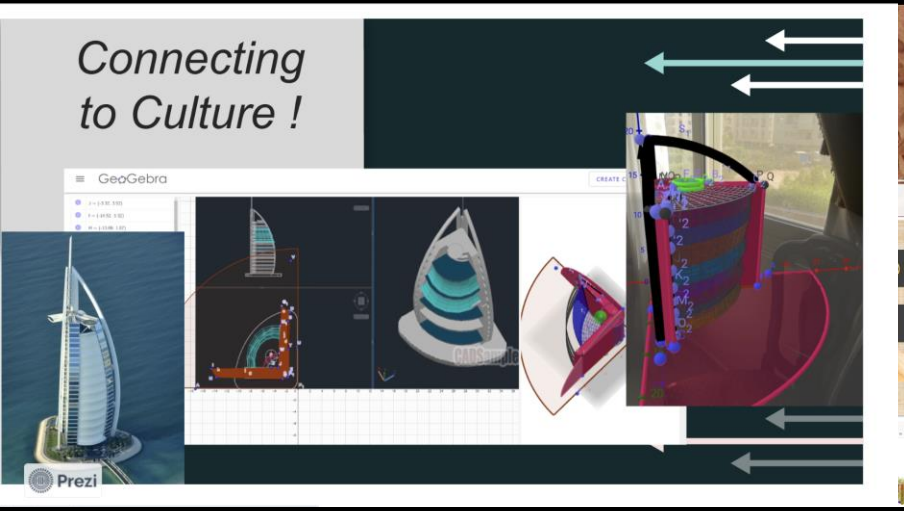




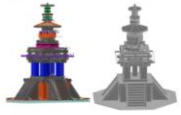
Shereen
El Bedewy
Egypt


Practices:
Culture
History
Through
Architectural
Modelling
Dynamic
Lesson Plan
Age
Architectural Model
Technologies
Digital
Physical
GeoGebra 2D/3D
AR
VR
3D Scanning
3D Printing
Origami
4D Frames
Classroom
Outdoor
Online
Museum
Environment





Kyeong Choi
South Korea



GeoGebra AR

Cheomseongdae

Ancient Korean Astronomical Observatory

Noah
Dana-Picard
Israel

EXPERIENCE WORKSHOP

THE EXPERIENCE-CENTERED MATH/ART MOVEMENT

www.experienceworkshop.hu

Connecting Hands-on and Digital Problem-Solving in Symmetry Education:

4dframe and Geogebra in Experience Workshop's Geodesic Dome Construction Activities

Kristóf Fenyvesi (University of Jyväskylä)
&
Diego Lieban (Johannes Kepler University)

VISUALITY & MATHEMATICS

EXPERIENTIAL EDUCATION OF MATHEMATICS THROUGH VISUAL ARTS, SCIENCES AND PLAYFUL ACTIVITIES

KOCF 미래융합창조문화재단
KOREA FUTURE CONVERGENCE OF CREATIVE CULTURE FOUNDATION

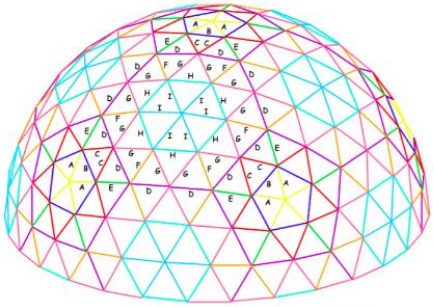
대한민국 발명체험교구 4D프레임
www.4dframe.com

Prezi

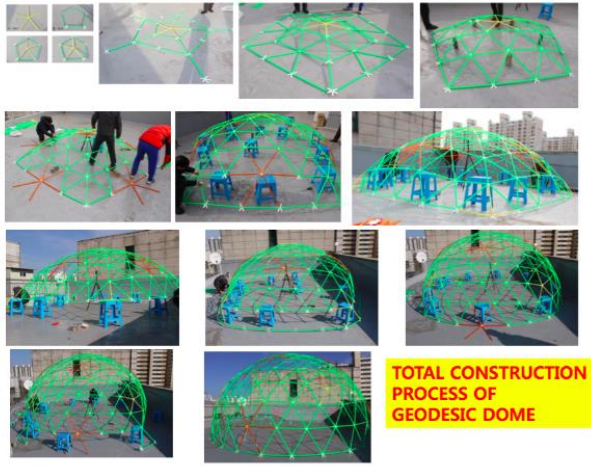
Processing request...

4D프레임 Geodesic Dome

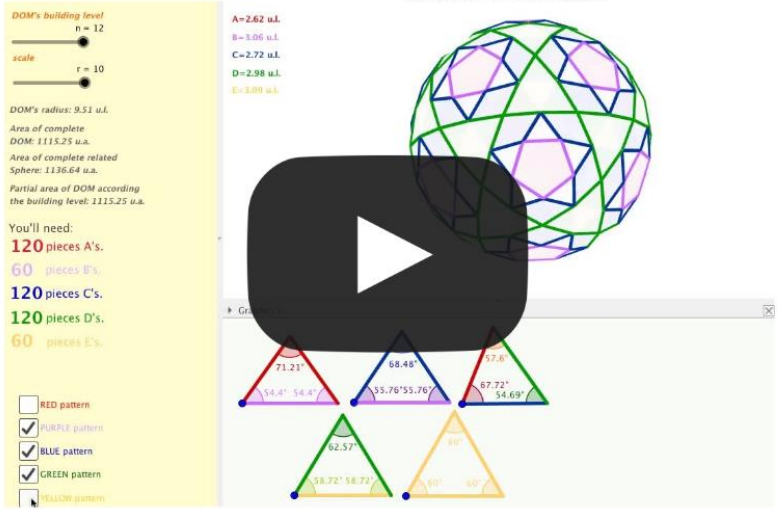
Components	Length of each tube	Needed pieces
	after	
A	42	30
B	49	30
C	47	60
D	52	90
E	48	30
F	51	60
G	53	130
H	55	65
I	56	60
5-way connectors		12
6-way connectors		380



http://desertdomes.com/domecalc.html



TOTAL CONSTRUCTION PROCESS OF GEODESIC DOME



16/07/2016 9

Photo: Bart van Overbeeke

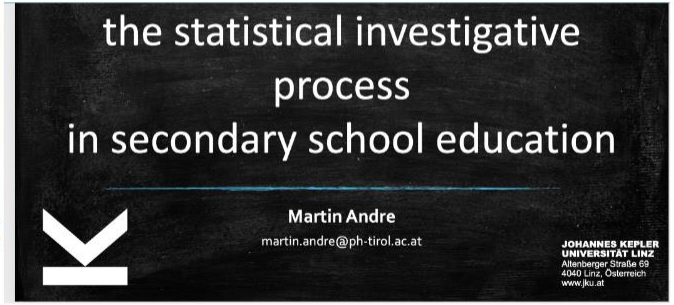
"Spaceship Earth," the AT&T Pavilion at Epcot in Disney World, Florida.

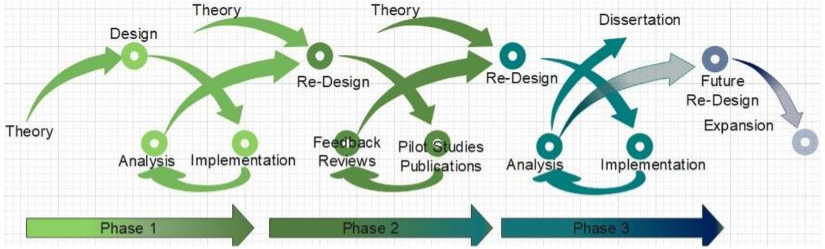
Origami Epcot Ball by students of Natalija Budinski math teacher

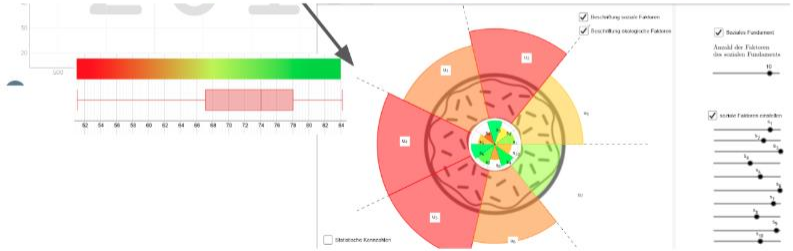
The People's Meeting Dome by Tejlgaard & Jepsen, Denmark

Big Data Visualisation in Statistics Education
Exploring ideas of Sustainable Development

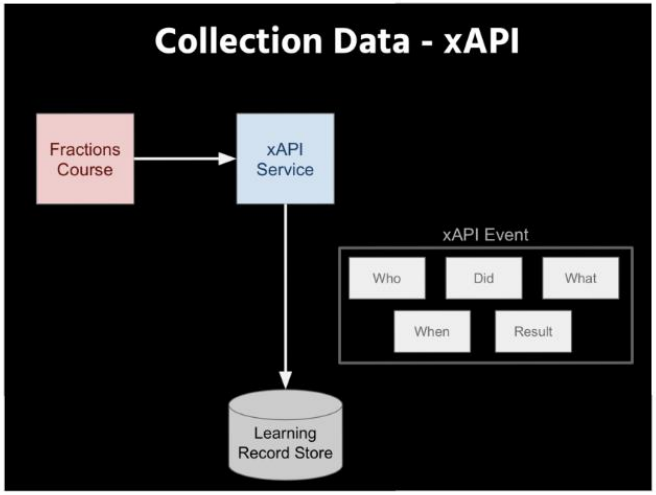
Martin Andre
Austria

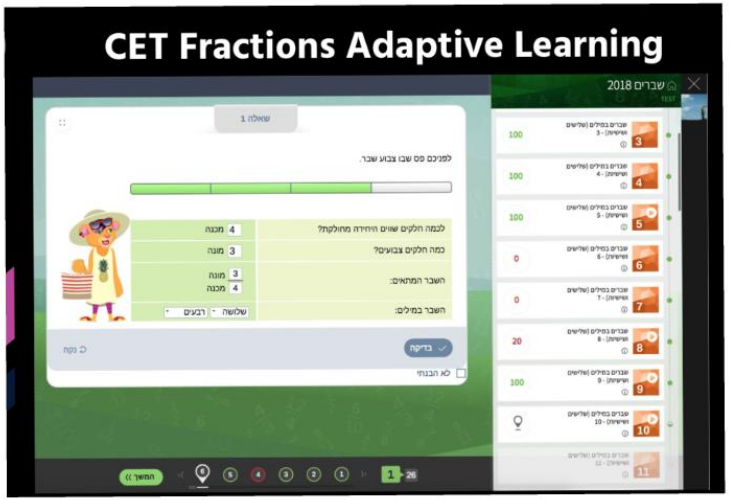


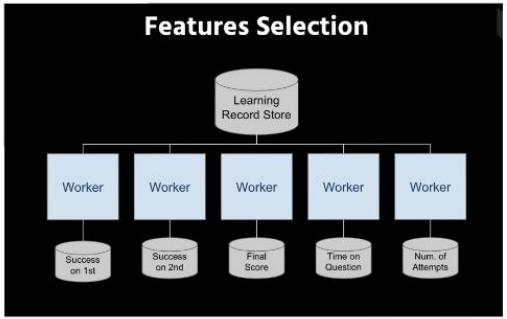


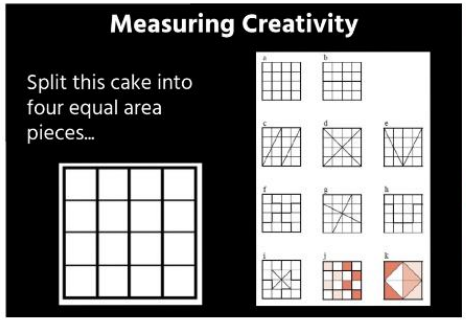


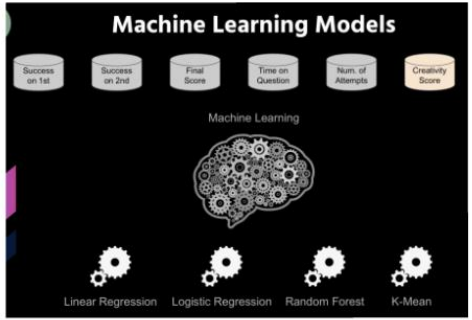
Detecting Creativities with Machine Learning



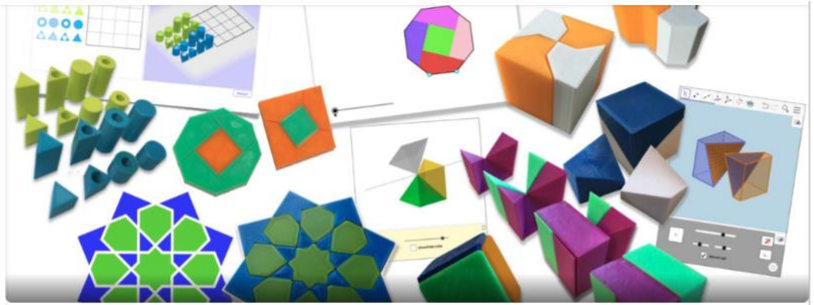


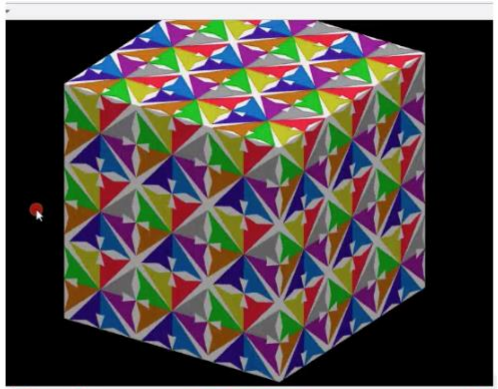






Roi Shillo, Centre for Educational Technology, Tel Aviv, Israel



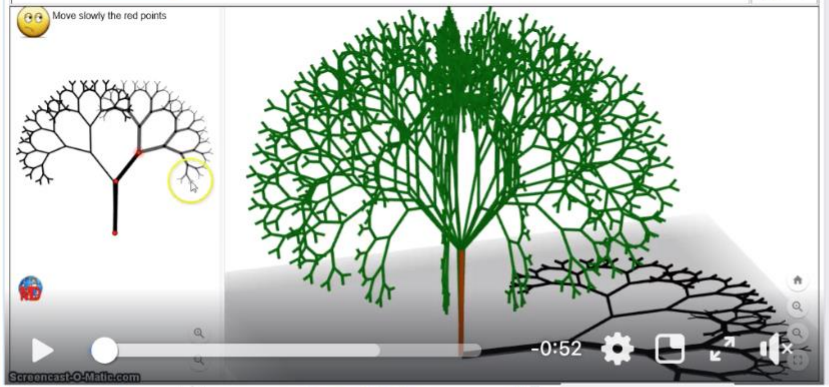


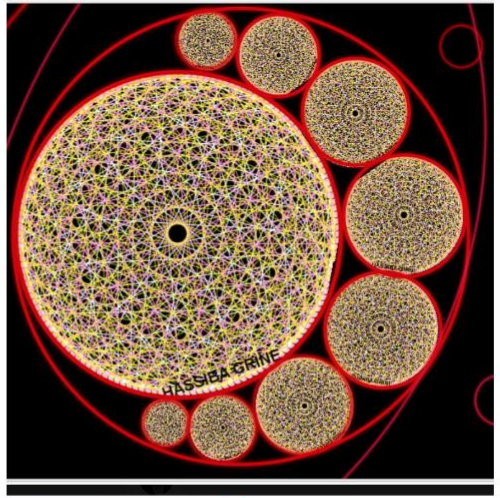
GeoGebra Arts & STEAM

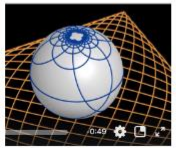
Public group · 13.0K members

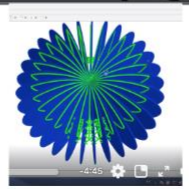
+ Invite

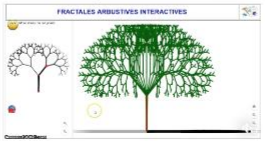
About | Discussion | Mentorship | Announcements | Rooms | Topics | Members | More











Prezi

Processing request...

The Founder of OECD's PISA assessment on the importance of creativity in education

RENEWABLE ENERGIES / RENEWABLE CREATIVITIES

CHILDREN & YOUTH ART EXHIBITION / WORKSHOPS

2023

Thank you

Do you have any questions?

Dr. Kristóf Fenyvesi
info@experienceworkshop.org
+358 40 805 3324
www.experienceworkshop.org
www.learningbydoing.fi

CREDITS: This presentation template was created by **Slidesgo,** including icons by **Flaticon** and infographics & images by **Freepik**.

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Finnish Institute for Educational Research
Since 1968

EXPERIENCE WORKSHOP

www.experienceworkshop.org