The Evolution of Education to Education 4.0 :

The STEAME School of the Future

Dr Gregory Makrides

Professor of STEAME Education

25 January 2022

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

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Project Number: 2019-1-CY01-KA201-058240

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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."

Thales Foundation

CYPRUS MATHEMATICAL SOCIETY 1983 CY.M.S.

1922

2022

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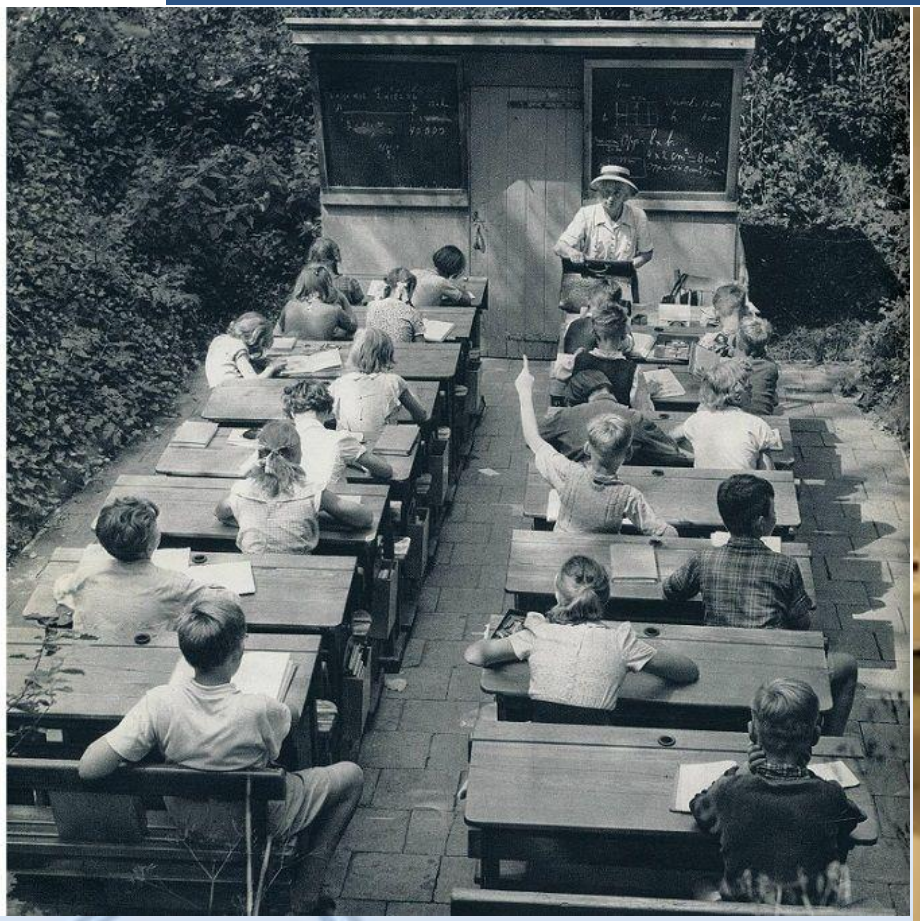
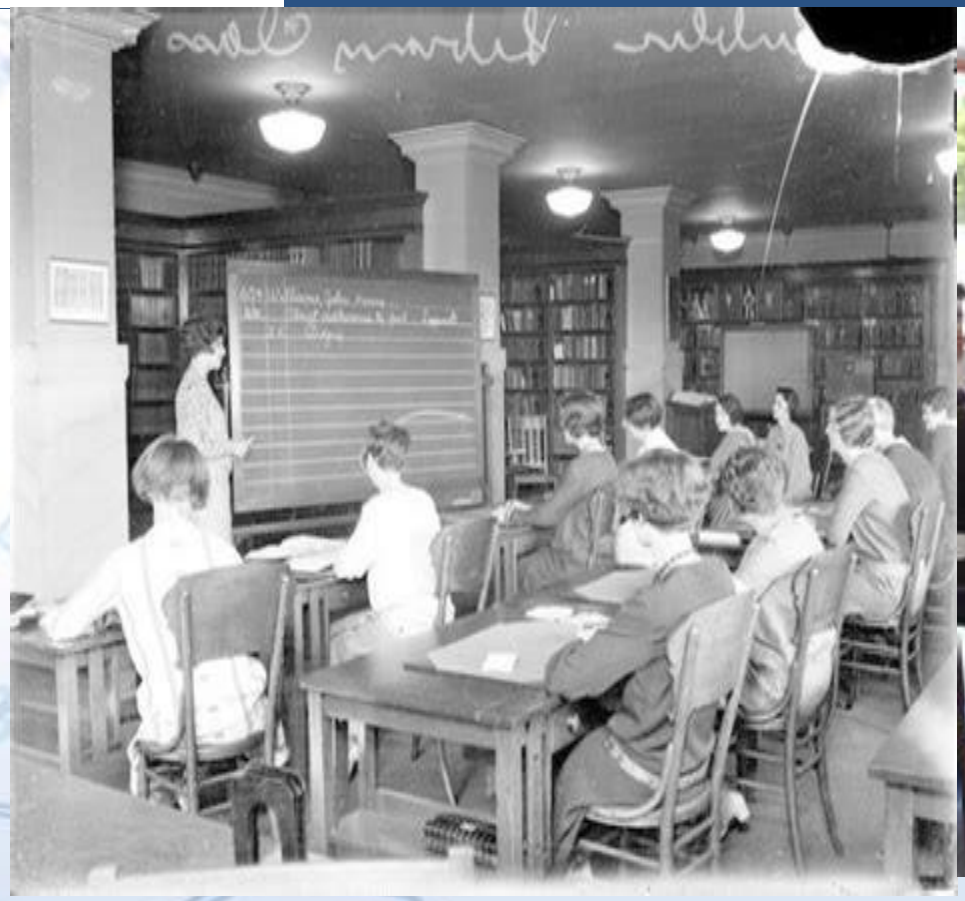


1950 With air-condition

2022 with air-condition

Thales Foundation

CYPRUS MATHEMATICAL SOCIETY 1983 CY.M.S.



1960 portability

2020+ portability

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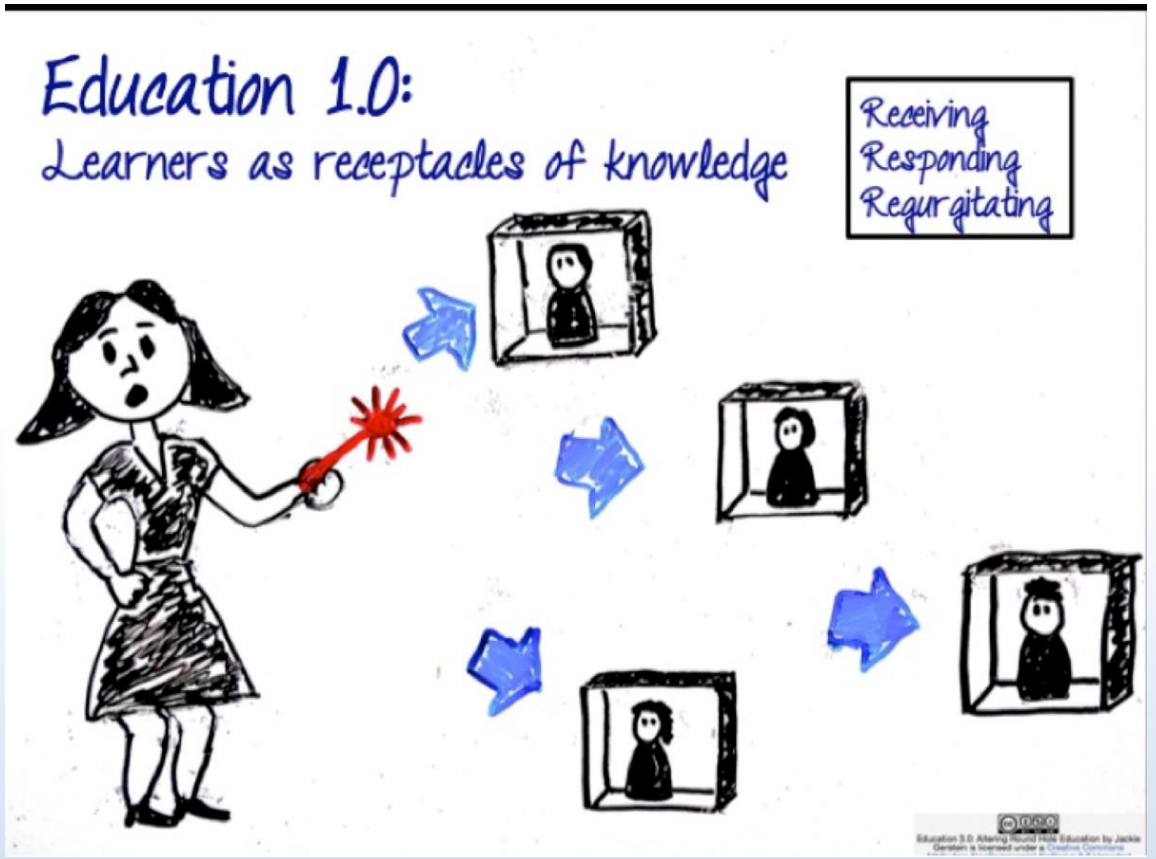
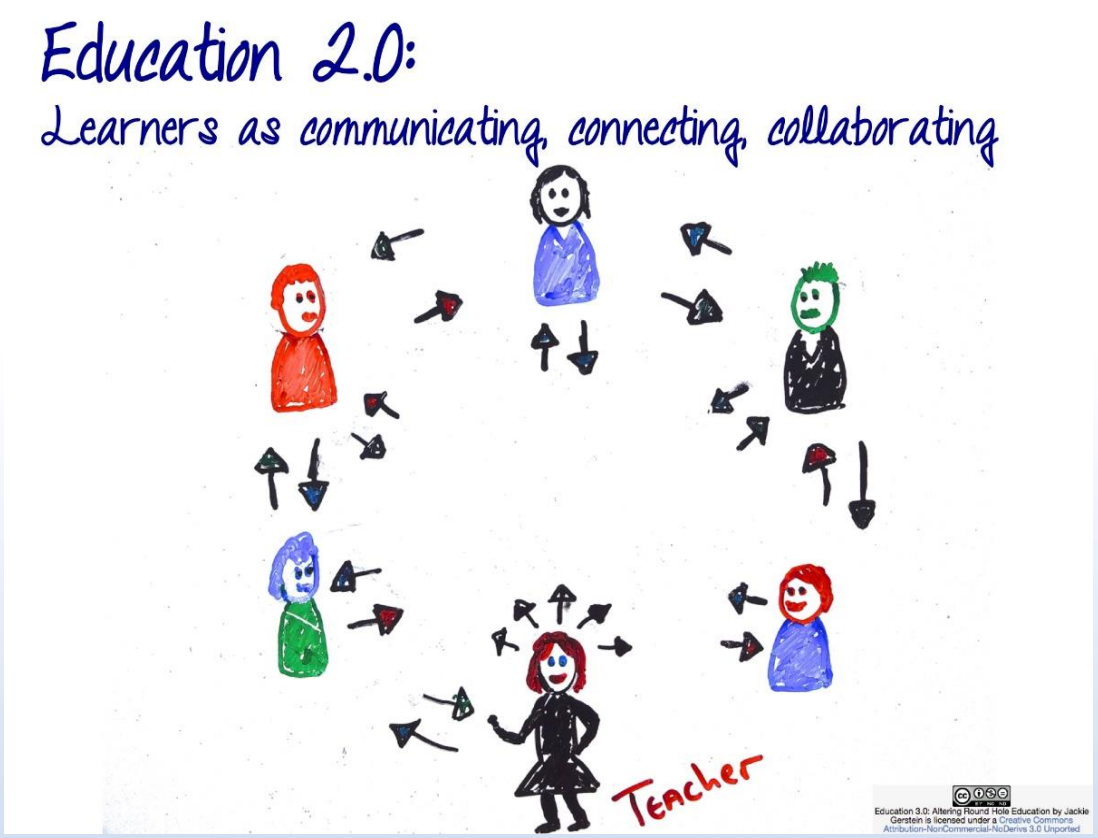
EDUCATION 1.0

- 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



EDUCATION 2.0

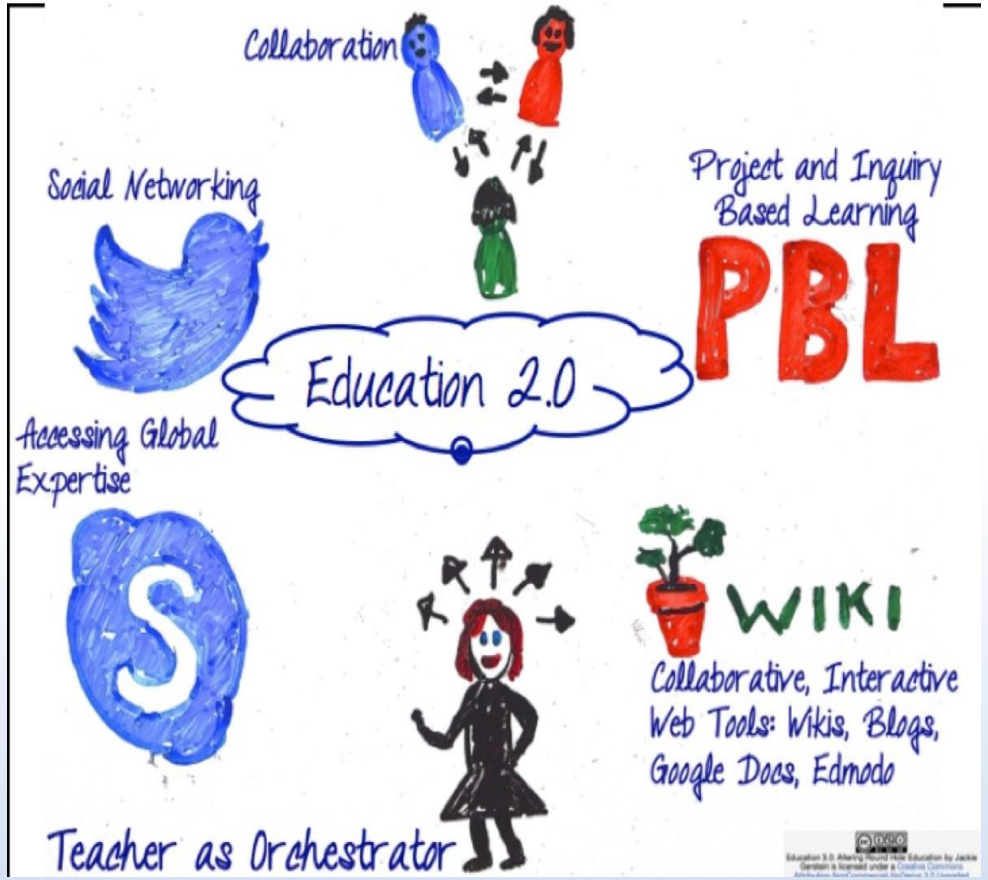
- Communication and collaboration are starting to grow
- Exam-based approach - the result is the examination - Memorization of knowledge
- An underestimated student-centered approach, we call it but do not apply it.
- the schools are still talking about hours of teaching ..... But they should talk about hours of learning !!!



Continue 2.0

EDUCATION 2.0

- 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 ....



EDUCATION 3.0

- 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

STEAME
SUMMER
CAMP
2021

Learning spaces of the future

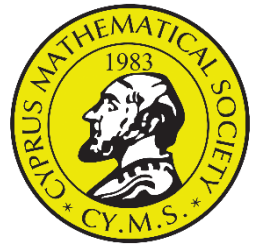
2025+

Learning spaces of the future

2030+

EDUCATION 4.0

- 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



2.0
Lesson Plans

3.0
Learning Plans

4.0
Learning
&
Creativity Plans

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November 2019 – December 2021, just the beginning…

STEAME : Science-Technology-Engineering-Arts-Mathematics-Entrepreneurship

www.steame.eu

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

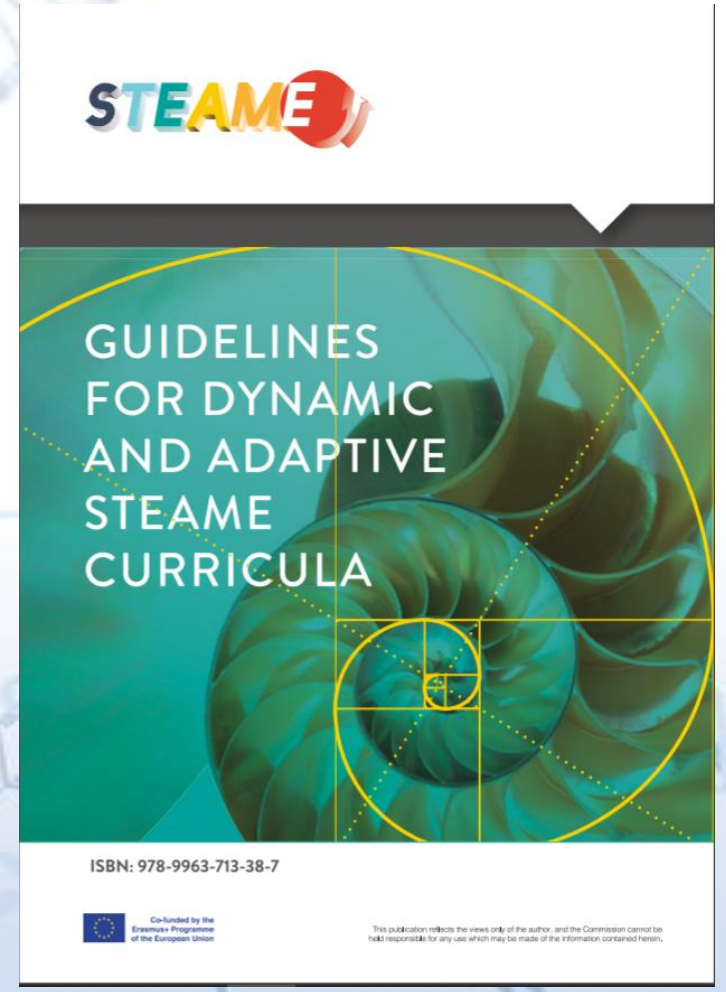
Co-funded by the Erasmus+ Programme of the European Union

Outputs

- O1. Guidelines for dynamic and adaptive STEAME curricula – published
- O2. Guidelines for STEAME Activities in Schools for two age groups – published
- O3. Guidelines for STEAME School Organizational Structure – published

Project Number: 2019-1-CY01-KA201-058240

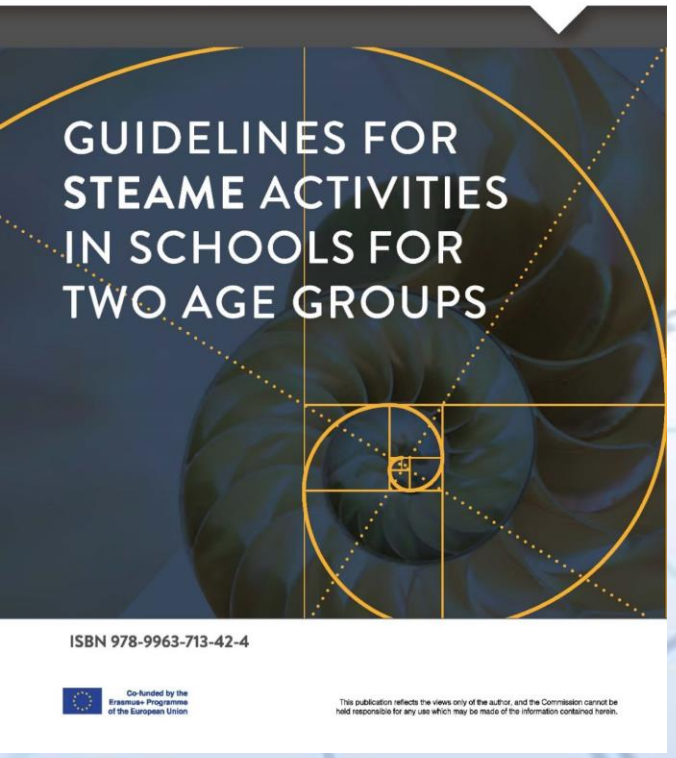
➢O1. Guidelines for dynamic and adaptive STEAME curricula



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

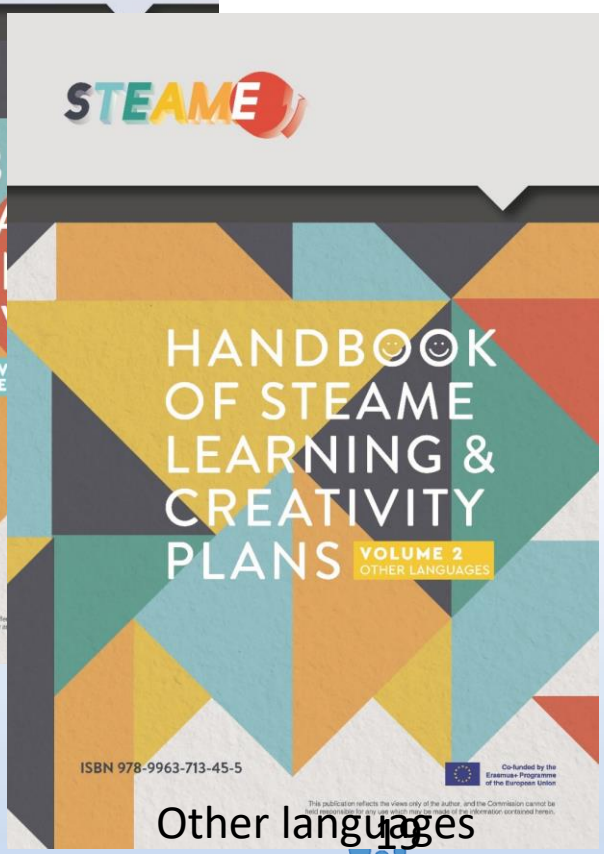


CONTENTS

- **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

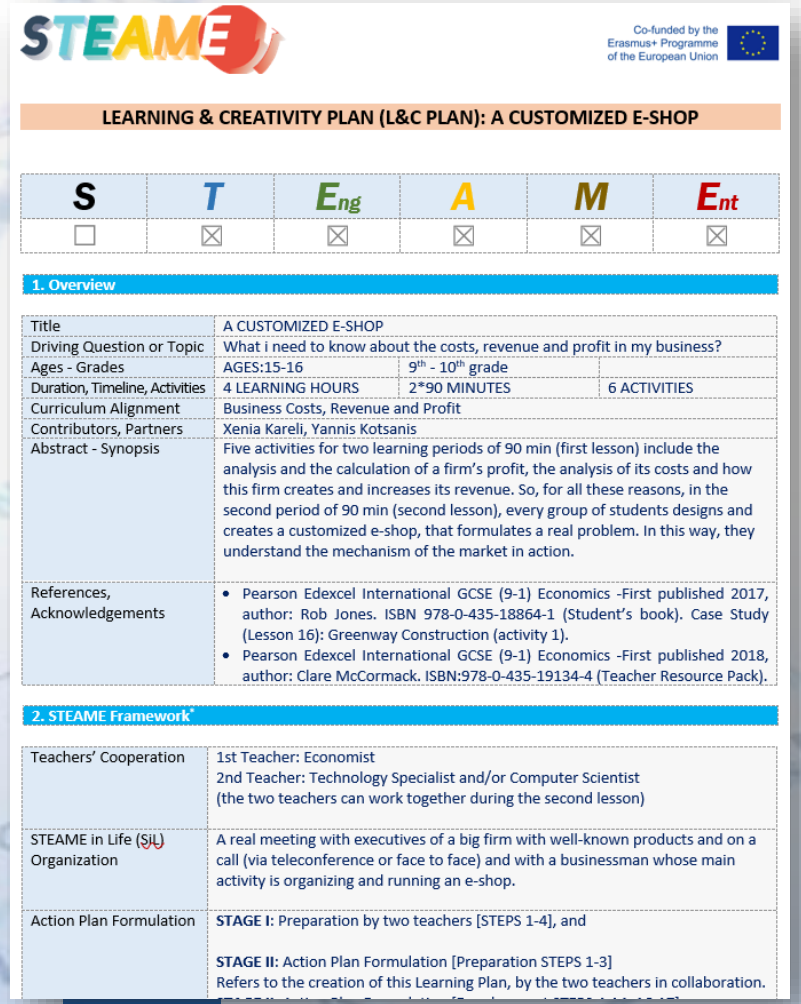
Languages:
English, Polish, Italian, Bulgarian, Greek

English version



Other languages

What is a STEAME Learning and Creativity Plan



STEAME

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LEARNING & CREATIVITY PLAN (L&C PLAN): A CUSTOMIZED E-SHOP

S	T	Eng	A	M	Ent
☐	☒	☒	☒	☒	☒

1. Overview

Title	A CUSTOMIZED E-SHOP		
Driving Question or Topic	What i need to know about the costs, revenue and profit in my business?		
Ages - Grades	AGES:15-16	9th - 10th grade	
Duration, Timeline, Activities	4 LEARNING HOURS	2*90 MINUTES	6 ACTIVITIES
Curriculum Alignment	Business Costs, Revenue and Profit		
Contributors, Partners	Xenia Kareli, Yannis Kotsanis		
Abstract - Synopsis	Five activities for two learning periods of 90 min (first lesson) include the analysis and the calculation of a firm's profit, the analysis of its costs and how this firm creates and increases its revenue. So, for all these reasons, in the second period of 90 min (second lesson), every group of students designs and creates a customized e-shop, that formulates a real problem. In this way, they understand the mechanism of the market in action.		
References, Acknowledgements	• Pearson Edexcel International GCSE (9-1) Economics -First published 2017, author: Rob Jones. ISBN 978-0-435-18864-1 (Student's book). Case Study (Lesson 16): Greenway Construction (activity 1). • Pearson Edexcel International GCSE (9-1) Economics -First published 2018, author: Clare McCormack. ISBN:978-0-435-19134-4 (Teacher Resource Pack).		

2. STEAME Framework*

Teachers' Cooperation	1st Teacher: Economist 2nd Teacher: Technology Specialist and/or Computer Scientist (the two teachers can work together during the second lesson)
STEAME in Life (SiL) Organization	A real meeting with executives of a big firm with well-known products and on a call (via teleconference or face to face) and with a businessman whose main activity is organizing and running an e-shop.
Action Plan Formulation	**STAGE I:** Preparation by two teachers [STEPS 1-4], and **STAGE II:** Action Plan Formulation [Preparation STEPS 1-3] Refers to the creation of this Learning Plan, by the two teachers in collaboration.

- **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**

STAGE	**Activities/Steps** Teacher 1 (T1) Cooperation with T2 and student guidance	**Activities /Steps By Students** Age Group: ____	**Activities /Steps** Teacher 2 (T2) Cooperation with T1 and student guidance
A	Preparation of steps 1,2,3		Cooperation in step 3
B	Guidance in step 9	4,5,6,7,8,9,10	Support guidance in step 9
C	Creative Evaluation	11	Creative Evaluation
D	Guidance	12	Guidance
E	Guidance	13 (9+12)	Guidance
F	Organization (SIL) STEAME in Life	14 Meeting with Business representatives	Organization (SIL) STEAME in Life
G	Preparation of step 15		Cooperation in step 15
H	Guidance	16 (repetition 5-11)	Support Guidance
I	Guidance	17	Support Guidance
K	Creative Evaluation	18	Creative Evaluation

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STEAME L&C Plans: Evaluation Rubric

Erasmus+

- **STEAME student evaluation rubric**

Fully completed analytics

1. STEAME Subjects *(overall performance of respective concepts/discipline/content of K-12 level)*					
	0 - N/A	1 - beginning	2- developing	3 - advanced	
☐ Science	☐ Technology	☐ Engineer	☐ Arts	☐ Mathematics	☐ Entrepreneurship

2. Competences *(knowledge, skills, values-attitudes)*				
	basic/beginning	emerging/developing	accomplished/strong	exemplary
creativity, innovation				
critical thinking				
collaboration				
digital skills				
oral - written language				
presentation skills				
social & emotional competences				

3. Project Management, Development and Realisation Processes				
	basic/beginning	emerging/developing	accomplished/strong	exemplary
goal achievement and motivation				
inquiry-based process				
problem-based process				
project-based and timeline process				
resources, references				
construction, artifacts, production outputs				
Entrepreneurship				

4. Formative Assessment (specified at each L&C)				
	D - limited/poor	C - adequate/good	B - substantial/great	A - detailed/excellent
Student Assessment by Teacher				
Self - Group*				
Self - Student*				

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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

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

4. STEAME SCHOOL SITES LINKS

5. STEM → STEAM → STEAME COURSES

6. Journal of STEAME Creations for and by School students

7. STEM-STEAM-STEAME EU FUNDED PROJECTS

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

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

10. STEAME EVENTS

11. STEAME INFOGRAPHICS

12. STEAME COMPETITIONS

13. PHOTOS & VIDEOS OF STEAME SCHOOLS

WEB-LINK

STEAME TRAINING COURSE FOR TEACHERS

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

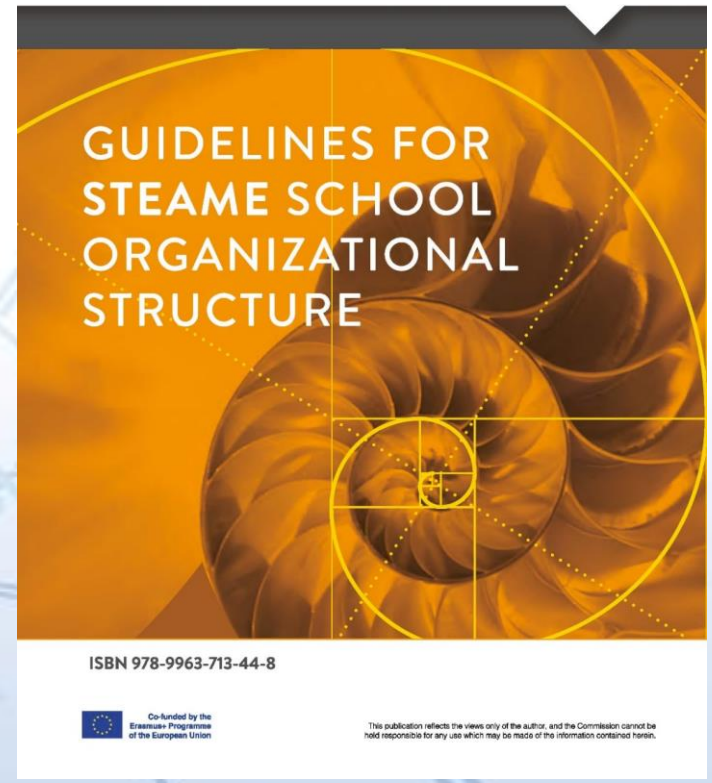
COURSE WEBINAR

SESSIONS

- **Students can publish their project work and results**

Specs and submission process

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

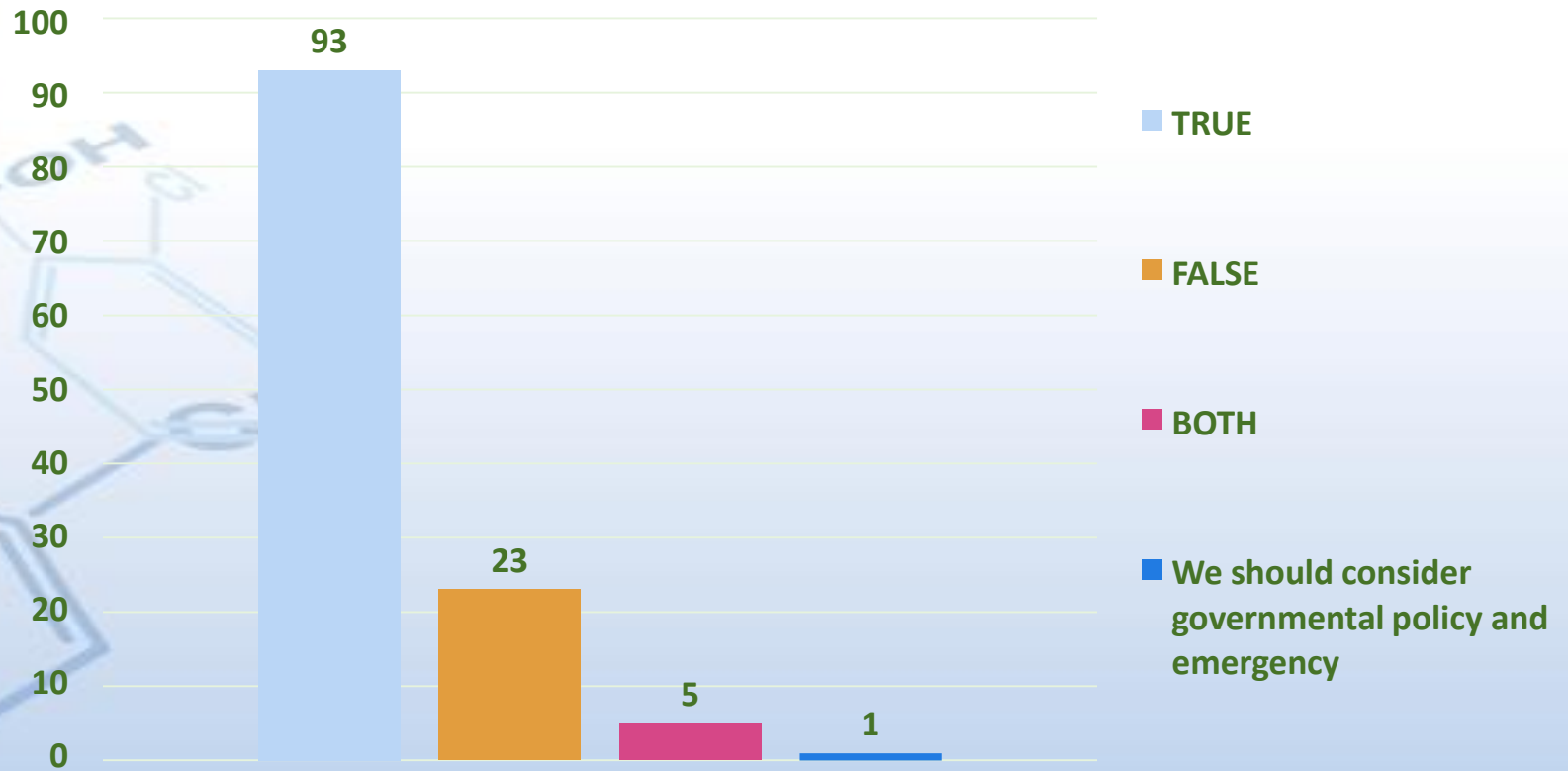
CONTENTS

Selected results from the ONLINE European survey conducted in 2020

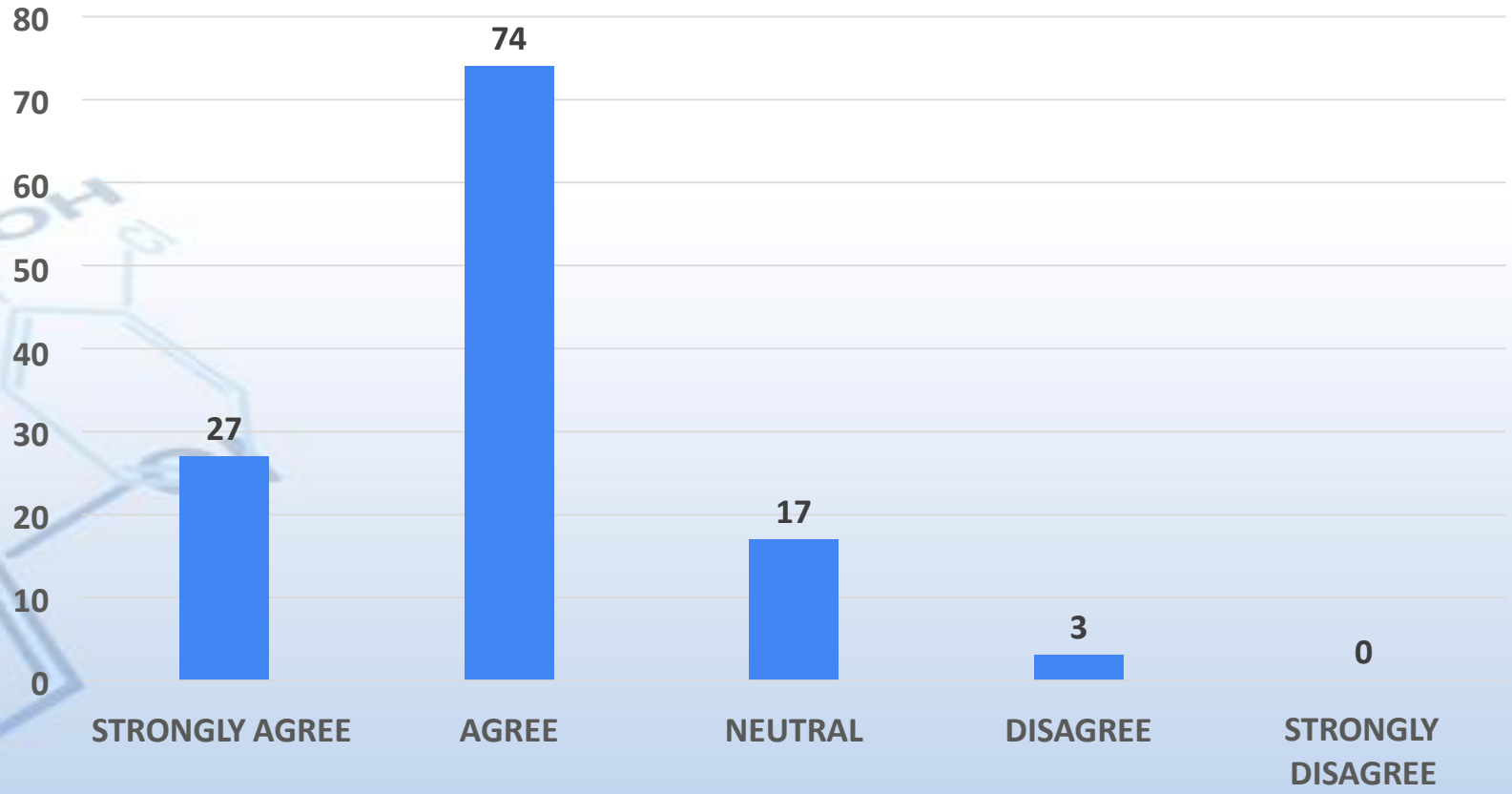
122 responses form expert teachers and school principals

Project Number: 2019-1-CY01-KA201-058240

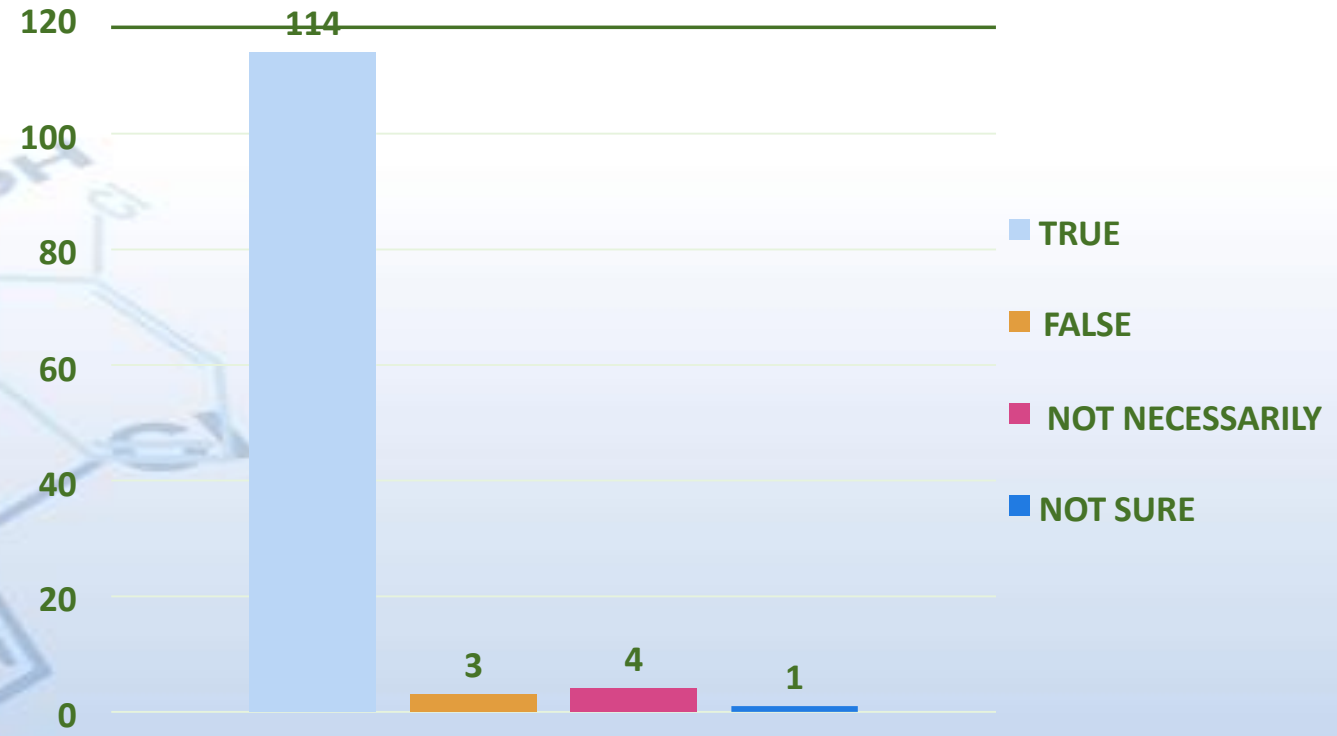
The STEAME programme should shape the education process of the school and the classroom design, not the other way around.



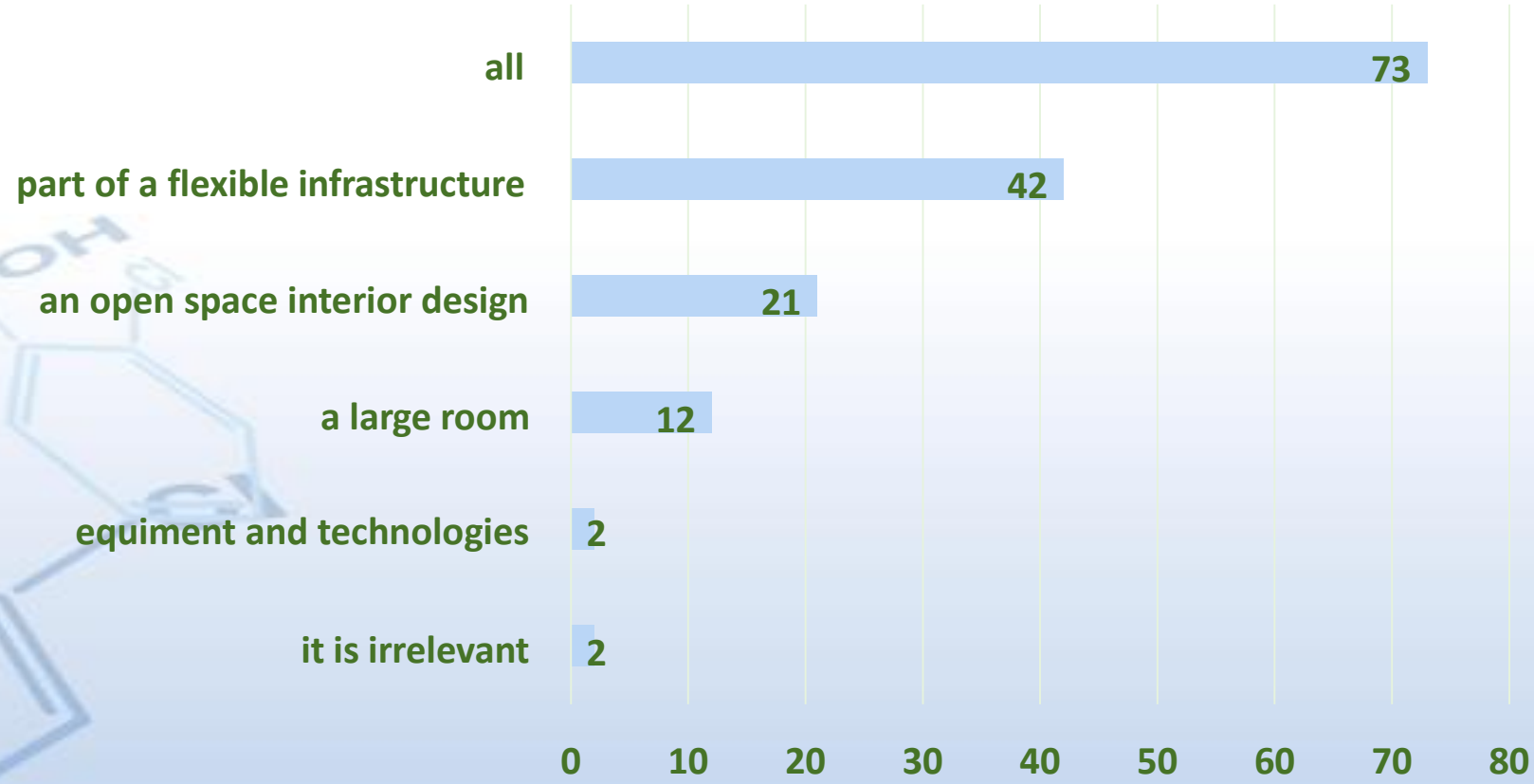
The classroom layout should be aligned with the outcomes of STEAME and blended learning



The classroom furniture has to be moveable in order to enhance layout flexibility



To achieve blended learning the STEAME classroom should be



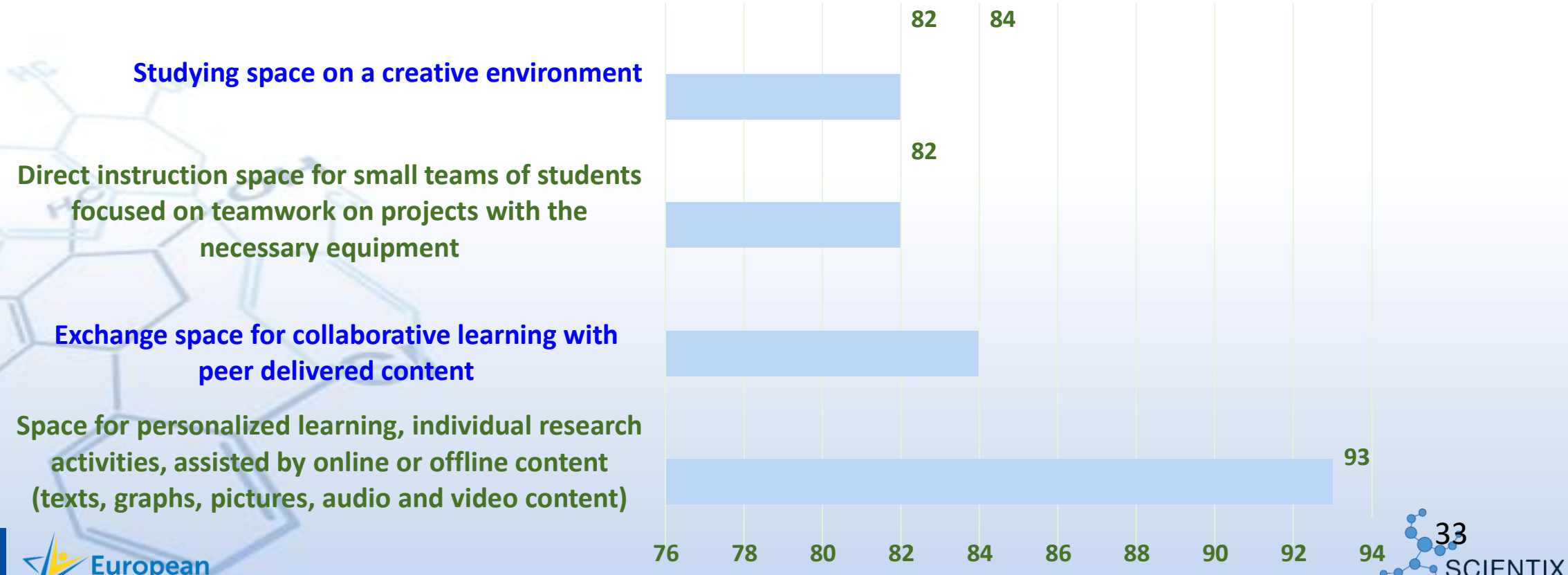
The classroom should be

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



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.**

Erasmus+

Architectural Designs and Animations

STEAME School of the future

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STEAME SCHOOL

…follow the design of bee swarn cells….

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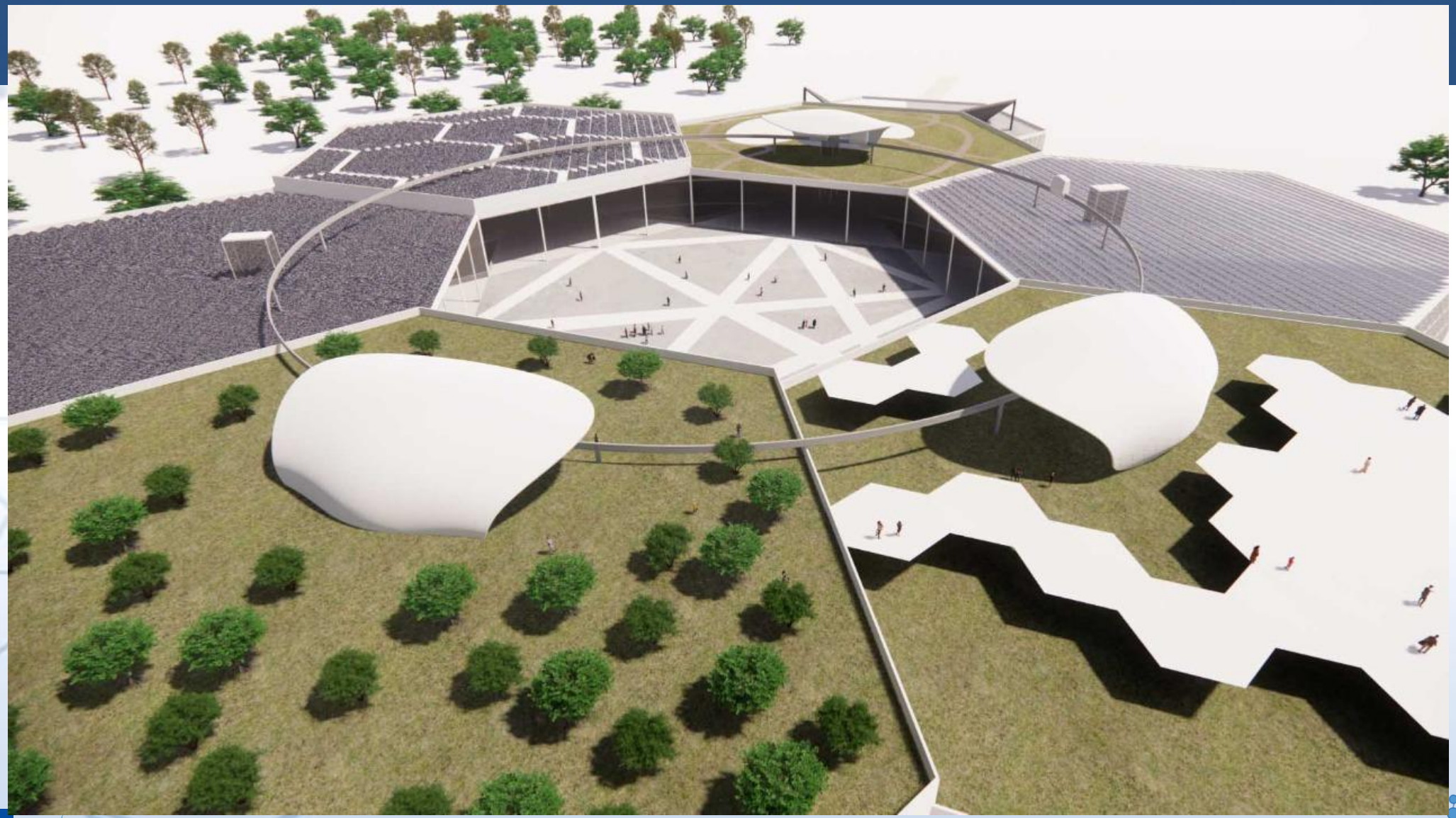
STEAME SCHOOL

STEAME SCHOOL



Specs Basement

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 Develpment 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

Satelite 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

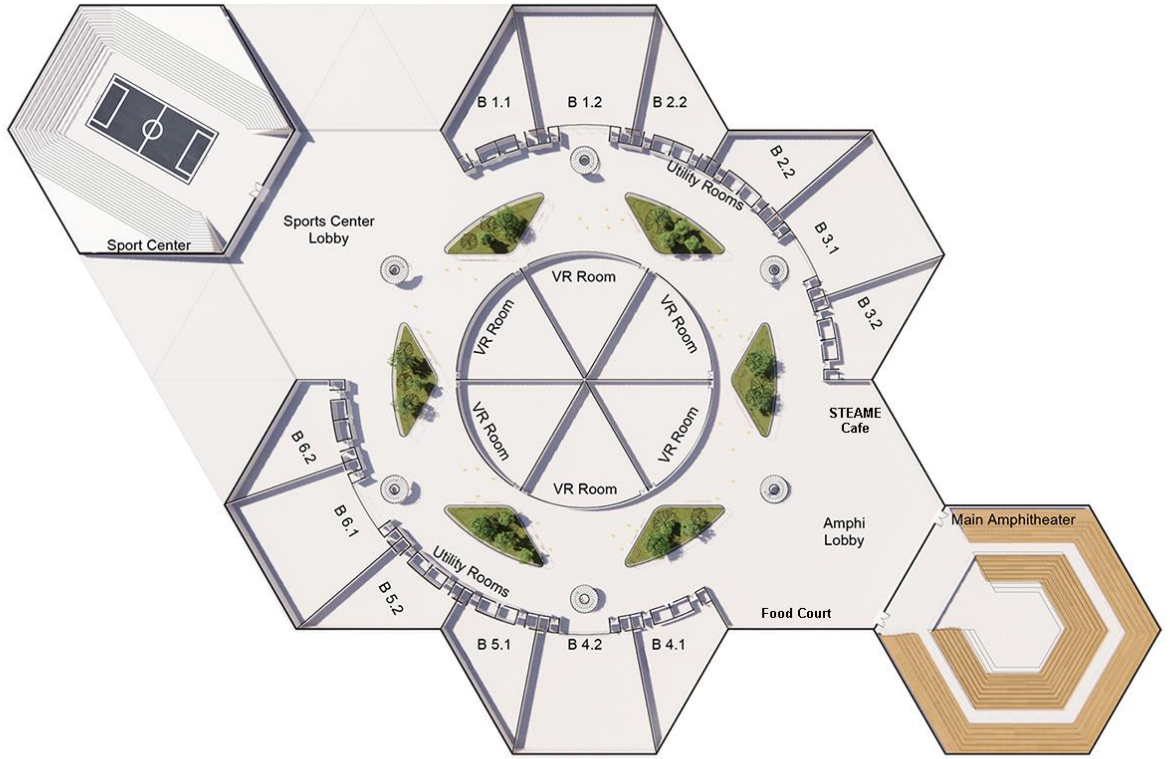
Specs
First floor

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



MAIN LABS

B1.1 Main Biology Lab
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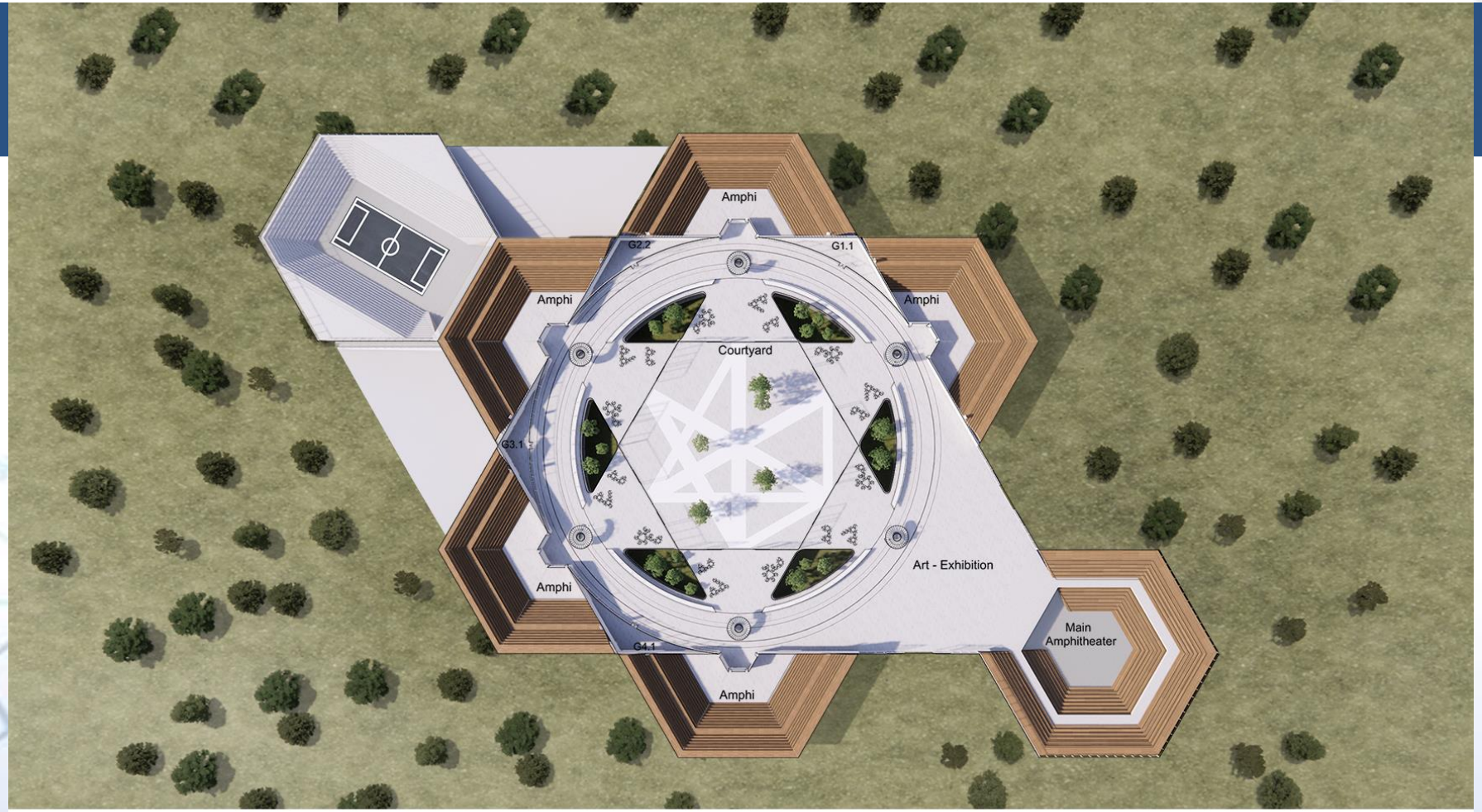
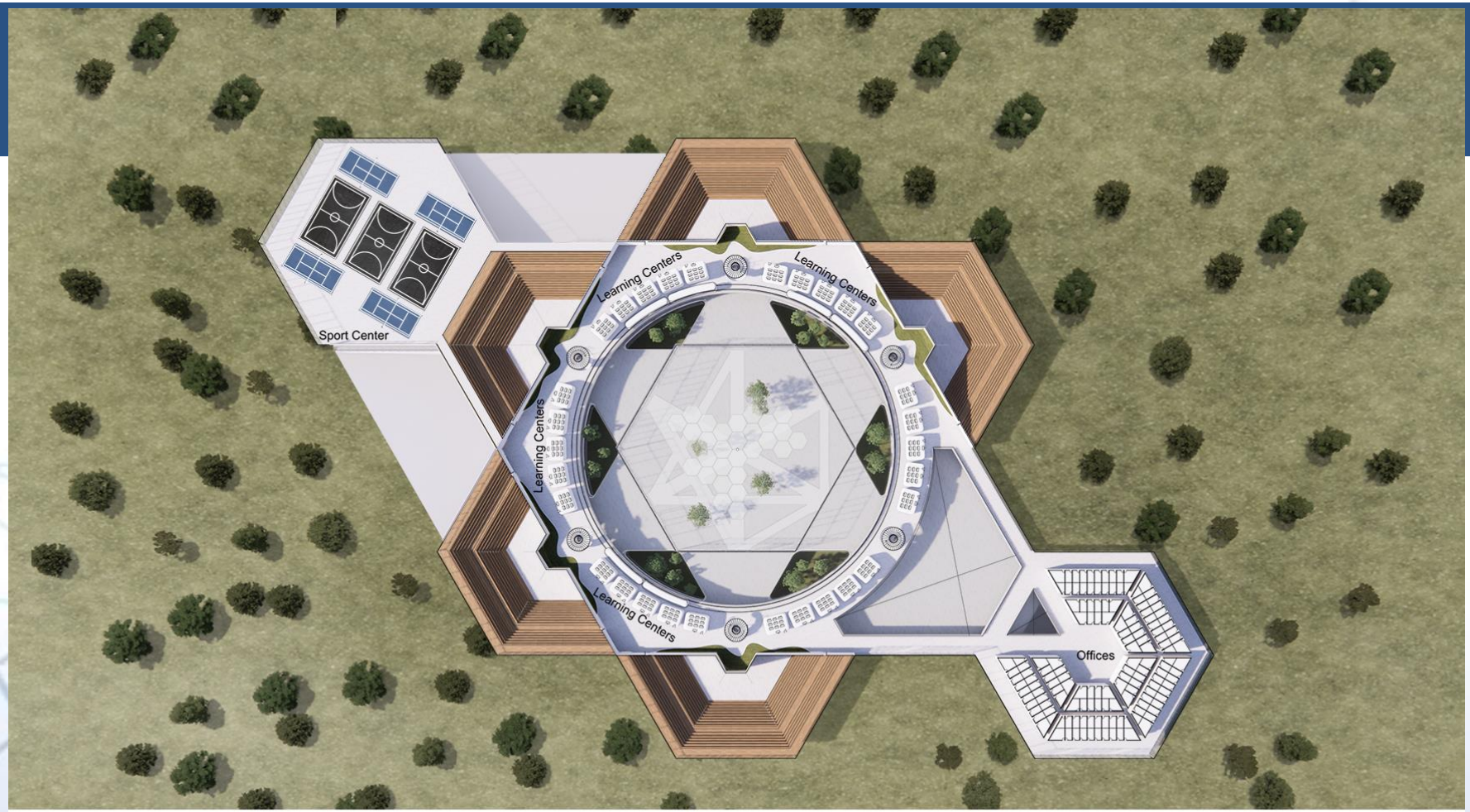
BASEMENT
1:2000 @ A4

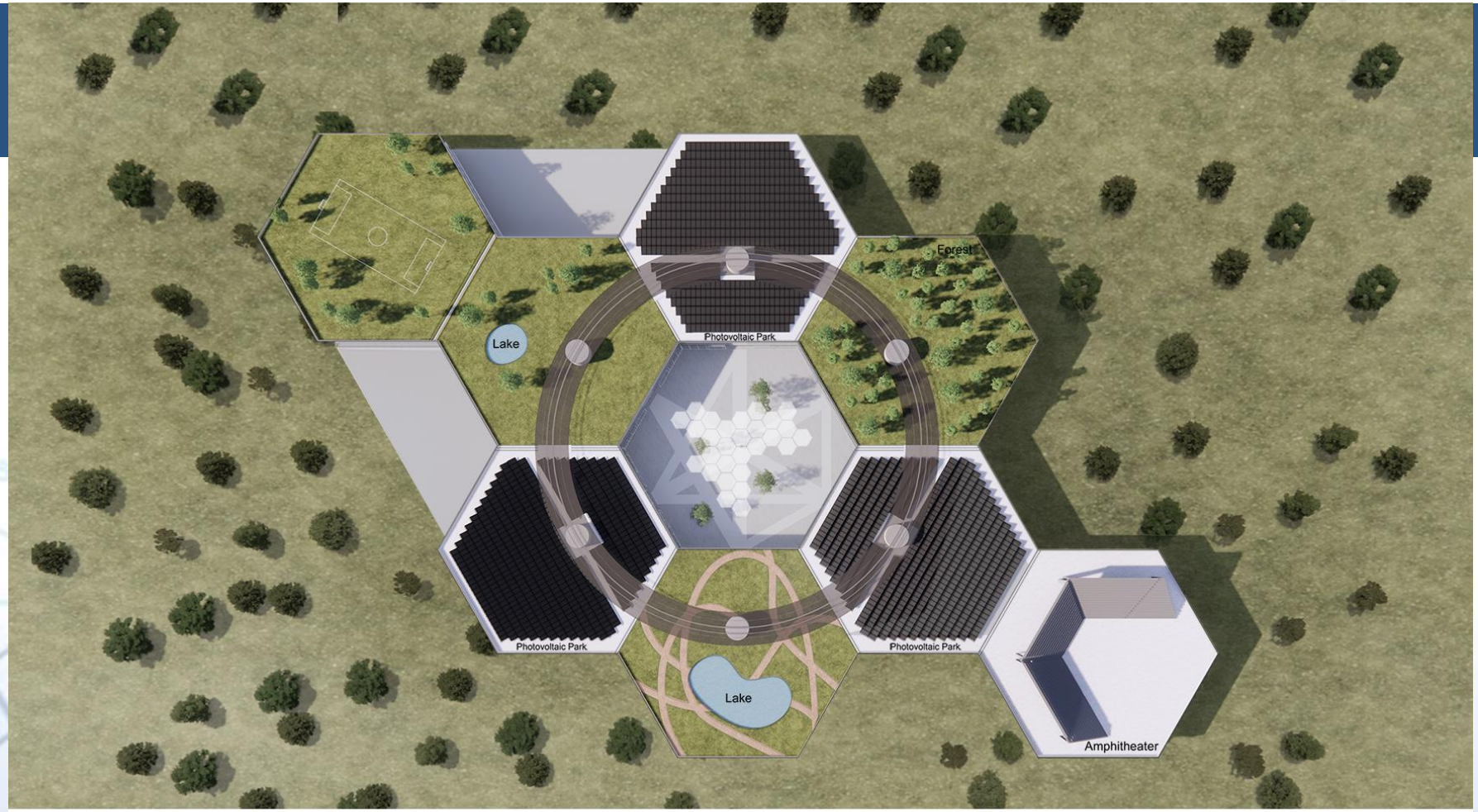


Satelite Labs
G1.1 Robotics – Computing –Multimedia S-Lab
G2.2 Construction- Environmental S-Lab
G3.1 Biology-Chemistry S-Lab
G4.1 Physics-Mathematics S-Lab

GROUND FLOOR
1:2000 @ A4



1st FLOOR
1:2000 @ A4



ROOF
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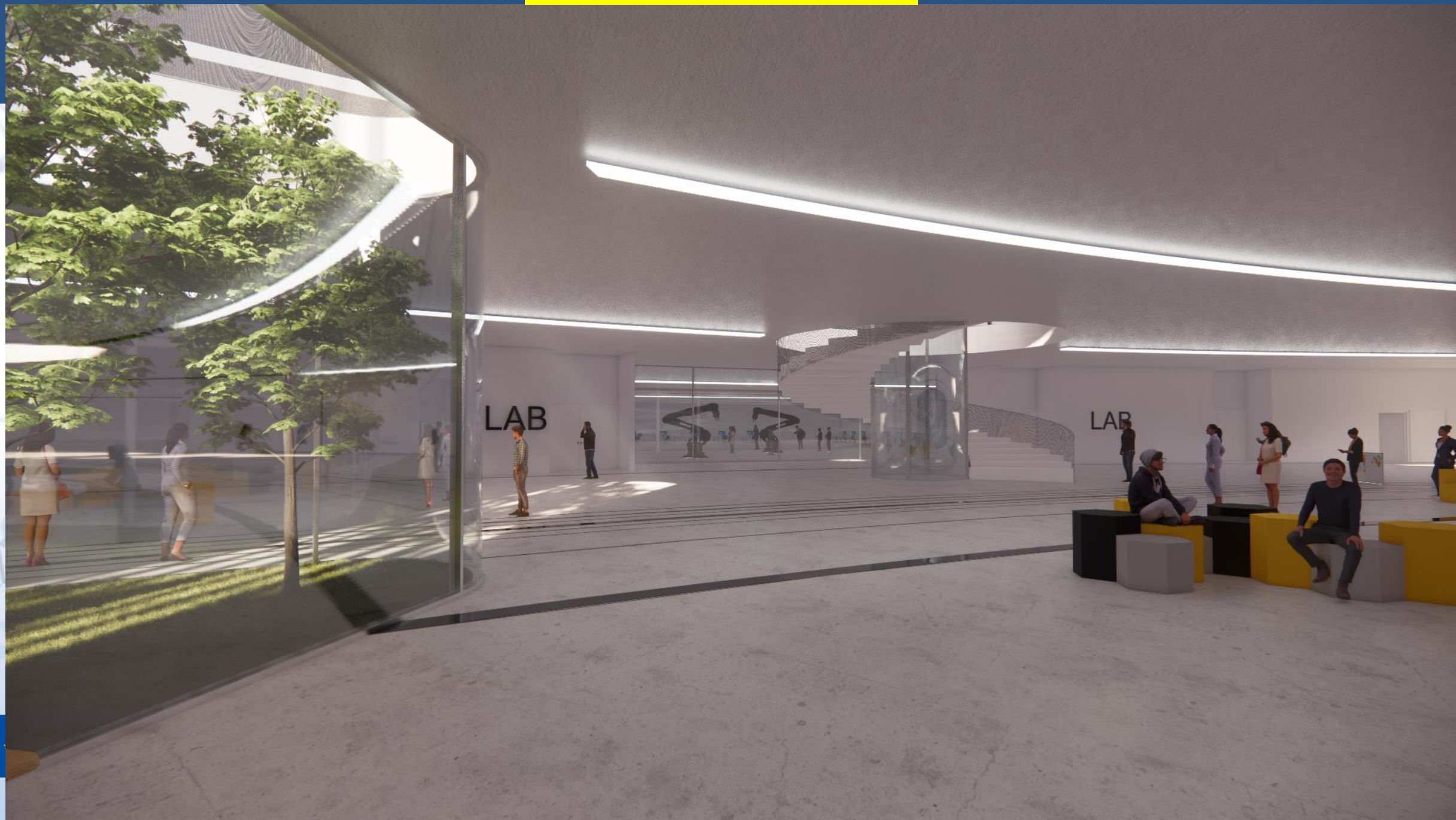
STEAME BASEMENT

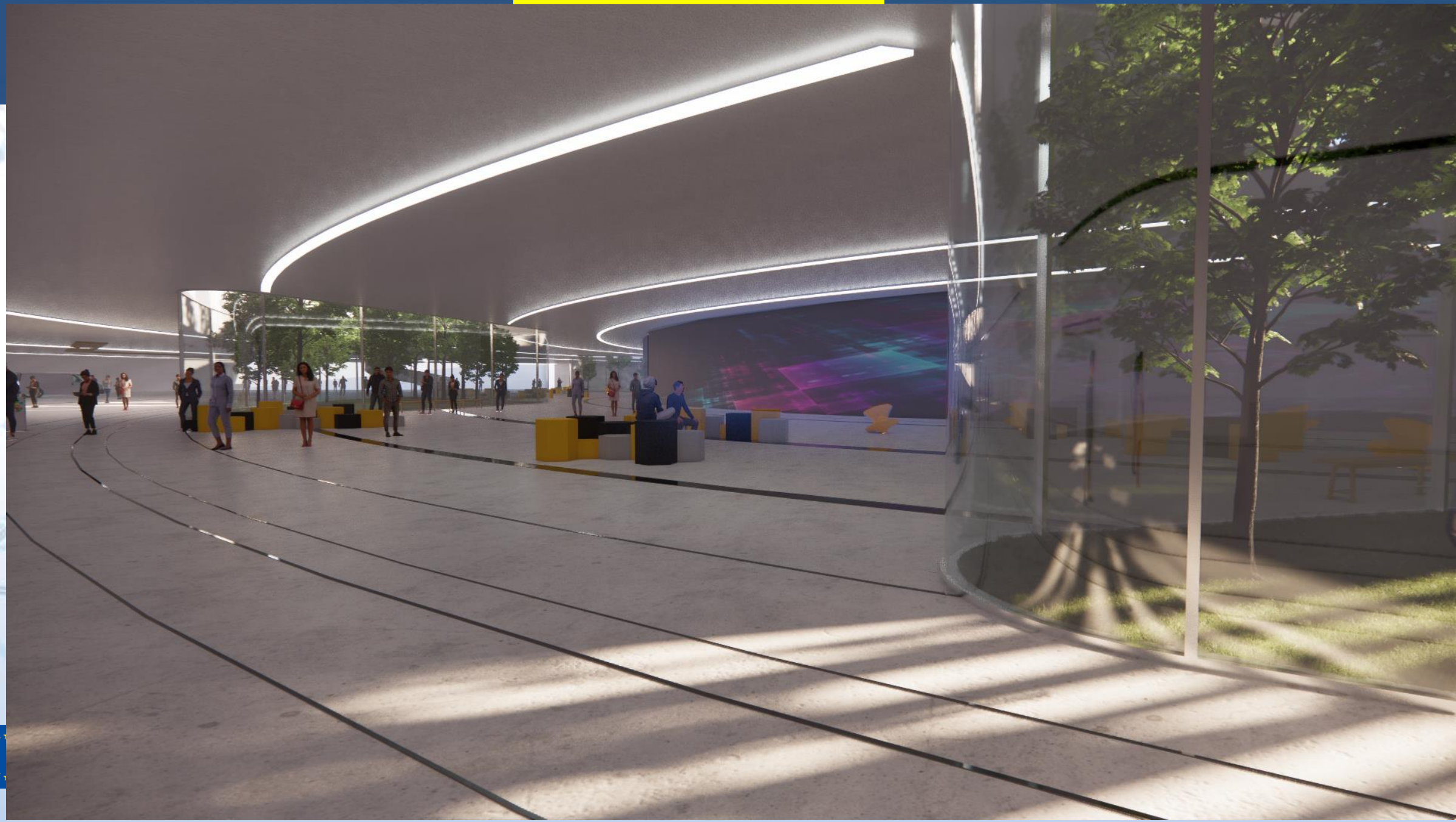
MULTI-SPORTS FIELDS OF THE FUTURE

VIDEO

STEAME BASEMENT LABS



STEAME BASEMENT VR



GOUND FLOOR

GROUND FLOOR LEARNING STATIONS

FIRST FLOOR LEARNING ROOMS

FIRST FLOOR

FIRST FLOOR

FIRST FLOOR STEAME TRAIN

FIRST FLOOR STEAME TRAIN

FIRST FLOOR STEAME TRAIN

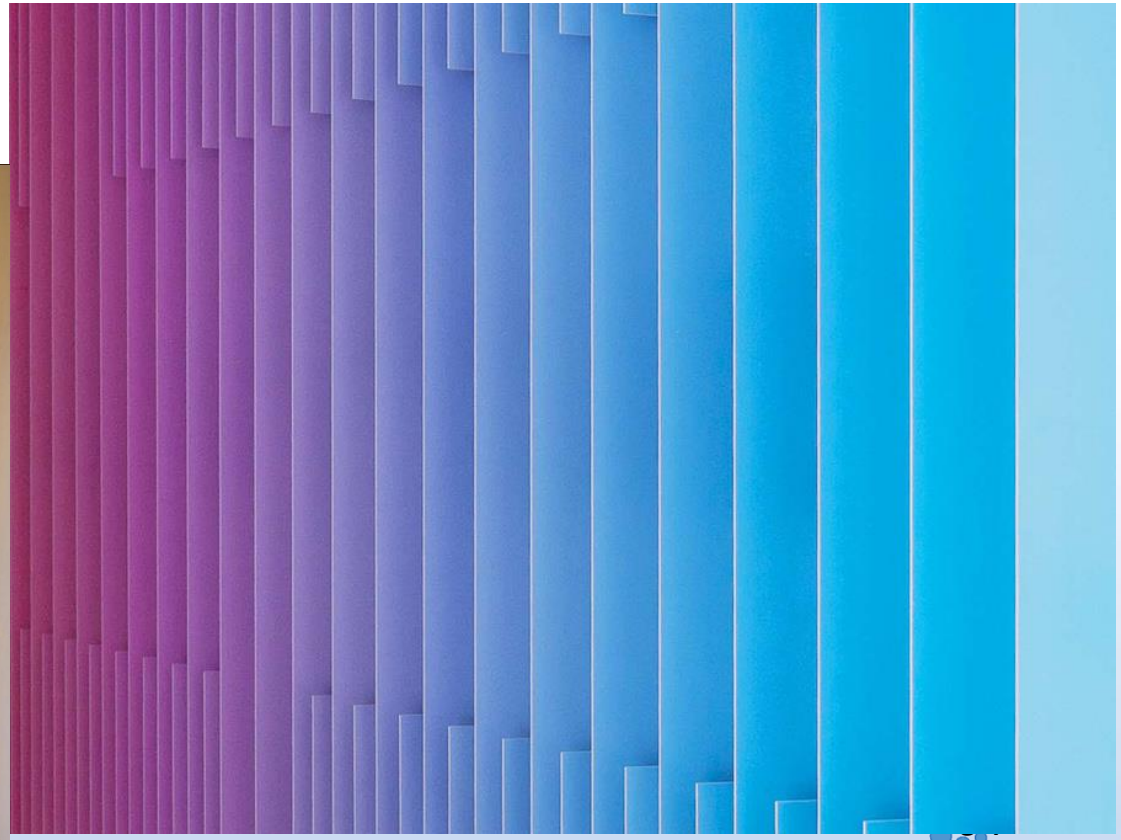
FITST FLOOR LEARNING ROOMS

FITST FLOOR LEARNING ROOMS

FITST FLOOR LEARNING STATIONS

FITST FLOOR VIEW

Colour of School changes every day



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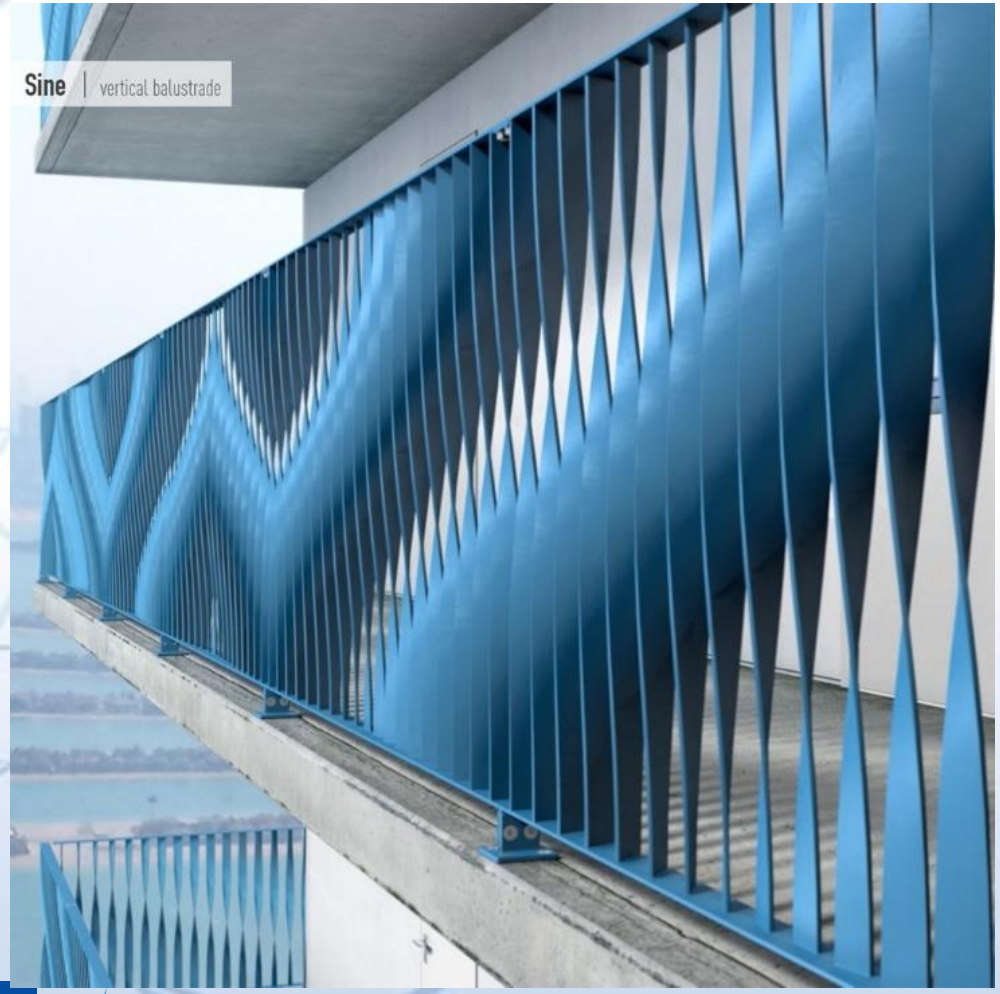
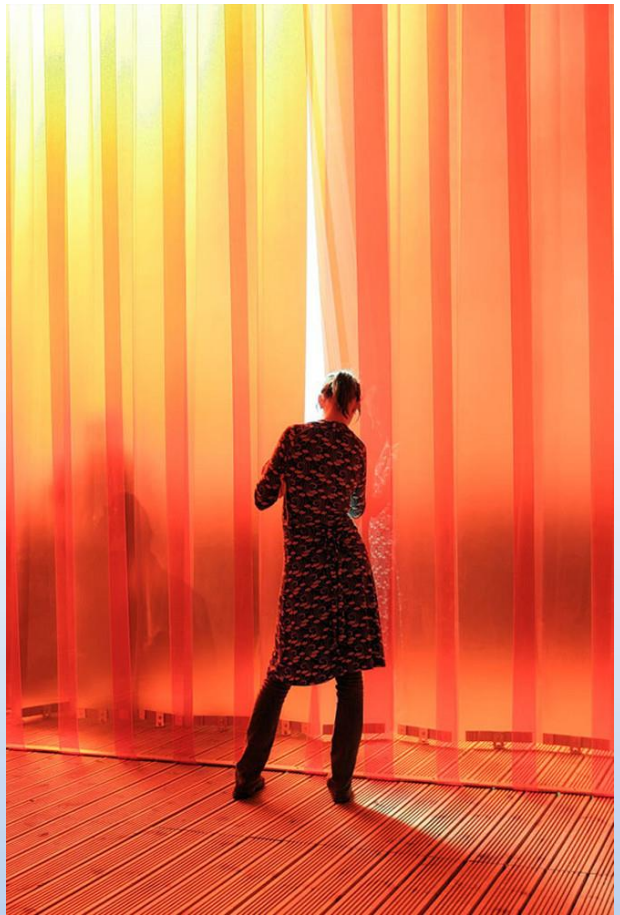
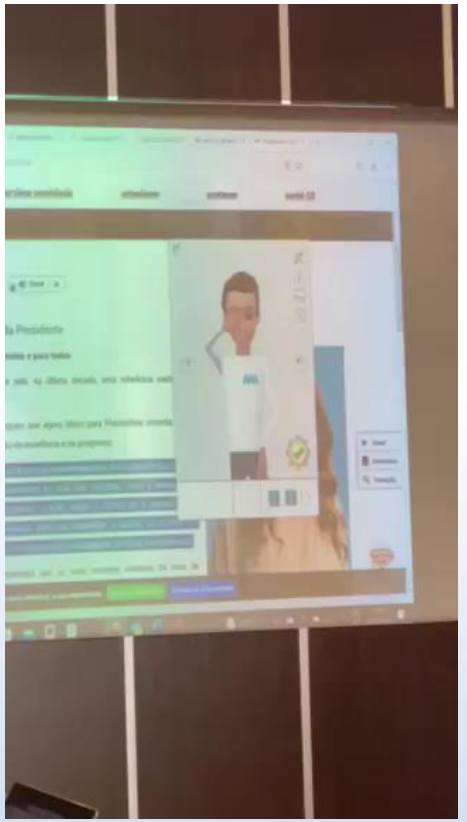


Colour of School changes every day



International Sign Language (IS) to be learned by all

InSign- Advancing inclusive education through International Sign



Architectural Designs in short animation

SEAMLEXITY
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STRATEGIC ACTIONS

(The paradigm shift of school learning environments)

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 1

(The paradigm shift of school learning environments)

- **Step 1. Secure digital learning through learning videos created by teachers. Learning videos in 3 speeds. To become available thought Learning Stations and Learning Rooms.**

STRATEGIC ACTION 2

(The paradigm shift of school learning environments)

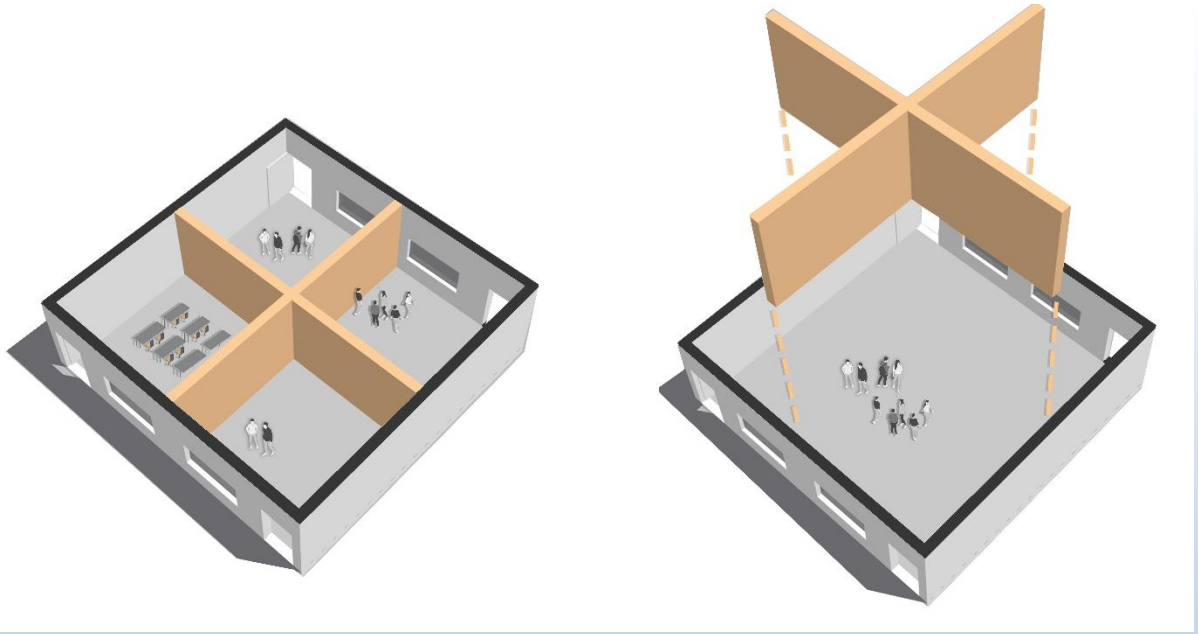
- **Step 2. Train teachers how to cooperate between different disciplines and how to develop(co-create) STEAME Learning & Creativity plans. Train teachers how to cooperate with academic and industry and how to do STEAME related activities in hybrid environments.**

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.**



STRATEGIC ACTIONS

(The paradigm shift of school learning environments)

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

Erasmus+

Project

STEAME GOES HYBRID

Blueprint Guidelines and Policy Recommendations

Started on 1 May 2021

European Schoolnet

SCIENTIX
The community for science education in Europe

Erasmus+

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**

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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

Completing the puzzle

Erasmus+

Started on 1.1.2022

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

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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

Completing the puzzle

Erasmus+

E=MD^2
Excellence in Math Education through (e-)Debate and Diversity

Starting on 1 February 2022

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Completing the puzzle

Erasmus+

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**

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Expecting results

STEAME ACADEMY

STEAME TEACHER FACILITATORS ACADEMY

KA2 PROGRAMME TEACHER ACADEMIES

Submitted 7 September 2021

Expecting results

European STEAME School Students Community

KA2 Small Scale project

Submitted 3 November 2021

Completing the puzzle

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!

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Students are ready,

……we are not ready for them!

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Competences of students in the centre

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

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**

Project Number: 2019-1-CY01-KA201-058240

Journalistic Article Competition for School Students

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

THEME

“The Role of Mathematics in STEAME Education”

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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

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Institute of Accelerating Systems and Applications

Prof. Ivan Apostolov
ENGLISH LANGUAGE SCHOOL

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Project Number: 2019-1-CY01-KA201-058240

Thank you!

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