The Evolution of Education to Education 4.0:
The STEAME School of the Future

Dr Gregory Makrides
Professor of STEAME Education
25 January 2022
The Evolution of Education to Education 4.0: The STEAME School of the Future

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Einstein said

“Imagination is more important than knowledge. Knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.”
1950  With air-condition  2022 with air-condition
1960 portability

2020+ portability
➢ Authoritarian
➢ The student is the passive recipient

➢ Teacher-centered system - the teacher gives knowledge as the absolute leader in the classroom

➢ Technology is forbidden in the classroom
Communication and collaboration are starting to grow

Exam-based approach - the result is the examination - Memorization of knowledge

An underestimated student-centered approach, we call it but do not apply it.

the schools are still talking about hours of teaching .......... But they should talk about hours of learning !!!
➢ Invasion of technology and social networking
➢ We apply technology to the classroom as a trend indicator, but ...... the class continues to have the same structure.
➢ Complete confusion .... .. students know the technologies better than teachers
➢ No design for what is used and what is not
➢ Many choices, there is no money for buying and applying, uncoordinated technology correlation with the curriculum .... .. the system can not properly follow the evolution of technology .... there is no teacher training ...... data is everywhere .... .. Google Search faster from traditional libraries .... the web knows more than our teacher ....WE WERE NOT READY FOR COVID-19
➢ Students give technical knowledge to their teachers ....
➢ Student-Centered approach
➢ The teacher is transformed into a Coordinator/facilitator, advisor, learner and practice guide
➢ The student is researching
➢ Flip classroom method applies
➢ More dialogue, technology is everywhere, the student is self-learning and everywhere.
➢ The classical style classroom no longer exists
➢ Lesson Plans are now called...

... Learning Plans
Project Based group learning
Learning spaces of the future
Learning spaces of the future
➢ Co-creation and innovation in the centre
➢ Whenever and Wherever
   Flipped classroom applied (Hybrid Learning Environments)
   Interactive practical exercise – F2F or Distance
➢ Learning is done at home or outside school, while in school students develop skills
➢ Development of personalized teaching and learning
➢ Learning Plans are now called Learning & Creativity Plans
➢ The technology
   Its free or/and easily accessible,
   Increased use of virtual reality, artificial intelligence, etc
   Continuous evolution and innovation and therefore a need for development of Competences and Skills so people become Adaptable to Change
STEAME: Guidelines for Developing and Implementing STEAME Schools

What was needed?

Model of STEAME Schools
Guidelines for STEAME Activities in Schools
Guidelines for cooperation between teachers of different disciplines
New organizational structures for STEAME schools
Training of Teachers - help them to adapt
Dynamic Change in Curricula, Tools, Methods
Outputs

➢ O1. Guidelines for dynamic and adaptive STEAME curricula – published
➢ O2. Guidelines for STEAME Activities in Schools for two age groups – published
O1. Guidelines for dynamic and adaptive STEAME curricula

CONTENTS
- CHAPTER 1 Approaches to teaching
- CHAPTER 2 Materials for teaching
- CHAPTER 3 Entrepreneurship aspects
- CHAPTER 4 Organizational suggestions for STEAME-oriented teaching
- CHAPTER 5 Propositions and analysis of STEAME-oriented curriculum- Adaptability and dynamics characteristics
O2. Guidelines for STEAME Activities in Schools for two age groups

CONTENTS

➢ CHAPTER 1. THE STEAME FRAMEWORK OF LEARNING AND CREATIVITY PLANS
➢ CHAPTER 2. GUIDE TO LEARNING AND CREATIVITY PLAN DEVELOPMENT
➢ CHAPTER 3. STEAME LEARNING AND CREATIVITY PLANS
➢ CHAPTER 4. COOPERATION AND CREATIVITY PROGRAM BETWEEN SCHOOLS & INDUSTRY
➢ CHAPTER 5. STEAME OBSERVATORY

Languages:
English, Polish, Italian, Bulgarian, Greek
What is a STEAME Learning and Creativity Plan

- Empty template available for use in the Observatory in EN, GR, IT, BG, PL
- Completed STEAME L&C Plans in the STEAME OBSERVATORY
- Designed for minimum 2 teachers collaboration
- It includes the 18 steps prototype teacher cooperation for STEAME project activity

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STAGE 1: Preparatory steps for two teachers [STEPS 1-4], and
STAGE 2: Action Plan Formulation [Preparation STEPS 5-13]

1. Overview

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### STEAME L&C Plans: Evaluation Rubric

#### STEAME student evaluation rubric

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<thead>
<tr>
<th>1. STEAME Subjects (overall performance of respective concepts/discipline/content of K-12 level)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - N/A</td>
</tr>
<tr>
<td>Science</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Competences (knowledge, skills, values, attitudes)</th>
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</thead>
<tbody>
<tr>
<td>basic/beginning</td>
</tr>
<tr>
<td>creativity, innovation</td>
</tr>
<tr>
<td>oral - written language</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Project Management, Development and Realisation Processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>basic/beginning</td>
</tr>
<tr>
<td>goal achievement and motivation</td>
</tr>
<tr>
<td>construction, artifacts, production outputs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Formative Assessment (specify at each L&amp;C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D - limited/poor</td>
</tr>
<tr>
<td>Student Assessment by Teacher</td>
</tr>
<tr>
<td>Self - Group*</td>
</tr>
<tr>
<td>Self - Student*</td>
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The STEAME Observatory

1. STEAME PROJECT OUTPUTS

2. LEARNING & CREATIVITY ACTIVITIES/PLANS 
   GRADES 7-9 (COLLECTION) LEARNING & 
   CREATIVITY PLANS WITH RELATED MATERIAL

4. STEAME SCHOOL SITES LINKS

6. Journal of STEAME Creations for and by School 
   students

8. EXPERIMENTS OR SCHOOL PROJECTS/CREATIONS 
   & LINKS TO VIDEOS, SITES GRADES 7-9

10. STEAME EVENTS

12. STEAME COMPETITIONS

3. LEARNING & CREATIVITY ACTIVITIES/PLANS 
   GRADES 10-12 (COLLECTION) LEARNING & 
   CREATIVITY PLANS WITH RELATED MATERIAL

5. STEM → STEAM → STEAME COURSES

7. STEM-STEAM-STEAME EU FUNDED PROJECTS

9. EXPERIMENTS OR SCHOOL PROJECTS/CREATIONS 
   & LINKS TO VIDEOS, SITES GRADES 10-12

11. STEAME INFOGRAPHICS

13. PHOTOS & VIDEOS OF STEAME SCHOOLS

WEB-LINK
Modules 1-2. How to construct Learning & Creativity plans
Module 3. How teachers can work together (18 steps prototype and other aspects)
Module 4. How to help teachers and students work online (Hybrid environments)
Module 5. How to support students in making oral presentations
Module 6. How to write papers/reports
Module 7. How to work on projects (Inquiry Based Learning, Project Based Learning)
Module 8. How to work on projects (peer questions)
Module 9. How to develop STEAME schools (Type A and Type B Schools, survey results)
Module 10. Evaluating STEAME project/activities work of students (Evaluation rubrics etc)
Module 11-12: Course Assignment hands on development of a L&C Plan

Listed in EPALE Platform as a KA1 course
➢ Students can publish their project work and results
O3. Guidelines for STEAME School Organizational Structure

TYPE A: How can we run STEAME activities in current school infrastructures?

TYPE B: What should a future school look like in order to best run STEAME activities?

KA1 four days STEAME training course for teachers, is published for

CONTENTS

INTRODUCTION (translated in all partner languages - Polish, Italian, Bulgarian, Greek)

CHAPTER 1. OVERVIEW AND CONTEXT

CHAPTER 2. RESULTS FROM THE SURVEY

CHAPTER 3. RESULTS FROM THE FOCUS GROUPS

CHAPTER 4. THE STEAME TRAINING COURSE FOR TEACHERS, SCHOOL HEADS AND AUTHORITIES

CHAPTER 5. ORGANIZATIONAL STRUCTURE OF STEAME TYPE A SCHOOLS – EXISTING

CHAPTER 6. ORGANIZATIONAL STRUCTURE OF STEAME TYPE B SCHOOLS – NEWLY ESTABLISHED SCHOOLS

CHAPTER 7. POLICY RECOMMENDATIONS (translated in all partner languages - Polish, Italian, Bulgarian, Greek)
Selected results from the ONLINE European survey conducted in 2020

122 responses form expert teachers and school principals

Project Number: 2019-1-CY01-KA201-058240
The STEAME programme should shape the education process of the school and the classroom design, not the other way around.
The classroom layout should be aligned with the outcomes of STEAME and blended learning
The classroom furniture has to be moveable in order to enhance layout flexibility.
To achieve blended learning the STEAME classroom should be

- Part of a flexible infrastructure: 42
- An open space interior design: 21
- A large room: 12
- Equipment and technologies: 2
- It is irrelevant: 2
The classroom should be

<table>
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<tr>
<th>Design Type</th>
<th>Number</th>
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<tbody>
<tr>
<td>Purposefully designed for STEAME</td>
<td>105</td>
</tr>
<tr>
<td>Designed in a classical way (in rows)</td>
<td>15</td>
</tr>
<tr>
<td>Both</td>
<td>4</td>
</tr>
<tr>
<td>Flexible</td>
<td>2</td>
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Ideas related to the assessment, teacher needs

➢ Assessment should be creation-based, without the typical exams but outcome assessment and creativity assessment.
➢ Assessment should become a co-assessment between teachers who need to learn to work together in different fields and with groups of students.

Thus, teachers need training for the change of mode of facilitating the learning and assessment.
STEAME schools must integrate the following spaces

- Studying space on a creative environment
- Direct instruction space for small teams of students focused on teamwork on projects with the necessary equipment
- Exchange space for collaborative learning with peer delivered content
- Space for personalized learning, individual research activities, assisted by online or offline content (texts, graphs, pictures, audio and video content)

The diagram shows the percentage of schools that integrate these spaces:

- Studying space on a creative environment: 82%
- Direct instruction space: 82%
- Exchange space: 84%
- Personalized learning space: 93%
Ideas related to the evolution of practices

➢ Without paper books, all books should be digital

➢ Students come to school without school bags, only tablets where they keep everything

➢ Schools should have internet but NO WIFI

➢ Schools should be all day schools from 8 to 5 without homework. After 5 pm it should be play time.
Architectural Designs and Animations

STEAME School of the future
...follow the design of bee swarn cells....
BASEMENT
STEAME THEATRE
MAIN LABS
B1.1 Main Biology Lab
B1.2 Main Chemistry Lab
B2.1 Main Physics Lab
B2.2 Main Mathematics Lab
B3.1 Main Construction and 3D printers Lab
B3.2 Main Environmental Lab
B4.1 Main Robotics Lab
B4.2 Main Computing and Software Lab
B5.1 Main Prototype Development Lab
B5.2 Main VR Centre Lab
B6.1 Main Skills and Talent Development Lab
B6.2 Main STEAME Communication Lab
➢ Additional VR rooms
➢ Learning stations
➢ Entry into amphitheatres
Specs

Ground Floor

Satellite Labs
- G3.1 Biology-Chemistry S-Lab
- G4.1 Physics-Mathematics S-Lab
- G5.1 Industry Liaison Office
- G5.2 Virtual Business Centre
- G1.1 Robotics – Computing –Multimedia S-Lab
- G1.2 Sound-proof student meeting room
- G2.2 Construction- Environmental S-Lab
- G2.1 Sound-proof student meeting room
- G3.2 Sound-proof student meeting room
- G4.2 Sound-proof student meeting room
- Individual Learning Stations as private u-shape booths
- Open space movable furniture for small group work by students
- Courtyard
- Reception area
- Entry into amphitheatres
THE VERY QUIET FLOOR – THE IDEAS FLOOR
➢ Open space flexible movable furniture for student groups
➢ Co-creation Train moving …with group siting stations
➢ Learning Centres/Rooms
➢ Additional Learning Stations
➢ Entry into amphitheatres
➢ Slow Moving STEAME train
➢ Administration offices
Specs
Roof

➢ Recreation spaces
➢ Cafeteria
➢ Garden and Lake
➢ Photovoltaics
➢ Football court
➢ Athletic field
➢ Open Amphitheatre
BASEMENT
1:2000 @ A4
Satellite Labs
G1.1 Robotics – Computing – Multimedia S-Lab
G2.2 Construction – Environmental S-Lab
G3.1 Biology-Chemistry S-Lab
G4.1 Physics-Mathematics S-Lab

GROUND FLOOR
1:2000 @ A4
MULTI-SPORTS FIELDS OF THE FUTURE

VIDEO
FIRST FLOOR STEAM TRAIN
Colour of School changes every day
Colour of School changes every day
International Sign Language (IS) to be learned by all

InSign- Advancing inclusive education through International Sign
Architectural Designs in short animation
How can we change current learning structures in schools into STEAME project based learning structures?

3 Steps for change to the future from Education 2.0 to Education 4.0
STRATEGIC ACTION 2
(The paradigm shift of school learning environments)

- Step 2. Train teachers how to cooperate between different disciplines and how to develop (co-create) STEAME Learning & Creativity plans. Train teachers how to cooperate with academic and industry and how to do STEAME related activities in hybrid environments.
  Give teachers freedom to create. Give students freedom to create.
STRATEGIC ACTION 3
(The paradigm shift of school learning environments)

- Step 3. Create open spaces in current schools or build the new schools with more open spaces for project based cooperative work between students. Create appropriate laboratories for creative work.
How can we change current learning structures in schools into STEAME project based learning structures?

3 Steps for change from Education 2.0 to Education 4.0

➢ Step 1. Secure digital learning through learning videos created by teachers.

➢ Step 2. Train teachers how to cooperate between different disciplines and how to develop (co-create) STEAME Learning & Creativity plans. Train teachers how to cooperate with academic and industry and how to do STEAME related activities in hybrid environments. Give them freedom to create.

➢ Step 3. Create open spaces in current schools or build the new schools with more open spaces for project based cooperative work between students.
Building more blocks
Creating the critical mass
Completing the puzzle

Erasmus+

Project
STEAME GOES HYBRID
Blueprint Guidelines and Policy Recommendations

Started on 1 May 2021
Completing the puzzle

STEAME GOES HYBRID

Blueprint Guidelines and Policy Recommendations

➢ O1: Blueprint Guidelines for Hybrid STEAME activities
➢ O2: Training Programme for facilitating the implementation of STEAME L&C Plans by SE teachers and Piloting the Blueprint Guidelines
➢ O3: STEAME HYBRID Blueprint at a glance: Policy Recommendations and School Label Development
NEW PROJECTS

ETRE: Empowering schools’ transition readiness to a distance/hybrid learning model enhanced by cloud technology tools (http://etre-project.eu/)
Started on 1 June 2021

ONLIFE: Empower Hybrid Competencies for ONLIFE Adaptable Teaching in School Education in times of pandemic, (http://onlife.up.krakow.pl)
Started on 1 June 2021
BYOD-Learning
Learning at Any Time, at Any Place via any Device

R1- **European Platform of Video Lessons** hosting videos accessible by teachers, students at any time and any place and through any device applying an approach of BYOD (Bring Your Own Device).

R2- **Methodology and specifications for the design of the video lessons** and set of digital tools and guidance on the digitalisation of the educational content to facilitate the learning process.

R3- **Training course for supporting teachers and educators to digital transformation** through development of digital readiness, resilience and capacity in mathematical education.
TTF
Teach the Future
Started on 1 January 2022

R1. Report: Teaching the future – climate, citizenship and digital teaching – curriculum and pedagogical guidelines

R2. Digital data dashboard for accessing climate data / information

R3. Teach The Future Teacher training course
E=MD^2
Excellence in Math Education through (e-)Debate and Diversity
Starting on 1 February 2022
FACILITATE – AI: Guidelines for facilitating the learning of Artificial Intelligence (AI) by School Students of Grades 7-12

Starting on 1 February 2022

➢ R1. AI Teaching Guide for teachers facilitating the learning of students in grades 7-12
➢ R2. Training Course for Facilitators of learning in AI-STEAME Education
➢ R3. Dynamic Online Learning Environment with OER on AI in interdisciplinary STEAME school subjected with a set of Blueprint Policy Recommendations
STEAME ACADEMY
STEAME TEACHER FACILITATORS ACADEMY
KA2 PROGRAMME TEACHER ACADEMIES
Submitted 7 September 2021
Completing the puzzle

European STEAME School Students Community
KA2 Small Scale project
Submitted 3 November 2021

Expecting results
New proposal to be submitted in 2022

STEAME-PARENTS

And the Puzzle of the Paradigm Shift would probably be completed

The yeast is ready.....lets make the bread!
Students are ready,

........we are not ready for them!
We invest in the development of competence and skills

...the competences to discover, recall and apply knowledge and the competence to self-adapt to change in technologies!
Some Important Related Events

EUROMATH & EUROSCIENCE 2022
Conference for school students and their teachers
27 June – 1 July 2022, in Thessaloniki, Greece

Watch Video – 60 sec

www.euromath.org

EUROMATH & EUROSCIENCE 2022
VENUE: GRAND PALACE HOTEL, THESSALONIKI GREECE
DATES: 27 JUNE - 1 JULY 2022

Project Number: 2019-1-CY01-KA201-058240
More STEAME Opportunities and challenges

The EUROPEAN STEAME Communication Competitions

➢ For adults, with international participation
➢ Pre-video submission for phase 1 is required
➢ Communicate STEAME Subjects in 5 minutes and win your place at the finals of the European STEAME Communication Competition 2022
Journalistic Article Competition for School Students

For students of ages 10-19, Deadline 2 May 2022

THEME
“The Role of Mathematics in STEAME Education”
European Comic Poster Competition in STEAM 2022

For students of age 14-18

https://steam-edu.eu/#competitions
STEAME SUMMER CAMP 2022

25-30 July 2022, Agros, Cyprus

www.thalescyprus.com

For grades 4-9 (Ages 10-15)

INNOMATH MID DAY 2022

VIDEO
Thank you!

www.steame.eu

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