Kids Inspiring Kids for STEAM

Methodological Guideline for Teachers

Dr. Kristóf Fenyvesi

University of Jyväskylä – Experience Workshop – Bridges Organization – International Symmetry Association





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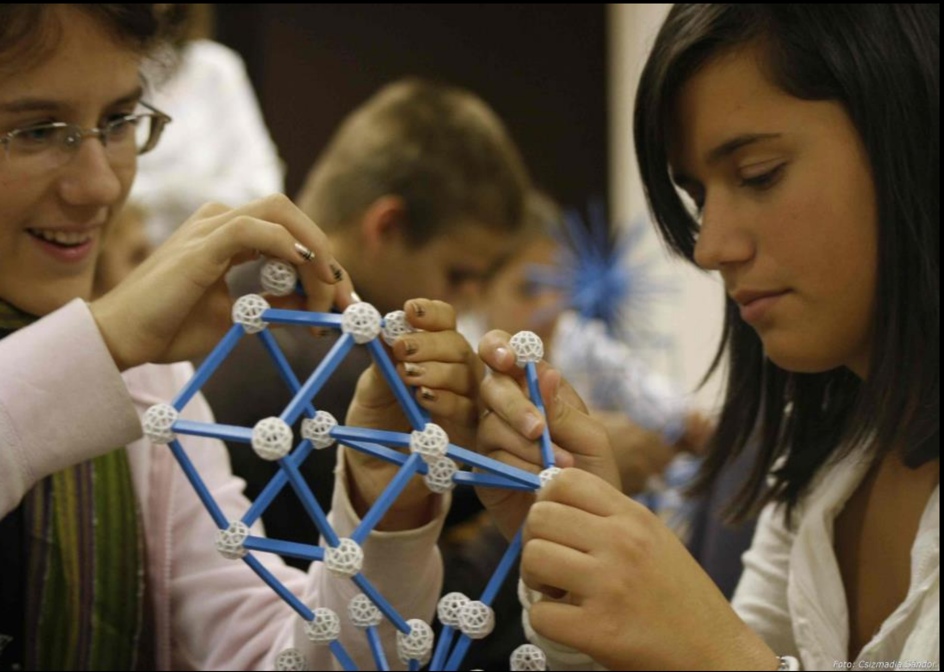
Kids Inspiring Kids for STEAM (KIKS) project's goals:

- to raise students' awareness towards the multi- and transdisciplinary connections between the STEAM subjects (Science, Technology, Engineering, Arts & Mathematics)
- make the learning about these fields more likeable



How to achieve KIKS goals?

- Students inspiring other students

by studying topics / phenomena according to their own interests

Students utilizing

- exciting new technologies
- open educational resources
- everyday items and materials

in their study projects.

STARTING POINT:

How would you get YOUR SCHOOLMATE to get interested to learn about a phenomenon or a topic in STEAM?

EXAMPLES for KIKS LOCAL CHALLENGES

https://www.kiks.unican.es/en/actividades/

STEAM is all around us! Local KIKS projects from Spain

Among the Spanish project topics we can find very interesting examples of how learning can be based on the built environment and cultural heritage of the place, where the students are living. A team has analyzed the geometry of different arches in Pontevedra city. Another team from Galicia has studied wind rosettes and nautical maps and found physics-based, geometrical and geographical explanation on how to determine the geographical North. They have also found the way on how to make a wind rosette in their own school. Another team from Pontevedra has used mathematics to verify disability ramps in the city. They found that most disability ramps are not complying with the law regarding the prescribed angle and the standardized width of disability ramps. They have shown that mathematics can be a tool of social inclusion and making critique of improper social practices - and many more...

Science as an artistic tool! Local KIKS projects from Finland

Finnish KIKS teams have mostly concentrated to find ways in implementing scientific research and methods in artistic projects with various STEAM learning opportunities. Creating visual effects, such as colorful shadows in a theater performance; extending artistic methods by algorithmic thinking; discovering geometrical properties of traditional Finnish Christmas decoration art, called Himmeli; designing funny geometrical hats; or making an interesting video and artistic photograph, which is based on a scientific experiment in thermodynamics, were all unique ways to go beyond learning subjects and making new connections between subjects of learning and between the learners in the KIKS spirit.

Kids learning from kids to see! Local KIKS projects from Hungary

Do (not) believe your eyes! The Magic Eyes Website (http://magiceyes2016.simplesite.com/) developed by Hungarian students tells you all the tricks of optical illusions and introduce the student team's own tricky artworks. The website is a real "hall of mirrors", where you can find everything from the biology of seeing to the description of various illusions and on-line tools to create your own ones. Are you interested in optical illusion? And do you know how science and technology can take deception to a new level? Just be careful to not lose your way in this virtual labyrinth of valuable materials!

Learning from the FUNgineers! Local KIKS projects from the UK

UK student groups have worked intensively together with their teachers on problems like energy conservation, developing a self-driven car, merging sound and image and making a theremin – one of the first synthesizers in music history – from ultrasonic sensors, Arduino, Raspberry Pi, jumper leads and Ohm speakers. Many of the participating UK kids has been involved in programs like Tomorrow´s Engineers Week or TeenTech Awards, which brought wider recognition of the KIKS project in the international scene.

Challenges for STEM Education: The Digital Challenge...

The growing technologization, digitalization, networkization, and increasing computational complexity of daily practices are reorganizing our society and culture in prolific ways...

We recognize it or not, but the increasing importance of mathematically structured patterns and scientific models has a great impact on our experience of everyday life, and a particular significance for all digitized societies.

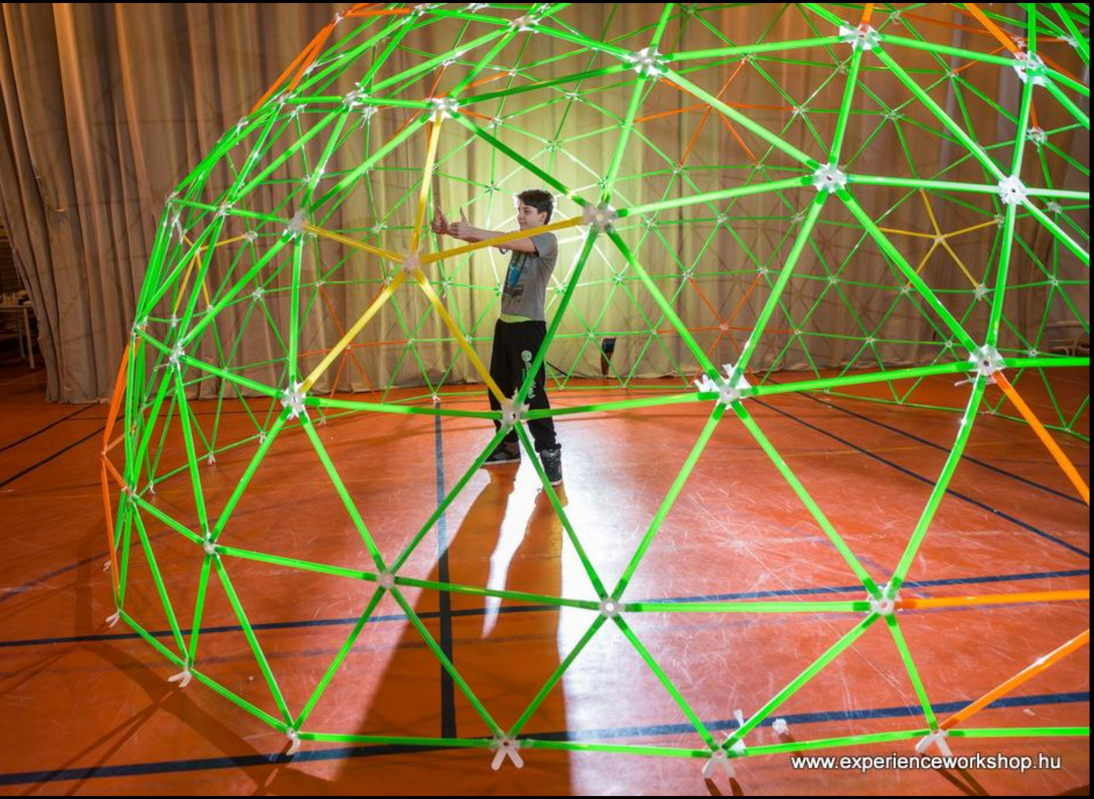
Photos: Aya Riha
& Sándor Csizmadia

Challenges for STEM Education: The Attitude Challenge...

Oddly, the abstractness of mathematics as a science makes it a unique discipline often perceived as exterior to the contexts of daily life.

As attitude-researches point out, students tend to sustain an aversion to mathematics (Iben 1991, Ma & Kishor 1997, Ruffell-Mason-Allen 1998, Gomez 2000, Hannula 2002, Uusimaki 2004; and see the term “math-anxiety”: Curtain-Phillips 1999, Ashcraft 2002)…

Photo:
Márton Kállai.



Students remain largely ignorant of how deeply mathematics is embedded in the world around them (Hannula 2011, 2012, Roesken-Hannula-Pehkonen, 2011)…

It seems to be a paradox that mathematics, although widely implemented in all industrialized societies, is experienced by most school pupils as a difficult and unpleasant subject
(cf. Rogerson, 1986).

Challenges for STEM Education:
Social and Cultural Challenges…

- ***the Gender-challenge…*** Science, Technology, Engineering and Mathematics (STEM subjects) often understood as male domains. This sets restrictions for girls’ attitudes toward STEM...

- Best education for the ”talented” few vs. everybody has a genuine talent?

Photo: G2Photo.

Challenges for STEM Education: The Motivation & Engagement Challenge…

Providing sufficient motivation for students is maybe one of the greatest challenges in education today…

Photo: G2Photo.

According to PISA results:

students should find education **enjoyable, develop self-belief and develop stamina to address challenging problems and situations.**

Challenges for STEM Education: The Visual Challenge…

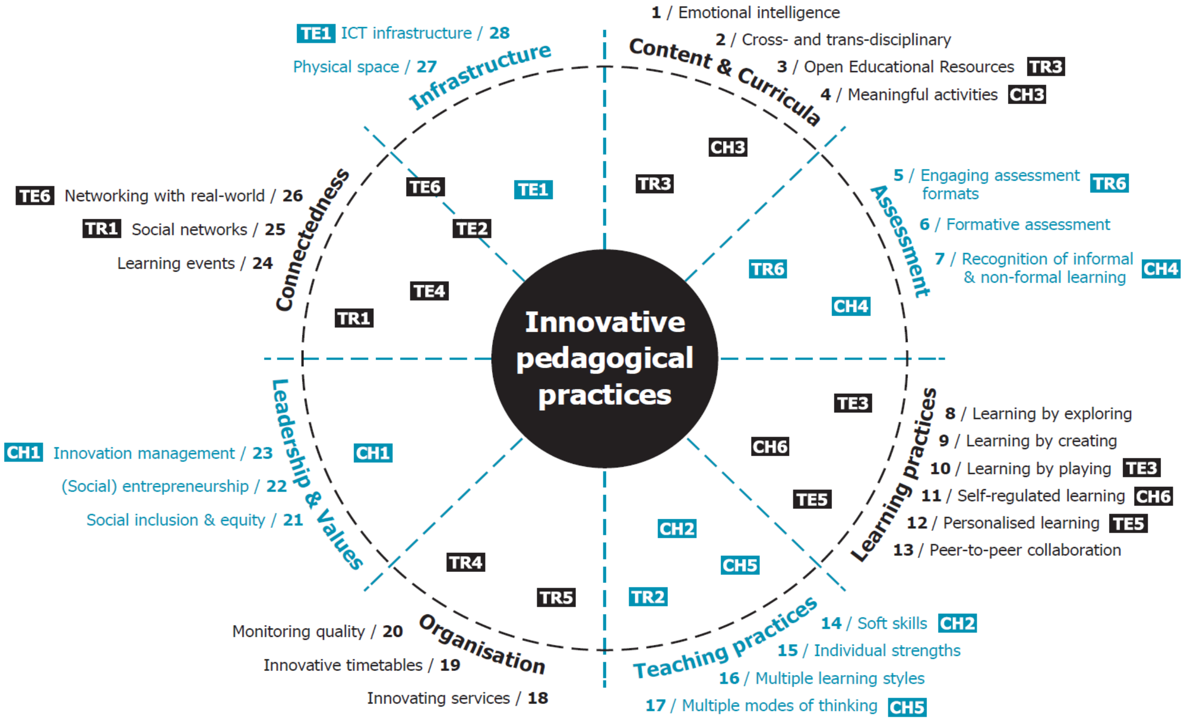
Today’s children are increasingly exposed to a multitude of visual stimuli (mobile technologies; video games; augmented reality; wearable cinema, Google glasses; 3D cinema already from '60s; “cinema is dreaming of the conquest of the 4-dimensional, or even multidimensional space”, Weibel 2014).

…while the traditional education of the STEM subjects did not follow these improvements and tendencies.

Photos: EU Info Spot, Budapest.

Elements of the Creative Classroom Framework

Mapping the Horizon Report Europe topics to the CCR Framework



Legend of Linkages to Horizon Report Europe Topics

TRENDS

TR1: Growing Ubiquity of Social Media

TR2: Rethinking the Role of Teachers

TR3: Increasing Focus on Open Educational Resources

TR4: Increasing Use of Hybrid Learning Designs

TR5: Evolution of Online Learning

TR6: Rise of Data-Driven Learning and Assessment

CHALLENGES

CH1: Integrating ICT in Teacher Education

CH2: Students' Low Digital Competence

CH3: Authentic Learning

CH4: Blending of Formal and Non-Formal Learning

CH5: Complex Thinking and Communication

CH6: Students as Co-Designers of Learning

TECHNOLOGIES

TE1: Cloud Computing

TE2: Tablet Computing

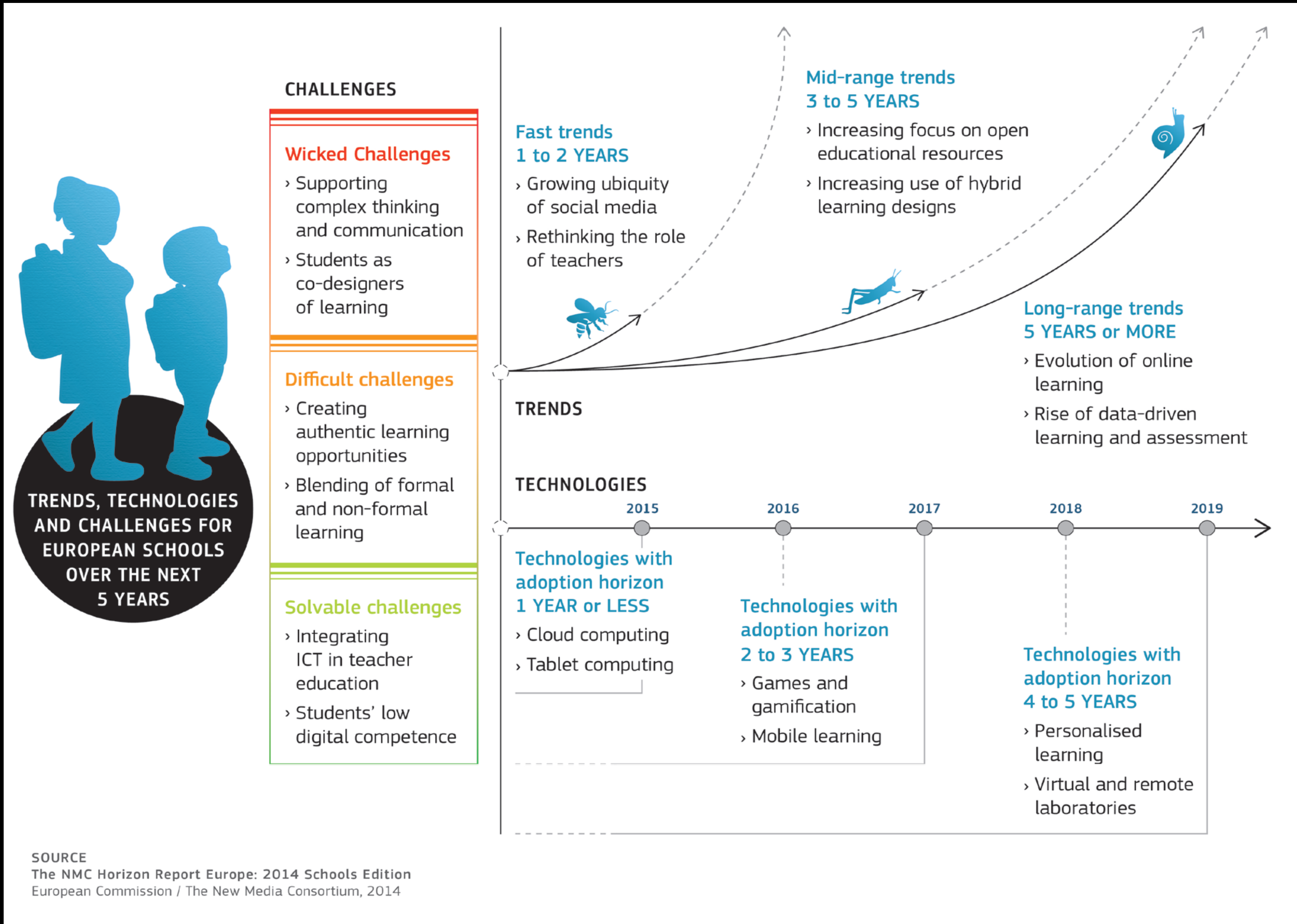
TE3: Games and Gamification

TE4: Mobile Learning

TE5: Personalised Learning

TE6: Virtual and Remote Laboratories

The Horizon Report Europe: 2014 Schools Editions



The Horizon Report Europe: 2014 Schools Editions

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Despite the attitude-challenge, and other challenges, students are able to recognize patterns and deal fluently with the abstractions of language, music, arts and design. Numerous research and empirical evidence indicates that people become easily motivated (and even fascinated) when STEM connections are presented in ways which relate to their experiences by triggering their natural curiosities and aesthetic sensibilities.

There is already significant research made by mathematicians, art historians, educators, and practicing artists and designers in the exploration of mathematical connections between the nature, arts, sciences, music, culture, architecture technology and design.

Photo: Pécs University.

STE*A*M: Science, Technology, Engineering, Arts & Mathematics

Photo: Tiia Monto [CC BY-SA 3.0 (https://creativecommons.org/licenses/by-sa/3.0)], from Wikimedia Commons

1 What is STEAM Education?

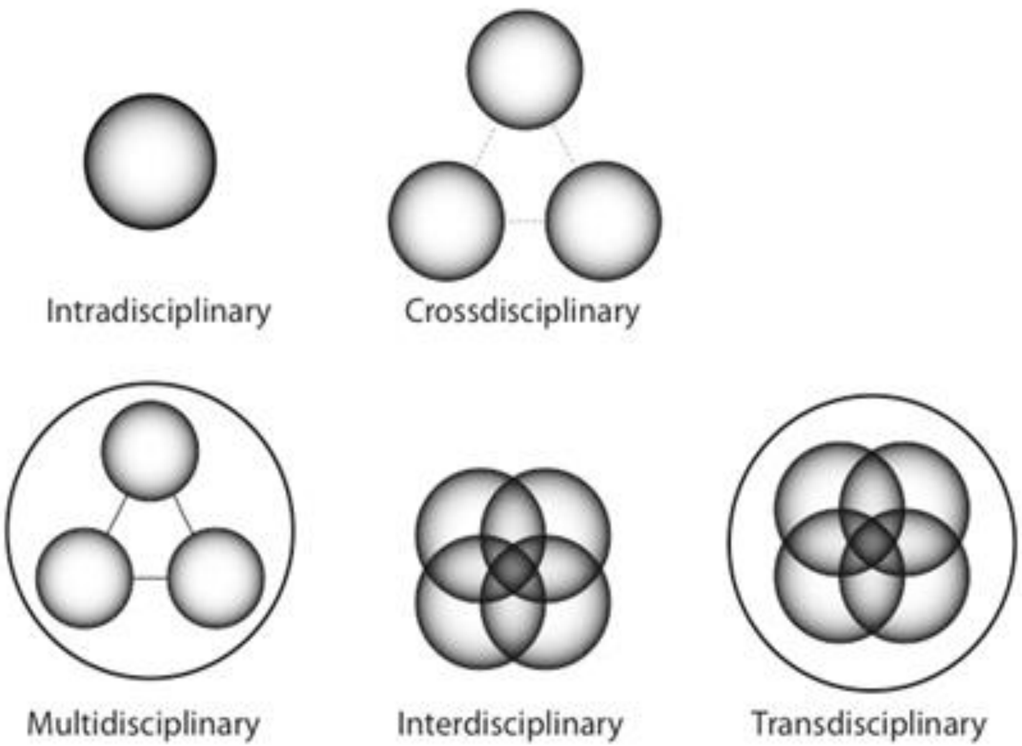
- The **Finnish National Core Curriculum** makes recommendations to teachers and schools about the development of *student-centered, multidisciplinary / phenomenon-based learning* programs and collaborative teaching.

- **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.

Design of multidisciplinary learning projects

What is multi- and transdisciplinarity?



Finland schools: Subjects scrapped and replaced with 'topics' as country reforms its education system

With Finland radically reforming the way its children are taught, Richard Garner visits Helsinki to find out if the teachers approve

RICHARD GARNER | HELSINKI | Friday 20 March 2015

For years, Finland has been the by-word for a successful education system, perched at the top of international league tables for literacy and numeracy.

Only far eastern countries such as Singapore and China outperform the Nordic nation in the influential Programme for

Design of multidisciplinary learning projects according to the Finnish National Core Curriculum

THE CONCEPT OF LEARNING ACCORDING TO THE FINNISH NATIONAL CORE CURRICULUM (FNCC)

- FNCC is based on a conception that sees the pupils as active actors. While acquiring new knowledge and skills, the pupils learn to reflect on their learning, experiences and emotions.

- Learning takes place in interaction with other pupils, the teachers and other adults, and various communities and learning environments. It involves doing things alone and together, thinking, planning and exploring, and assessing these processes in a versatile manner.

- Learning together promotes the pupils' skills in creative and critical thinking and problem-solving and their ability to understand different viewpoints.

- The interests, appraisals, working approaches and emotions of the pupils, as well as their experiences and ideas of themselves as learners, influence their learning process and motivation.

FNCC 2014, p. 17

Design of multidisciplinary learning projects according to the Finnish National Core Curriculum

In order to safeguard every pupil’s possibilities of examining wholes and engaging in exploratory work that is of interest to the pupils, the education provider shall ensure that the pupils’ studies include at least one multidisciplinary learning module every school year.

FNCC 2014, p. 33.

Design of multidisciplinary learning projects according to the Finnish National Core Curriculum

The purpose of the multidisciplinary learning projects:

- strengthening the pupils' participation and offering opportunities for involvement in the planning of the objectives, contents and working methods of the studies;
- bringing up issues that the pupils find meaningful and interesting, and creating opportunities for discussing and working on them;
- providing additional opportunities for studying in different groups, as well as with pupils of various ages and with several different adults;
- offering opportunities for combining what the pupils have learned outside the school with school work;
- giving space for intellectual curiosity, experiences and creativity and challenging the pupils to engage in many types of interaction and language use situations reinforcing the application of knowledge and skills in practice;
- practising agency that is consistent with sustainable lifestyle, and inspiring the pupils to act in a manner that contributes to the community and the society.

FNCC 2014, p. 34.

Design of multidisciplinary learning projects according to the Finnish National Core Curriculum

THIS APPROACH IS TRANSFORMING THE TEACHERS' ROLE

Multiple Creativities are coming into play…

A practice-based framework

Modalities

- we can use several different tools
- production of intellectual products can be shared by the use of technologies
- (online) platforms blur the boundaries between formal and informal learning

Forms of authorship

- authorship is negotiated
- all actors of the learning process has a role in creating something new
- machines can also contribute to creation

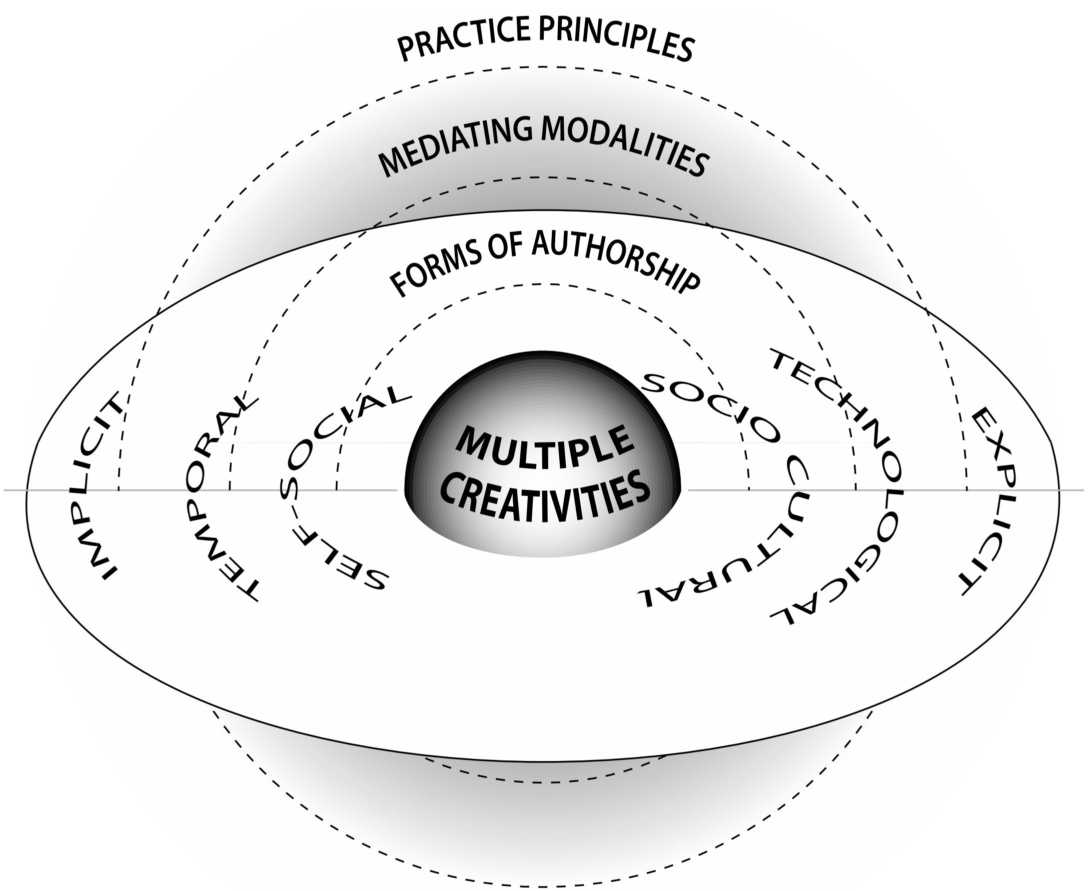
Practice principles

- can be declared (explicit) or only done without declaration (implicit)
- depend on the goals of production and the nature of interaction in communities, e.g. *entrepreneurial, transformative, experimental, participatory, exploratory, interactive, dialogic, market oriented, vesting authority,* etc.

Domains: some elements of culture

Fields: specific forms and principles of practices

Persons: individuals and communities



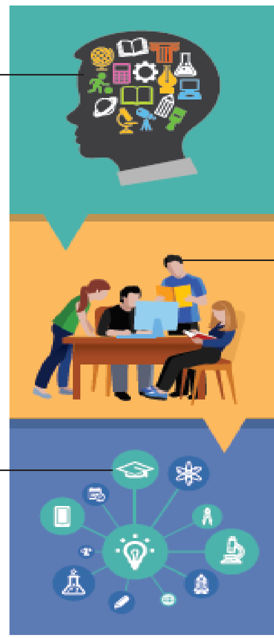
Source: Burnard, Pamela: *Musical creativities in practice.* Oxford University Press, 2012. page 223

STEAM framework in the South Korean Curriculum

STEAM Background & Necessity

Meeting the increasing demand for integrative education

Many in society now acknowledge the need for individuals who have integrative education that embraces emotions and creativity to excel in competition with artificial intelligence.



Students-led learning

There is a growing need for lessons where students take the initiative in learning, e.g., learning to resolve real-life problems, thus elevating the level of joy experienced in learning.

Emphasizing integration in promising science and technology areas

Future society will require talented minds that are capable of going beyond disciplinary boundaries to integrate new areas of technology.

In seeking to foster Creative Talents with Integrative Thinking, in accordance with the 2015 National Curriculum of Korea, STEAM is essential.

Ministry of Education

www.moe.go.kr
STEAM Education Support Team, Ministry of Education, Building 14, 408 Galmae-ro, Sejong-si, 30119, Republic of Korea

KOFAC

www.kofac.re.kr
Office of Creativity & Convergence Education Planning, Korea Foundation for the Advancement of Science & Creativity, 602, Seolleung-ro, Gangnam-gu, Seoul, 06097, Republic of Korea

STEAM Application

▶ STEAM Learning Framework

The STEAM learning framework is a tool designed to facilitate the introduction of STEAM classes into schools.

- Understand the need to solve a problem. CONTEXT PRESENTATION
- Voluntarily find ways to solve a problem. CREATIVE DESIGN
- Enjoy success in the problem-solving experience. EMOTIONAL TOUCH

Take on the challenge of a new problem.

Improvement of Integrative Thinking and Creative Problem-solving capabilities.

▶ Example: "Achoo! Was That Fine Dust?!"

STEAM class designed to take fine dust as a subject to raise the awareness of students regarding local and public problems and discover solutions.

- S: Gather information on fine dust.
- T E: Use an app to measure fine dust levels.
- A: Make a poster to prevent the production of fine dust.
- M: Complete a graph to illustrate fine dust status.

Context Presentation	Discuss how harmful fine dust can be.
Creative Design	Determine surrounding fine dust levels and develop a plan to prevent them causing damage.
Emotional Touch	Work in small groups, produce an advertisement and give a presentation about preventing fine dust.

STEAM framework in the South Korean Curriculum

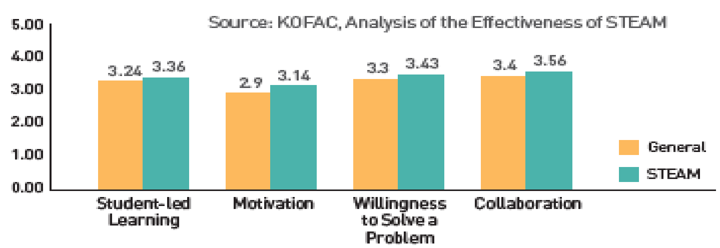
STEAM Achievements

▶ STEAM in Textbooks

STEAM content incorporated into units in science textbooks for Grades 3-4 and 5-6.

E.g. Grade 3: Properties of Sound – Make and Play a Musical Instrument.

▶ Improvements achieved by use of STEAM



▶ Fun and practical classes

"STEAM taught me that there can be more than one answer to a problem. I learned to find my own solutions using creative ideas and integrative thinking."

- Student, Dongam Middle School -

"I could see the changes in students during STEAM classes, as they became more eager to take part in the lesson."

- Teacher, STEAM Teachers' Study Group -

STEAM Support Programs

▶ Programs supporting use of STEAM education in schools

1. Support for Leading Groups	Schools leading Creative and Integrative Education / Teachers' Study Groups
2. Teacher Training for Increased Competence	Remote training / Training at high-tech science centers / Overseas training / Manager training
3. Development and Distribution of STEAM Content	Career program / Curriculum program / Science program / Test-free semester program
4. Promotion of Interactive Exploration Activities	STEAM outreach / STEAM with university students / STEAM Research & Education
5. Establishment of Framework and Infrastructure	STEAM incorporated in textbooks and the 2015 National Curriculum / Science Labs of the future / Infinity Imagination Lab

▶ Find STEAM content

http://steam.kofac.re.kr

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STEAM framework in the South Korean Curriculum

Memorizing facts and solving problems in textbooks
alone cannot spark curiosity.
What really matters is
understanding *why* the acquired knowledge is
important and *where* to apply it
in order to find answers and solutions
to the problems encountered in daily life.
STEAM education is the way to meet this goal.

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STEAM framework in the South Korean Curriculum

About STEAM

- **STEAM Key Term 1:** Education Based on Scientific Technology
- **STEAM Key Term 2:** Ability to Solve Problems in the Real World

POLICY BACKGROUND

- High Scores but No Confidence in Science and Mathematics

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STEAM framework in the South Korean Curriculum

‘Learning Standards Framework,’ the Backbone of STEAM

Step 1: ‘Presentation of Situations’ to Let Students Recognize Problems as Their Own Issue

Step 2: ‘Creative Design’ for Discovering How to Solve the Problem on One’s Own - "Find Your Own Way, Not a Single Determined Answer"

Step 3: ‘Emotional Touch’ for Challenging a New Problem

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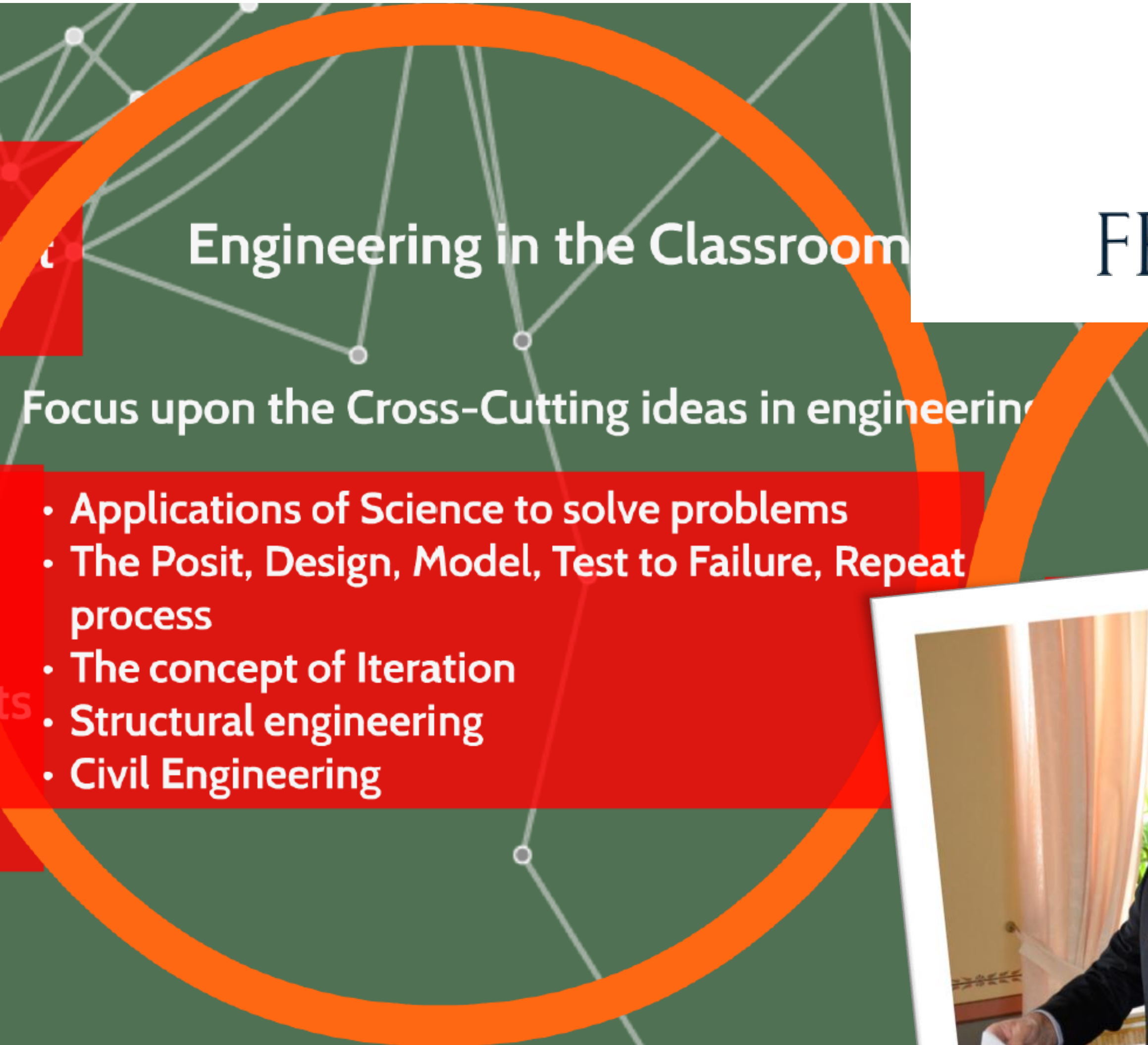
Technology

Possible Topics:

- Robotics
- Google Classroom
- Teaching Mathematics using Spreadshe
- Scratch Coding
- Accessing Large Databases



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Arts in STEAM

Topics here can include:

- Art as Problem Solving
- Creativity as learning
- The idea of Versatile Genius or Renaissance Person
- Art in communication
- The role of considering an aesthetic in all disciplines

Mathematics

The focus here should be upon the role of shifting the perception of mathematics among the teachers who enroll.

- Mathematics as human activity
- Connections between mathematics and the other subjects
- Mathematics as more than number concepts

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REVIEWING THE POTENTIAL AND CHALLENGES OF DEVELOPING STEAM EDUCATION THROUGH CREATIVE PEDAGOGIES FOR 21ST LEARNING:

HOW CAN SCHOOL CURRICULA BE BROADENED TOWARDS A MORE RESPONSIVE, DYNAMIC, AND INCLUSIVE FORM OF EDUCATION?

Dr. Laura Colucci-Gray (Project lead, University of Aberdeen), Prof. Pam Burnard (University of Cambridge); Ms. Carolyn Cooke (Research Assistant, University of Aberdeen); Dr. Richard Davies (Aberystwyth University); Dr. Donald Gray (University of Aberdeen); Ms. Jo Trowsdale (University of Warwick)

A report from one of the BERA Research Commissions

- Shifting policy landscape
- Challenges for STEM education
- Defining STEAM
- Controversy and critique

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A report from one of the BERA Research Commissions

- Subject silos
- Definitional problems with 'The Arts' or A
- The changing contract between science and society
- Beyond mono-disciplinarity

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A report from one of the BERA Research Commissions

- Multi-, inter- and trans-disciplinary STEM
- Knowledge is contextual
- Knowledge is linked to environment
- Knowledge as embodied
- Knowing as perception

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A report from one of the BERA Research Commissions

- Science Education (plus arts, music, drama, dance; STEAM Education)
- Technology (plus arts, music, drama, dance, creativity)
- Engineering (plus arts, music, drama, dance, creativity)
- Arts based pedagogies (plus arts, music, drama, dance, creativity)
- Mathematics education (plus arts, music, drama, dance, creativity)
- Creative Pedagogies

Table 1: Conceptual changes in the theory of knowledge

Concept / doctrine	**Traditional**	**Networked**
The subject of knowledge	Single individual	Community / network
Knowledge	Justified and truthful information (believes)	Interpreted information
Type of knowledge	Explicit knowledge	Also tacit knowledge and raw data
A fact	Information based on empirical evidence	A transforming node gaining evidence from the network
Thinking	Individual's activity	Collective activity, "we think" and "they think"
Knowledge creation	By researchers, often in a closed environments (labs, institutions), based on existing knowledge	By experts and citizens in the web, based on open communication and sharing tacit knowledge
Knowledge dissemination	Via books (printed material)	Via internet and via collaboration
Perspectives (points of view)	Subjective and eliminable	Inevitable, essential part of knowledge creation
Temporal disposition	One-time units of knowledge	Continuous processes of knowledge creation

David Weinberger (2012) as it is summarized by Antti Hautamäki


Photos: G2Photo.

Pedagogical Consequences

In mathematics and science education there is a growing need to design activities, which focus on the creative process instead of emphasizing a product, which was created by following a certain plan.
(Cf. Hähkiöniemi, Fenyvesi et al., 2016)

In the case e.g. of mathematics, these kind of activities can underline the **process aspect of mathematics** (Ernest, 1989).

Photos: G2Photo.

Nowadays problem solving is not thought to be an individual work, but a collaborative effort (Hesse et al., 2015).

Connecting science, technology, engineering, arts and mathematics (cf. STEAM) in a multi- or transdisciplinary framework by solving complex problems through creative processes, can also support students to collaborate.


Photos: G2Photo.

Different students’ strengths in different areas are adding up on the group level. (Cf. Hähkiöniemi, Fenyvesi et al., 2016)

Supporting teachers and students in appreciating different types of creativities…


Kalocsai Kinga fotó


Photo: Tamás Bódi.

Art as a context for mathematical and scientific problem solving can be a fruitful starting point, as art is usually thought to include creative thinking and finding one's own way.

Creative activities may support the students to recognize that *doing "real" mathematics* and science is creative thinking; and creative thinking in mathematics and science means, that you do your own mathematics and science. (Cf. Hähkiöniemi, Fenyvesi et al., 2016)

Let the students to BUILD UP THEIR OWN MATHEMATICS and SCIENCE through play, art and creative activities!

To teach or not to teach?

- Process or product?
  - Which should we facilitate?
- Whose mathematics / science? Whose artwork?
  - Authorship / Ownership
- Creativity
  - Originality, flexibility, fluency, elaboration
- Problem solving vs. routine tasks

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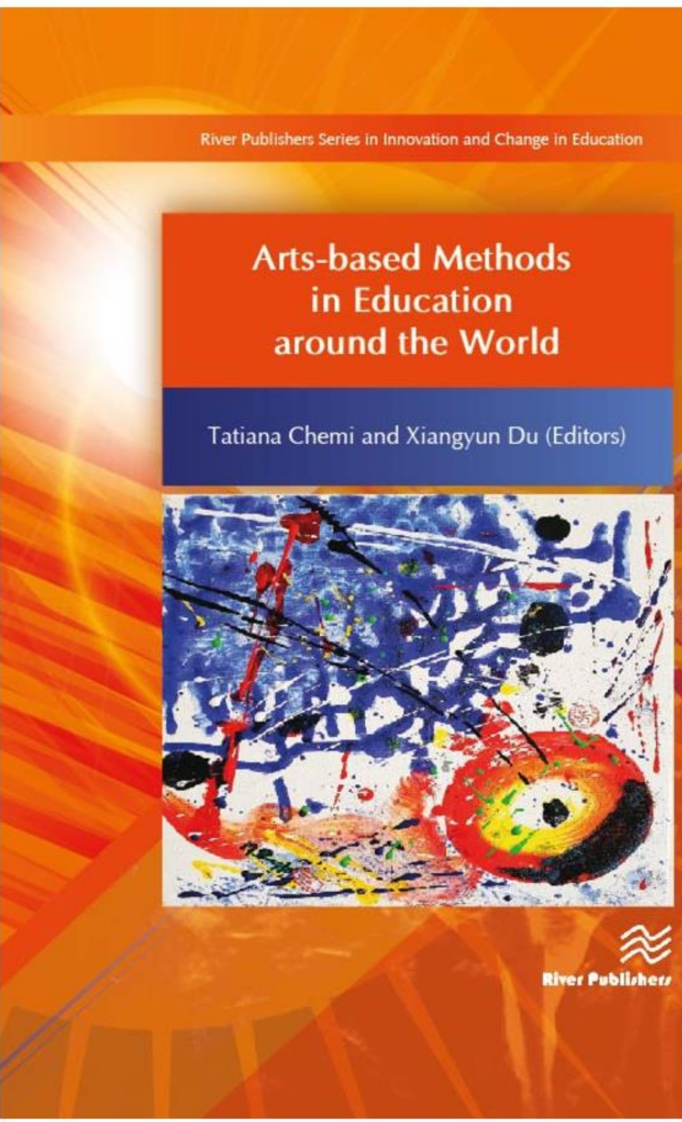
Design Pedagogy

- Problem-based learning
- Collaboration
- Focusing on material experiences
- Learning by doing
- Project-based experiences with situated learning
- *Design thinking*, as ”multiple forms of intelligence that designers employ in their approach to creativity and learning”.
- Playfulness
- Constructing, individual and social sense-making



River Publishers

The River Publishers Series in Innovation and Change in Education - Cross-cultural Perspective

Arts-Based Methods in Education Around the World

Editors:
Tatiana Chemi, Aalborg University, Denmark
Xiangyun Du, Qatar University, Qatar and Aalborg University, Denmark
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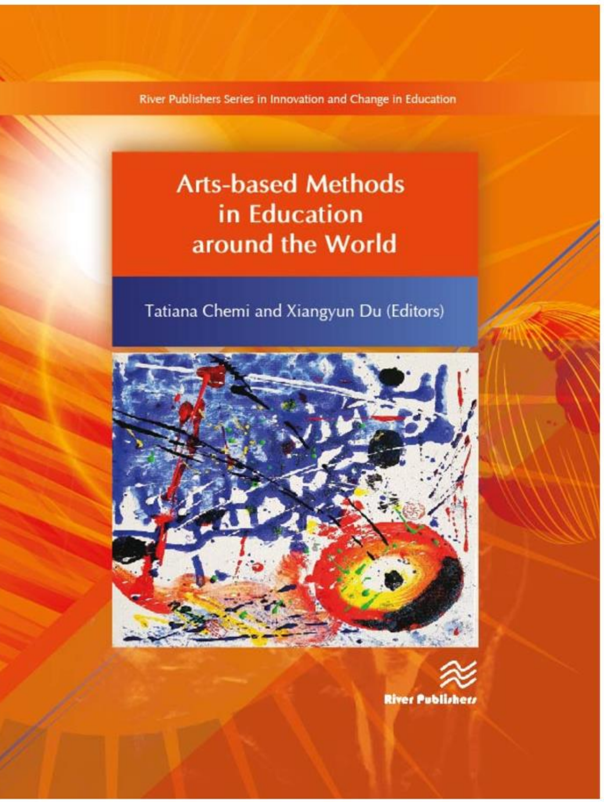
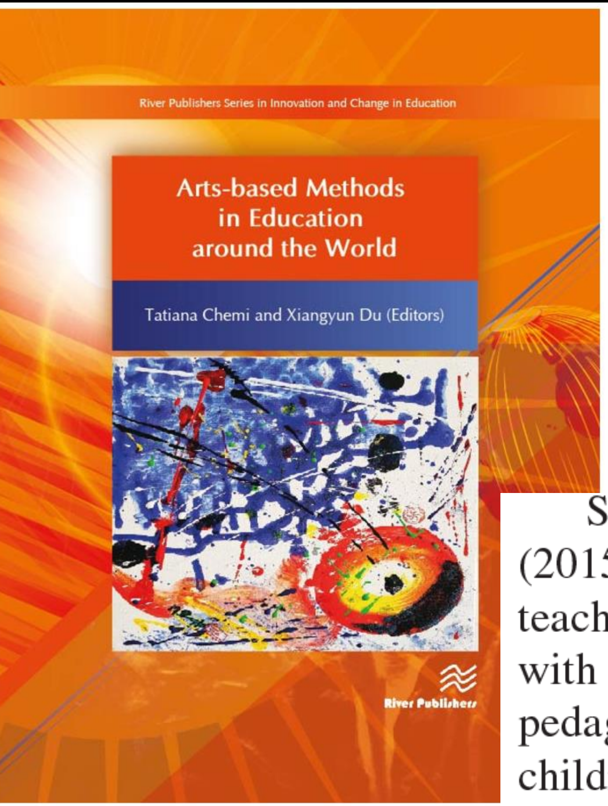
Description:
Arts-Based Methods in Education Around the World aims to investigate arts-based encounters in educational settings in response to a global need for studies that connect the cultural, inter-cultural, cross-cultural, and global elements of arts-based methods in education. In this extraordinary collection, contributions are collected from experts all over the world and involve a multiplicity of arts genres and traditions. These contributions bring together diverse cultural and educational perspectives and include a large variety of artistic genres and research methodologies.

The topics covered in the book range from policies to pedagogies, from social impact to philosophical conceptualisations. They are informative on specific topics, but also offer a clear monitoring of the ways in which the general attention to the arts in education evolves through time.

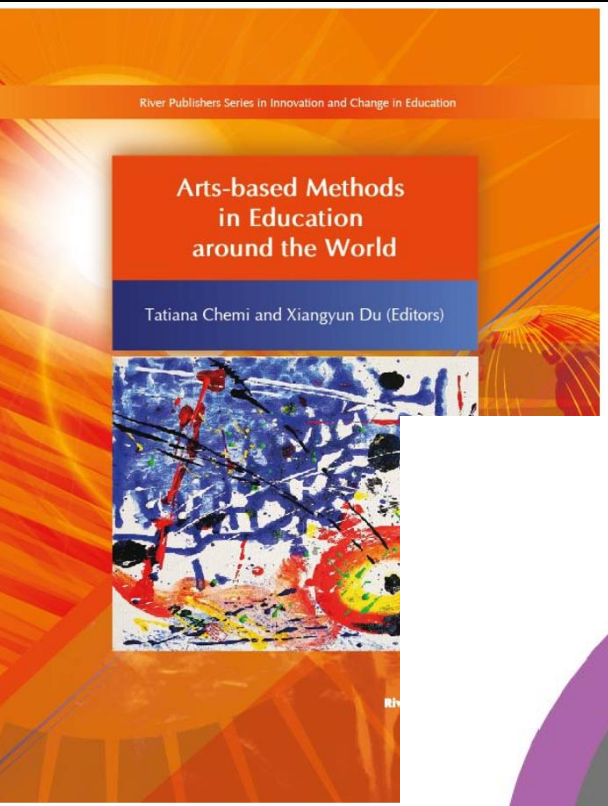
Keywords: Arts-based education, artistry in teaching, art performance, drama, inspiration, reflection, student participation, culture, arts, creativity

UNIVERSITY OF CAMBRIDGE
PRIMARY SCHOOL


River Publishers Series in Innovation and Change in Education
Arts-based Methods in Education around the World
Tatiana Chemi and Xiangyun Du (Editors)
River Publishers



Some 20 years ago a path-breaking UK creativity researcher, Anna Craft (2015), coined the term 'possibility thinking' (PT). Co-researching with teachers and practitioners in early years and primary classrooms, Craft, along with her collaborators, sought to identify the nature of PT together with pedagogical strategies that seem to foster 'what if' and 'as if' thinking in children aged 3–11. Classroom and policy strategies were devised to foster the development of PT which generates novelty operationalized by question-posing, play, immersion, innovation, being imaginative, taking risks, and self-determination within the enabling contexts of time and space which foster it (see Burnard et al., 2006). Beyond the seminal studies lead by Anna Craft and her team (Burnard et al., 2006), numerous subsequent studies were undertaken, fuelled by the potential of PT, the generative practices of artists working in collaboration with primary educators, and the importance of co-creating education futures to consider 'how' children 'might' learn creatively for the 21st century (Craft, 2015).



Arts-Based Perceptual Ecology

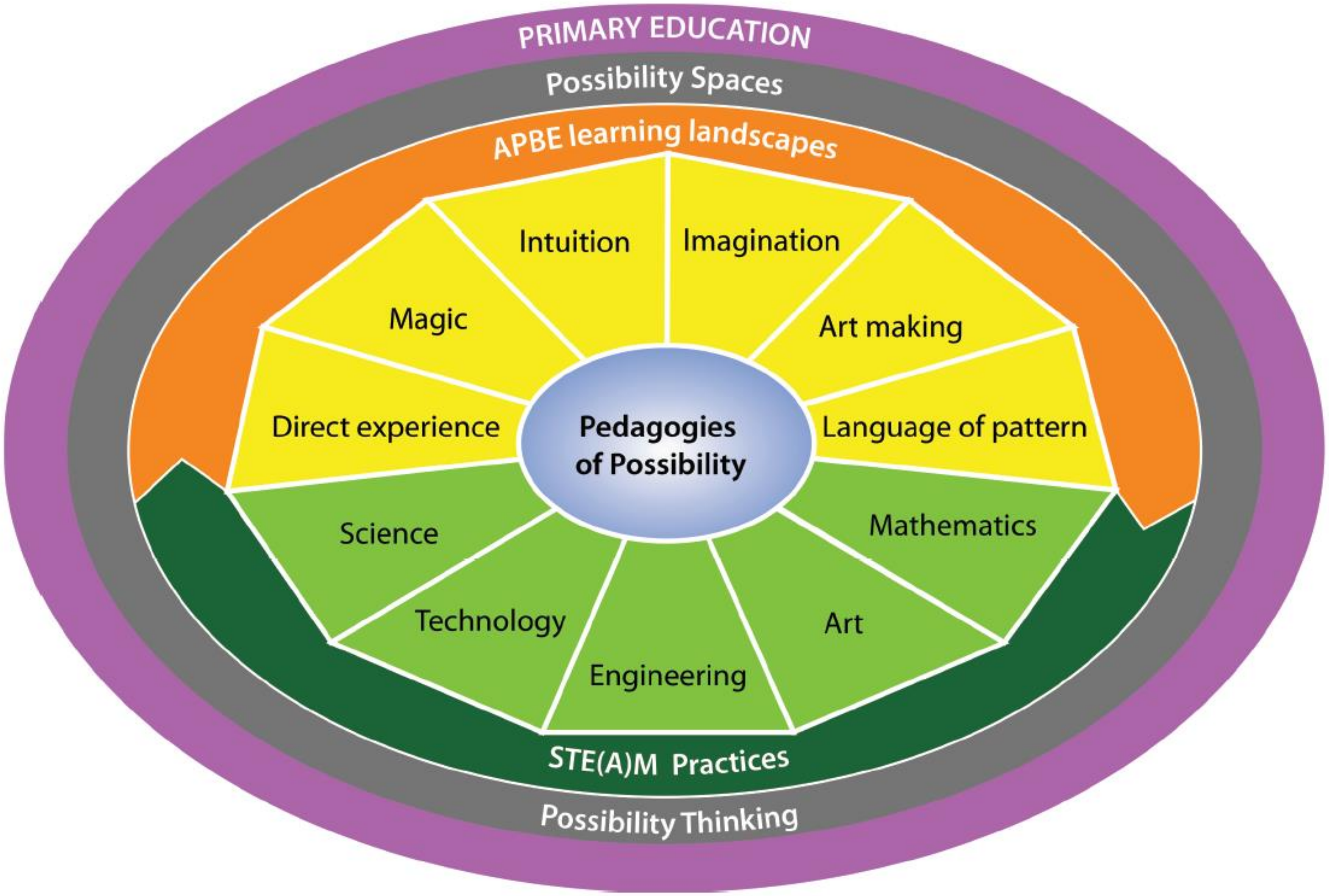


Figure 11.18 Towards a framework for innovation and change in primary education.

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.

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Kristóf Fenyvesi and Tuuli Lähdesmäki (Ed.)

Aesthetics of Interdisciplinarity: Art and Mathematics

Kristóf Fenyvesi
Tuuli Lähdesmäki
Editors

Aesthetics of Interdisciplinarity: Art and Mathematics

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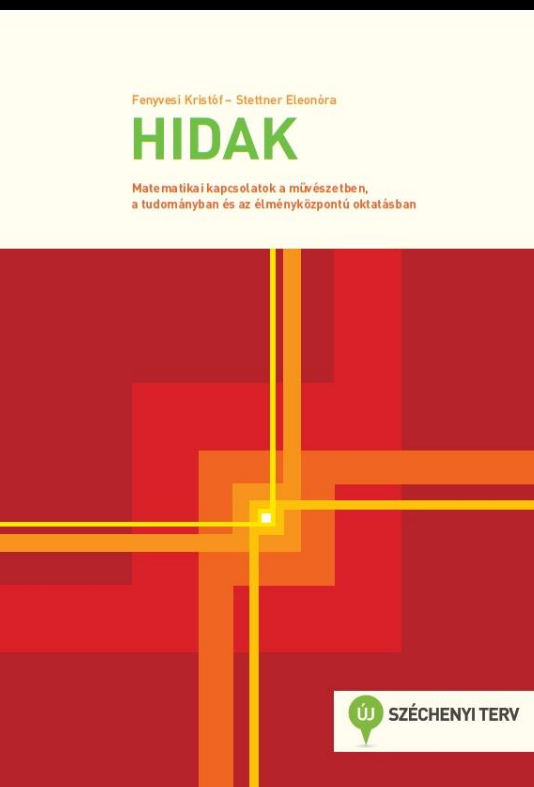
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Eds. Kristóf Fenyvesi, Ilona Oláhné Téglási & Ibolya Prokajné Szilágyi

Publisher: Eszterházy Károly College, Eger, 2014

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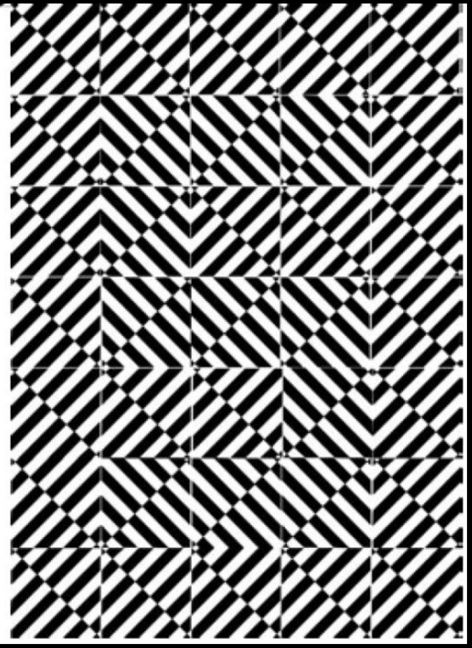

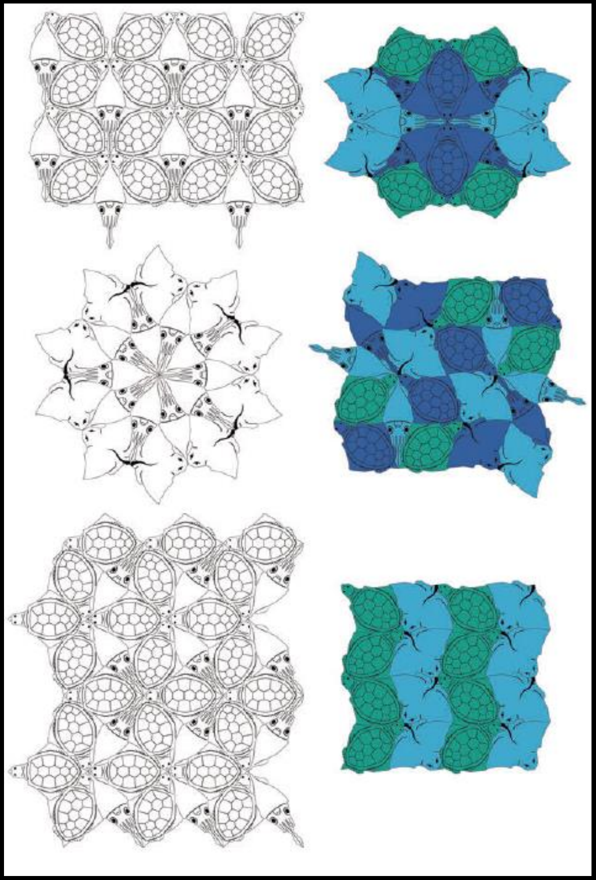

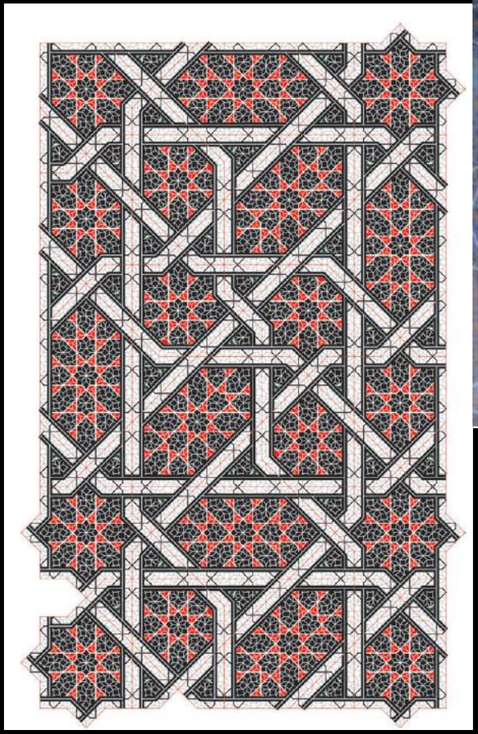

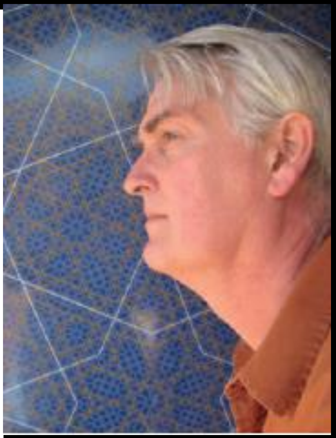

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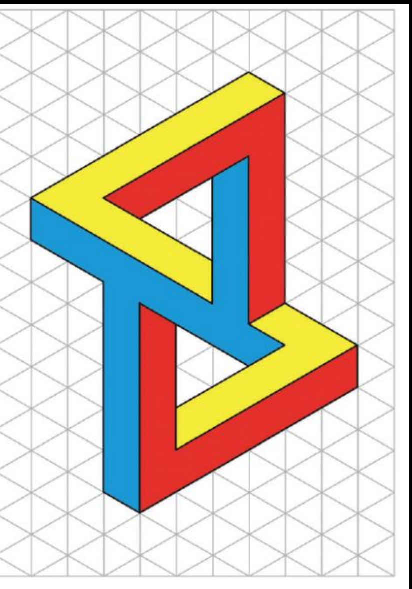

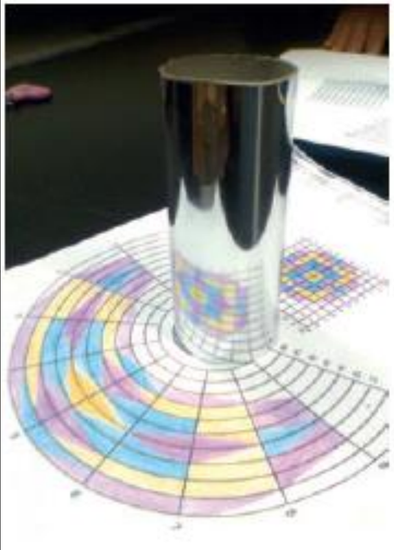

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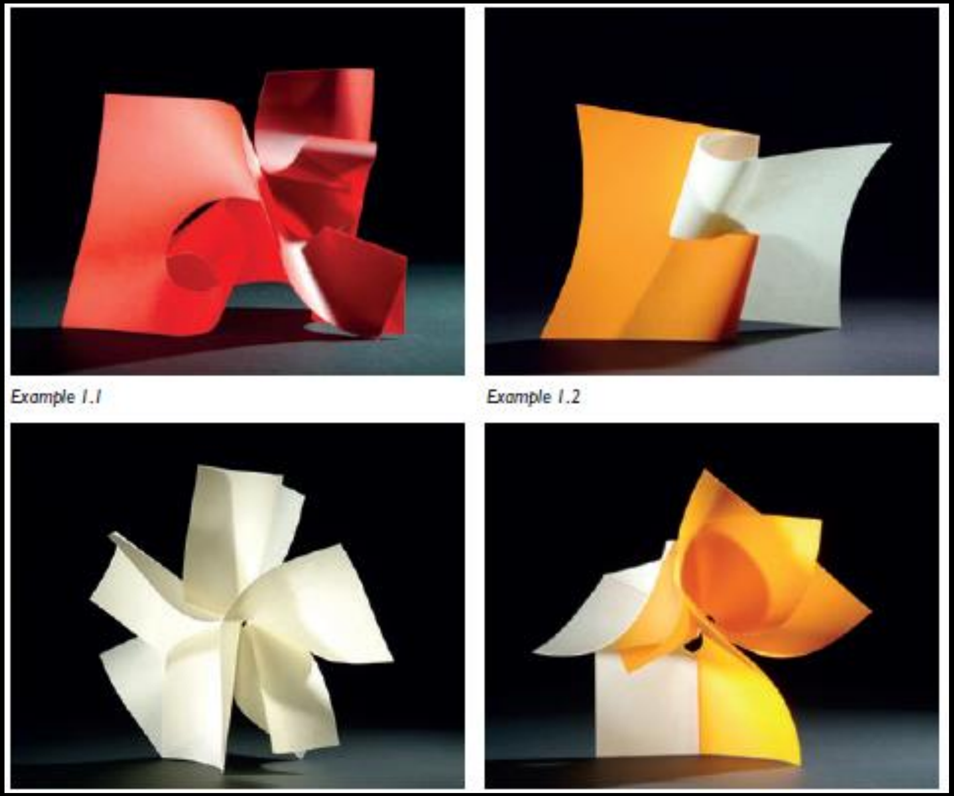

STEAM FAQ - some of the frequently asked questions from teachers who personally developed and conducted STEAM lessons in their schools:

Q: There are difficulties in operating a class according to the standards of STEAM within a fixed time frame, such as a normal length of a class (40-45 mins). How can we effectively execute a STEAM class within this 40-45-minute period?

A: It may be difficult to implement a class reflecting all of the STEAM components for a single theme within the limited time frame of 40 minutes. In this case, it is recommended to conduct a STEAM class by dividing it into two to four lessons, and it may also be efficient to guarantee the continuity of activities by using methods such as implementing block times. There are also many STEAM programs that can be conducted within a single lesson according to the theme. Thus, efforts must be taken to reorganize and apply a program to suit the situation of a pertinent school and the level of its students.

Source: https://steam.kofac.re.kr/

STEAM FAQ - some of the frequently asked questions from teachers who personally developed and conducted STEAM lessons in their schools:

Q: Each subject has its own goals, content elements, achievement standards, and achievement levels. However, STEAM has no determined specific goals or elements, and a too-open-ended scope, so a STEAM class sometimes becomes a simple program for experiencing science. Thus, it is thought that an integrative aspect related to the achievement goals and achievement level is needed rather than an integration of content elements. How can we realize this?

A: STEAM recommends that a problematic situation be presented in the real world, focusing on scientific technology, for students to plan the achievement goals and achievement level of related subjects to be reflected as much as possible. To achieve this purpose, you must compress and present contents on the subject knowledge that students need to learn, present a context to solve a problem in relation to the real world, and compose a class for students to display their creativity while looking for a solution.

Source: https://steam.kofac.re.kr/

STEAM FAQ - some of the frequently asked questions from teachers who personally developed and conducted STEAM lessons in their schools:

Q: What is the difference between a conventional project class and a STEAM class? I cannot feel a great different when I compare the two in the aspects of self-directed learning, the establishment of plans, solution of problems, mutual cooperation, and a sense of accomplishment emerging as a result of learning.

A: They are similar in the aspect of nurturing abilities to solve problems. However, there is a clear difference in that a STEAM class must satisfy the standards of STEAM (to include scientific content, to include two or more elements, and to reflect the learning standards framework). Through this process, the students can grow in their abilities to solve problems in the real world with naturally integrated knowledge from various fields of study.

Source: https://steam.kofac.re.kr/

STEAM FAQ - some of the frequently asked questions from teachers who personally developed and conducted STEAM lessons in their schools:

Q: When it is hard to simultaneously connect subjects while operating a STEAM class, how can we settle this issue?

A: They are similar in the aspect of nurturing abilities to solve problems. However, there is a clear difference in that a STEAM class must satisfy the standards of STEAM (to include scientific content, to include two or more elements, and to reflect the learning standards framework). Through this process, the students can grow in their abilities to solve problems in the real world with naturally integrated knowledge from various fields of study.

Source: https://steam.kofac.re.kr/

STEAM FAQ - some of the frequently asked questions from teachers who personally developed and conducted STEAM lessons in their schools:

Q: Some teachers deeply understand STEAM, while others may find it unfamiliar. I wonder if there is no added difficulty to introducing STEAM classes.

A: STEAM can be seen as a kind of shift in educational viewpoints. We must change the current educational viewpoint and methods for educating that focus on teachers, a single subject, traditional knowledge in studies, and control. The shift will bring more educational methods focusing on students, the integration of subjects, application, and autonomy, along with various materials and experiences through STEAM. You need not think that teachers should present everything to the students, but they should instead let students find a problem and solve it through various methods on their own to suit the STEAM class structure. You must present a guideline to students for them to find the knowledge they need and to realize this knowledge on their own through discussions.

Source: https://steam.kofac.re.kr/

STEAM FAQ - some of the frequently asked questions from teachers who personally developed and conducted STEAM lessons in their schools:

Q: An evaluation of students can be done after finishing a STEAM class. How can we evaluate the students?

A: It is recommended to evaluate the students without focusing on the results and by paying more attention to the process. The evaluation can include a mind map evaluation, learning plan evaluation, discussion evaluation, evaluation through observation, evaluation of presentations by each group, learning results evaluation, self-evaluation table, similar problem solutions, portfolio evaluation, and self-reflection journal evaluation.

Source: https://steam.kofac.re.kr/

Interested in STEAM? Looking for support in connecting mathematics & art in education? Do you have a good idea?

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