DIRECTORATE GENERAL FOR
INNOVATION AND EDUCATIONAL
TECHNOLOGIES

EDU SIM STEAM

Transnational Meeting

2020

EDUSIMSTEAM | Erasmus+ KA3 Forward Looking Cooperation Project

With the support of the Erasmus+ Programme of the European Union

EDUSIMSTEAM / "WP-2 TEACHER TRAINING / CURRICULUM INTEGRATION" DESIGN ONLINE MEETING MINUTES

1. **Date:** 20/11/2020, 12-1:30 pm CET

2. **Meeting Facilitator:** Sumeyye Hatice Eral

3. **Attendees**

Present:

No	Organizations	Attendees
1	Blackrock Education Center (BEC)	Susan Gibney
2	Both Social	Piet Kommers
3	Both Social	Irene Weerkamp
4	CTEM Academy	Miguel Gonçalves
5	CTEM Academy	Carlos Silva
6	Education Department of Galicia	Luz Ares and her team
7	H2 Learning	Karolina Wójcik
8	Kaunas University of Technology	Robertas Damaševičius
9	Kaunas University of Technology	Ligita Zailskaite
10	Kaunas University of Technology	Rytis Maskeliūnas
11	METU	Erdinc Cakiroglu
12	MoNE, DGIET	Sümeyye Hatice ERAL
13	MoNE, DGIET	İpek Saralar-Aras
14	MoNE, DGIET	Tunç Erdal Akdur
15	MoNE, DGIET	Ceyda Özdemir
16	MoNE, DGIET	Büşra Söylemez
17	ROBOTSAN	Can KOYUNCU
18	Vilnius University	Anita Juškevičienė

4. **Agenda**

- Introduction
- İpek Saralar-Aras's presentation on Plenary Discussion on WP-2 Teacher Training / Curriculum Integration
- Ligita Zailskaite's presentation on Ideas for Training Curriculum
- Erdinc Cakiroglu's presentation on Reflections on Pedagogical Model
- Discussion on training models and frameworks

5. Main Discussion

- Project coordinator Sumeyye Hatice Eral set the scene of the project and informed related to devlierable development process of the project.

- İpek Saralar-Aras from MoNE DGIET highlighed different ways of STEAM professional development and exemplified STEAM education platforms according to teachers' needs in Needs Analysis Report on her presentation.

- As WP-2 leader, Ligita Zailskaite from Kaunas Technical University suggested some pedagogical methods, activities and resources like learners' research, problem solving, algorithmic thinking, critical computational thinking, collaborative learning skills, making and tinkering activities, robotics activities for training curriculum. In addition, she proposed some tools for the Online Platform Building on her presentation.

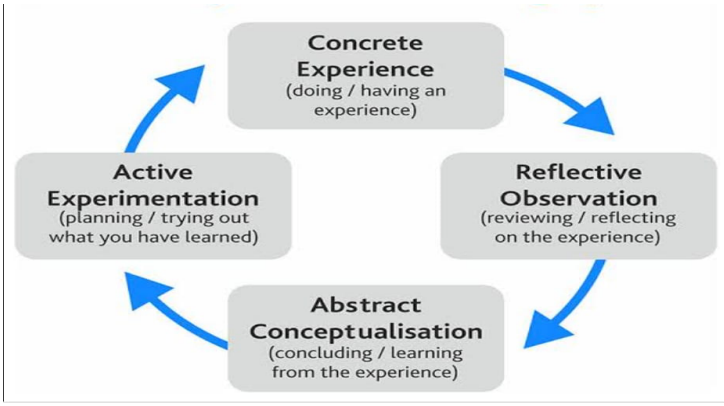
- Erdinc Cakiroglu from METU made a supportive presentation on Pedagogical Model to reflect on pedagogical design for STEAM. He defined pedagogical priorities as arts integration, skill-based, integrative and problem-based. He offered scenario-based learning activities to combine all these priorities.

- Sumeyye Hatice Eral invited all the participants to the breakout rooms so as to discuss on these issues:

1. Which frameworks could be used as a reference to build such STEAM platform for teachers?
2. Which training models/ modules could be integrated?
3. Which training model could be developed to connect WPs? (WP-2,3,4)

Group 1

Piet Kommers from Both Socical suggested Kolb's Learning Styles to create engaging custom eLearning. It can be illustrated as follow:



Group 2

Susan Gibney from Blackrock Education Center summarized their group discussion like that:

- Contents of the training should have practical benefits for teachers; thus, they can apply what they have learned in their classrooms, experience what effects and consequences of the trainings and then share them with other teachers so as to develop their pedagogical competence.
- Related to the duration of the trainings, the 4-module model for this online training is good but it can be long because teachers are tired of such trainings during the remote education because of COVID-19. They suggested to be shortened or designed more interactive.

Group 3

Carlos Silva from CTEM Academy summarized group discussion and described the model of discussion. Accordingly, Luz Ares from Education Department of Galicia shared the below framework from ATS STEAM PROJECT as a suggestion.

In Training model/modules, the group emphasized on interdisciplinary approach rather than sticking to programming and robotics. In addition, they offered webinar as training model to connect WPs.

EduSimSteam Meeting November 20th

Group 3

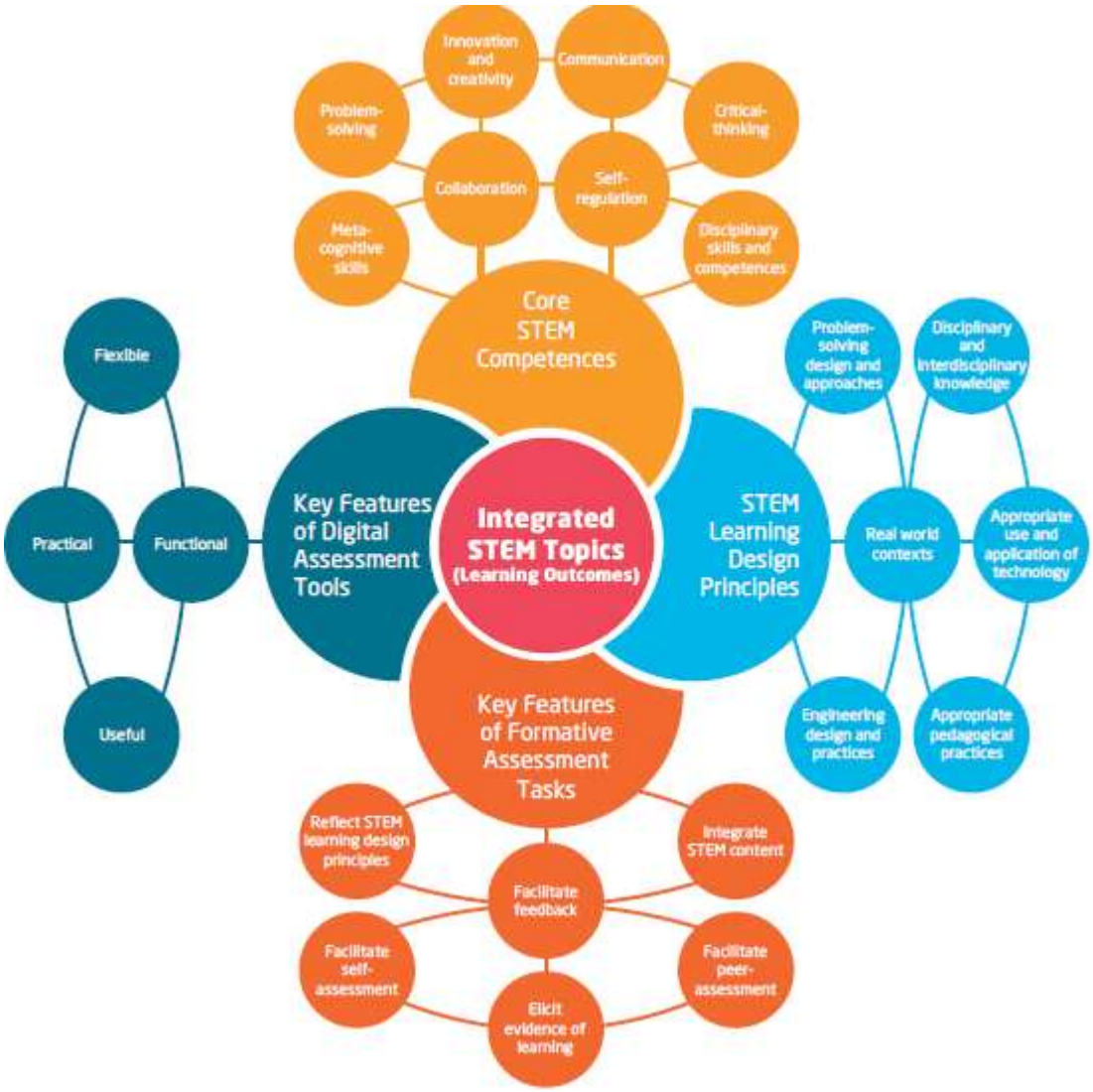
1. **Which frameworks could be used as reference to build such STEAM platform for teachers?**

A reference from coursera

European training module

A framework for STEAM not online was developed in another instance reaching 120 schools. Pilot Assessment of Transversal skills in STEM. (ATS STEAM PROJECT)

A structure, content, modules.

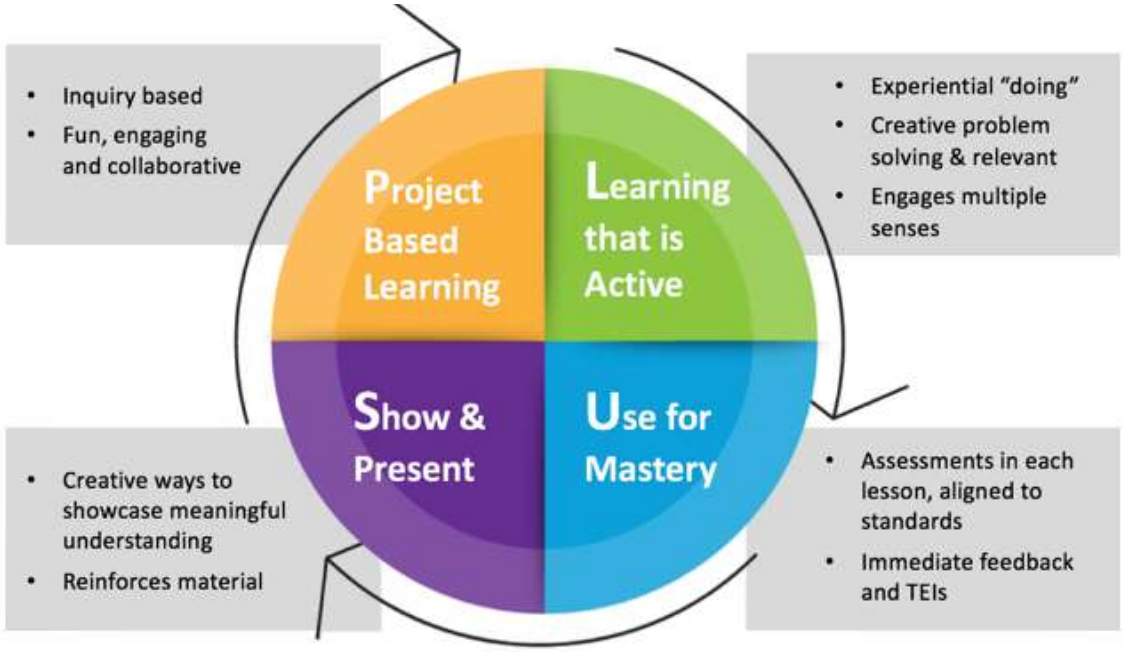


2. **Which training models/ modules could be integrated?**

Embedded systems

Problem solving approach

Project base learning



Try not to stick to programming and robotics to achieve problem solving, use some interdisciplinary approach to solve them

Critical thinking

Creativity and collaboration

Communication

3. **Which training model could be developed to connect WPs? (WP-2,3,4)**

Webinars (most of)

EDUSIMSTEAM

REFLECTIONS ON PEDAGOGICAL MODEL
From WP-3 Perspective

METU

Defining STEAM

There is no single unifying definition of STEAM (or even STEM)

Searching for **the** STEAM approach

Thinking about **a** STEAM approach

But we can **decide** on a sound pedagogical framework that is suitable for our purposes.

Which learning outcomes?

Skills

- creativity, problem-solving, computational thinking, critical thinking, global collaboration, innovative thinking and communication

Knowledge

- Interdisciplinary
- Using existing knowledge to explore problems.
- Generating knowledge

Attitudes & values

- Towards engineering and science.

Experience

Constraints - Oportunities

Capabilities of the platform.

Cross-cultural nature

Robotics and algorithmic thinking

Others?

What should be our pedagogical priorities?

There is no single pedagogical approach for STEAM that is suitable for all needs.

Let’s think about our priorities.

PRIORITIES – 1
Arts Integration

A shift from STEM to STEAM by linking science with other subjects and disciplines. “Arts” here is not limited to the visual arts but also related to social studies, history, physical arts, fine arts and music.

It is mostly related to students’ use of **imagination** and **creativity**.

- Adapting a “**design thinking**” framework into the STEM education can be a powerful approach to shifting towards STEAM education.
- **Themes** of the activities can be related to the subjects listed above.

PRIORITIES – 2
Skills-based

There is a focus on the core skills such as creativity, problem-solving, critical thinking, global collaboration, innovative thinking and communication.

PRIORITIES – 3
Integrative

STEAM education activities are interdisciplinary.

In each activity, there are connections to more than one science field (STEM fields) as well as to Art fields. The intensity and the nature of these connections may vary. While all activities are focusing on creative problem solving, sometimes a disciplinary connection may be obtained through a simple information brief, other times it can be in the core of problem solving.

PRIORITIES – 4
Problem-based

ill-structured, real-world related problems

STEAM learning activities may need to include learning goals about the basic tools (such as sensors or coding) but should obviously go beyond that. Embedding the “tool learning” goals into scenarios that involve problem solving, collaboration, and innovative thinking can be helpful in this sense.

HOW TO INTEGRATE ALL?
Scenario-based learning activities

Guided by a **pedagogical model,** scenarios can act as a virtual glue that can combine most of these priorities?

- Require active learning
- Problem-based (ill-structured)
- Require the application of subject knowledge as well as cyclical design-based approaches and skills.

- Relating to some subjects may be done through expository approaches.

THANK YOU

Erdinç Çakıroğlu

REPUBLIC OF TURKEY
MINISTRY OF NATIONAL EDUCATION

Plenary Discussion on WP-2

STEAM Training Curriculum for Teachers

Directorate General for Innovation and Educational Technologies

20/11/2020

Presentation Overview

- Setting the Scene
  - Digital Education Frameworks
  - EduSimSteam Need Analysis Report
  - Teachers' Needs
- Examplary STEAM Education Platforms
  - Canvas.net
  - CourseEra
  - European SchoolNet Academy
  - Teacher Academy by School Education Gateway
- Conclusion
- Discussion
  - Training models
  - Frameworks as references

Setting the Scene

- T2-1 Establishing training framework and design generation
- T2-2 2nd Transnational Meeting in Lithuania: **Online Meeting**
- T2-3 Teacher Training Platform and Implementation of Pilot Training
- T2-4 Documenting Pilot Teacher Training

Setting the Scene

Available STEAM Frameworks for Professional Development

- DigiCompEdu (European Commission, 2017)

- A Highly Structured Collaborative STEAM Program: Enacting a Professional Development Framework (Bush et al., 2016)

- STEAM Education: An Overview of Creating a Model of Integrative Education (Setiawan et al., 2019)

Setting the Scene

Available STEAM Frameworks for Professional Development

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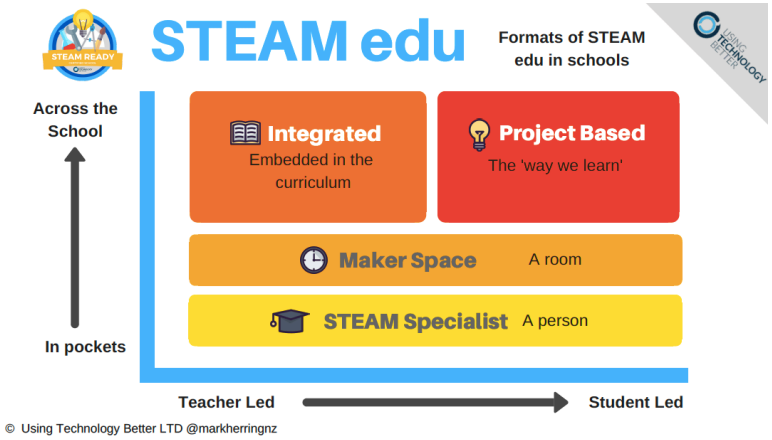
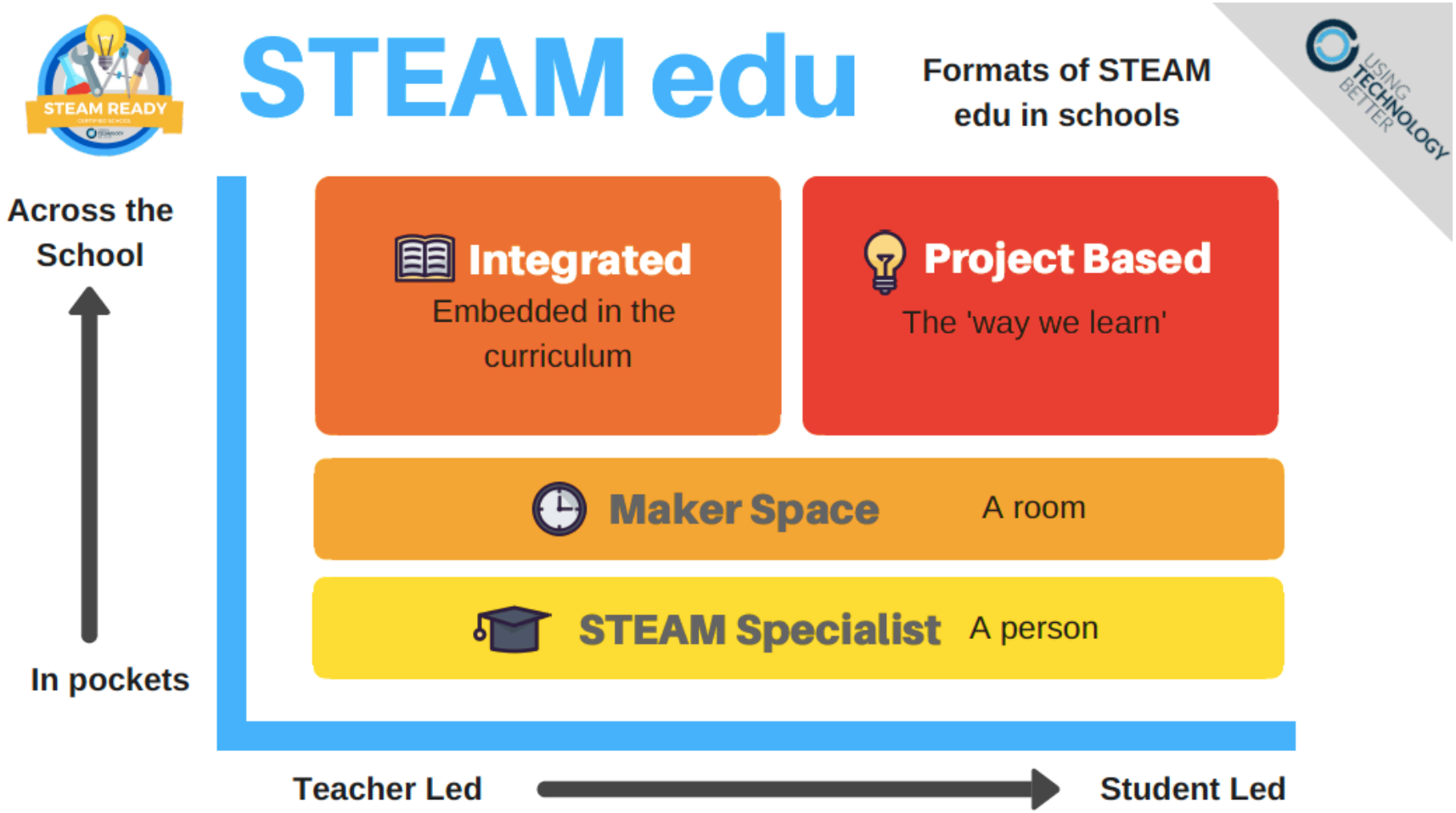
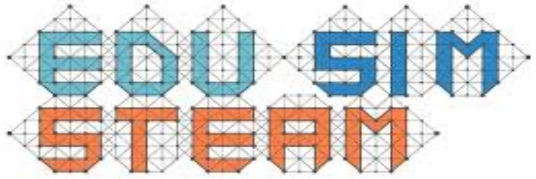


Setting the Scene



Setting the Scene: Research on STEAM PD



- The foundation of effective PD is the improvement of student learning by improving teachers' knowledge, skills, attitudes, and practices (Guskey, 2000; Loucks-Horsley et al., 2010)
- Teacher PD has often been conducted in ways that are disconnected from classroom practice (workshop style, as in Darling-Hammond & Richardson, 2009), and as a result, has little long-term impact on classroom instruction.
- Teacher learning should be situated within a context (Putnam and Borko, 2000).
- PD that has a well-planned classroom implementation component can alter teachers' practice by impacting teachers' knowledge and skills through the actual practice of teaching (e.g., Borko, 2004; Greeno, Collins, & Resnick, 1996; Lave & Wenger, 1991).

Setting the Scene

EduSimSteam Need Analysis Report
Deliverable 1.2 Edusimsteam Needs Analysis Report

Participants

- Ireland (n=114),
- Lithuania (n=223),
- Netherlands (n=38),
- Portugal (n=123),
- Spain (n=310) and
- Turkey (n= 1121)

Teachers' Needs

Type of courses on STEAM Education teachers would like to participate in by the percentage of teachers who chose them (%)

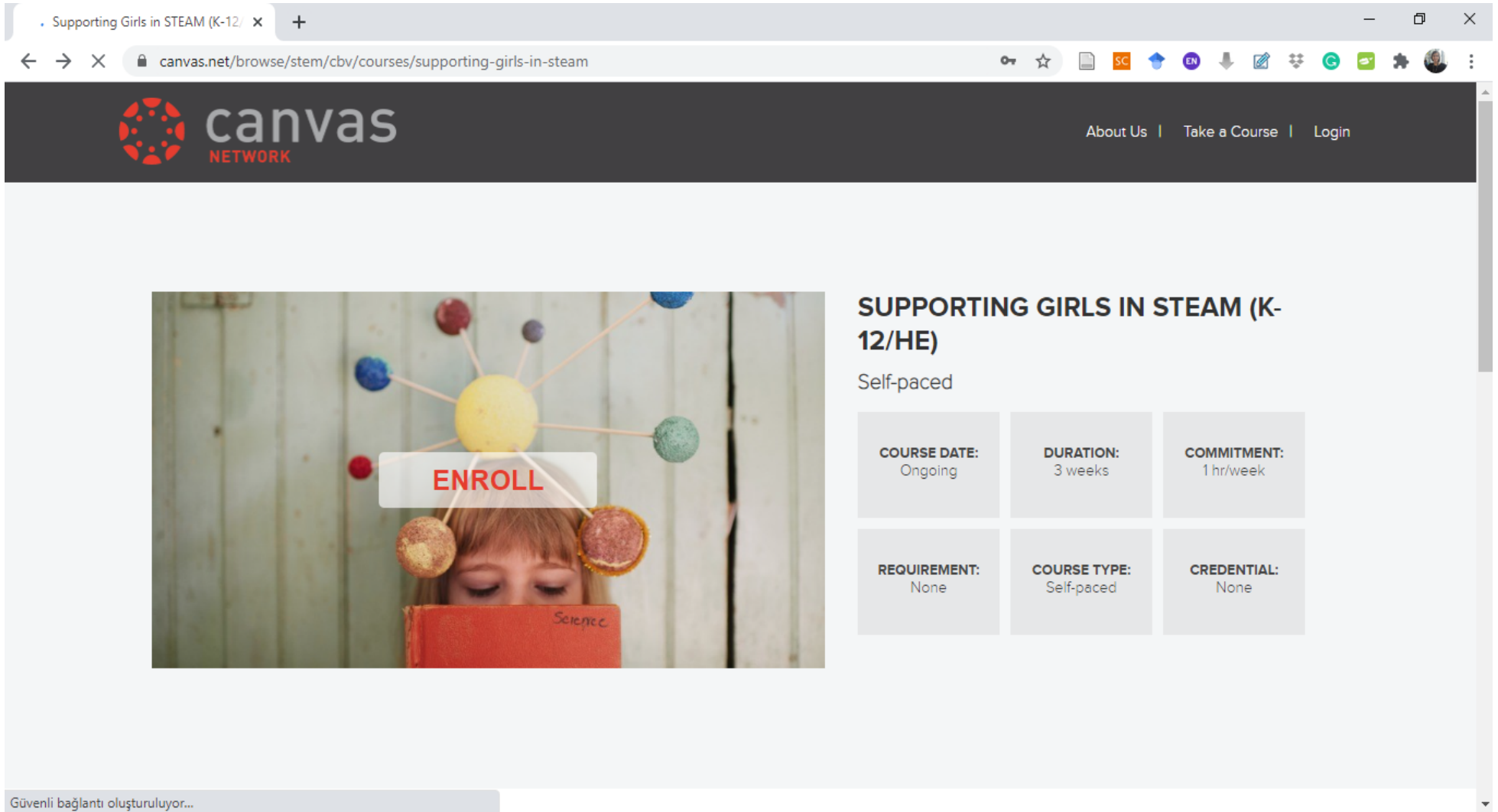
Country/Type	Ireland	Lithuania	Netherlands	Portugal	Spain	Turkey
MOOC	12.86	26.96	55.56	55.17	32.66	67.98
Webinar	70.00	70.43	44.44	72.41	50.25	68.12
Face-to-face training	61.43	53.91	11.12	31.03	50.26	66.23
Traditional lecture	17.14	12.17	11.11	20.69	24.12	16.45
Other	5.71	8.70	NA	10.34	31.16	6.11

K-12 (and university) teachers
Webinars vs. interactive ways

Ideas for STEAM Education Platforms

- Canvas.net
- Coursera
- European SchoolNet Academy
- Teacher Academy

Canvas.net


Supporting Girls in STEAM (K-12/
canvas.net/browse/stem/cbv/courses/supporting-girls-in-steam
canvas
NETWORK
About Us | Take a Course | Login
ENROLL
Science
SUPPORTING GIRLS IN STEAM (K-12/HE)
Self-paced
COURSE DATE: Ongoing
DURATION: 3 weeks
COMMITMENT: 1 hr/week
REQUIREMENT: None
COURSE TYPE: Self-paced
CREDENTIAL: None
Güvenli bağlantı oluşturuluyor...

Canvas.net

- STEAM CAMP – Do It Yourself
- **Created by:** Canvas.net

- **Designed for:** Teachers who may be interested in creating their own STEAM CAMP based upon a proven model created by Jennifer Miller and Sandra Wozniak.

- Incorporated NASA MMS Challenge curriculum, authored by Jennifer Miller, Sandra Wozniak, and Tom Chambers, along with other NASA Magnetospheric Multiscale (MMS) fabrication resources.

Learning Outcomes

- Build an EXTREME Weather Makerspace, SolarSolv Makerspace, and Habitat Makerspace environment using free resources.
- Use a STEAM (science, technology, art, and math) framework to map creative approaches to core content needs.
- Implement 3D printing software programs, computational thinking activities, green screen, and other STEM programs.
- Connect with top scientists, educators, engineers, artists, and community organizers to share best practices for achieving community buy-in.
- Identify funding opportunities and gain insights about how to connect your organization's makerspace to community partners.

Learning Outcomes

Makerspace

STEAM (science, technology, art, and math) framework

core content needs

3D printing software programs

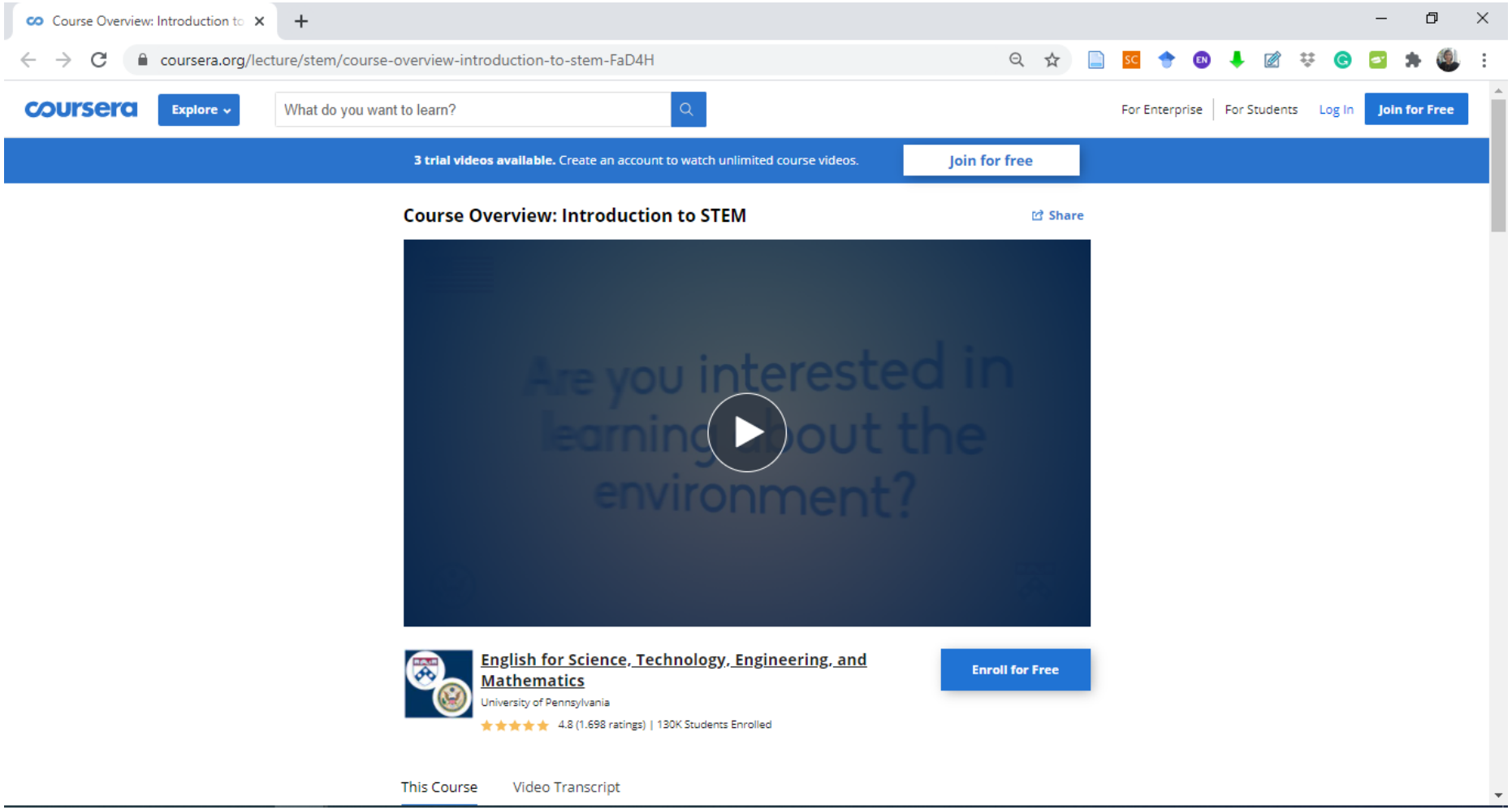
STEM programs

- Connect and

share best practices

community partners

Coursera


Course Overview: Introduction to
coursera.org/lecture/stem/course-overview-introduction-to-stem-FaD4H
coursera
Explore
What do you want to learn?
For Enterprise
For Students
Log In
Join for Free
3 trial videos available. Create an account to watch unlimited course videos.
Join for free
Course Overview: Introduction to STEM
Share
Are you interested in learning about the environment?
English for Science, Technology, Engineering, and Mathematics
University of Pennsylvania
4.8 (1,698 ratings) | 130K Students Enrolled
Enroll for Free
This Course
Video Transcript

Coursera

- **Course name: Introduction to STEM**

- **Content:** English for STEM

  «Syllabus: What you will learn from this course»

  - Unit 1: Is the Earth Getting Warmer? (7 hours to complete)
  - Unit 2: The Greenhouse Effect (7 hours to complete)
  - Unit 3: The Impacts of Climate Change on our World (6 hours to complete)
  - Unit 4: Discovering Cleaner Energy Sources to Power the World (7 hours to complete)

- **Duration:** 4 weeks

- **Place:** Online

Coursera

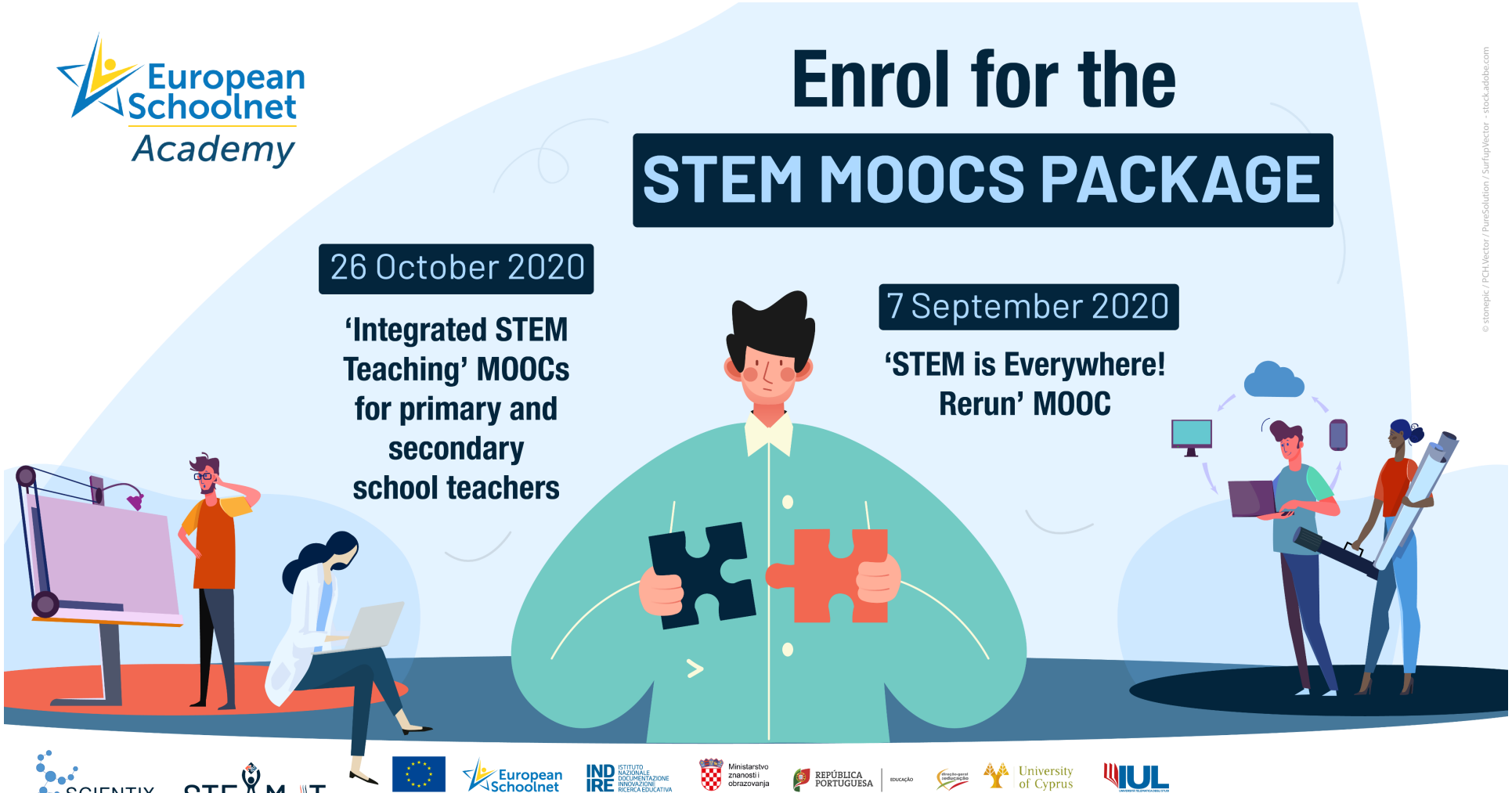
- **Course name:** The STEAM Movement
- **Content:** Biology Across Disciplines: The Arts and Biology

«In this module, we'll explore the intersection of biology with the fine arts.»

- Unit 1: Introduction (3 hours to complete)
- Unit 2: Art as Foundational to Biology (1 hour to complete)
- Unit 3: Art to Communicate Biology (3 hours to complete)
- Unit 4: The STEAM Movement (3 hours to complete)

- **Duration:** 4 weeks
- **Place:** Online

European SchoolNet Academy



The 'STEM is Everywhere! (rerun)' MOOC has been funded under the European Union's H2020 research and innovation programme – project Scientix 4, coordinated by European Schoolnet (EUN) and the 'Integrated STEM Teaching' MOOCs for primary and secondary school teachers are co-funded by the STE(A)M IT and Scientix 4 projects. STE(A)M IT have received funding from the European Union's ERASMUS+ programme (Grant agreement 612845-EPP-1-2019-1- BE-EPPKA3-PI-FORWARD), coordinated by European Schoolnet (EUN). The content of the document is the sole responsibility of the organizer and it does not represent the opinion of the European Union or the Education, Audiovisual and Culture Executive Agency, which are not responsible for any use that might be made of the information contained.

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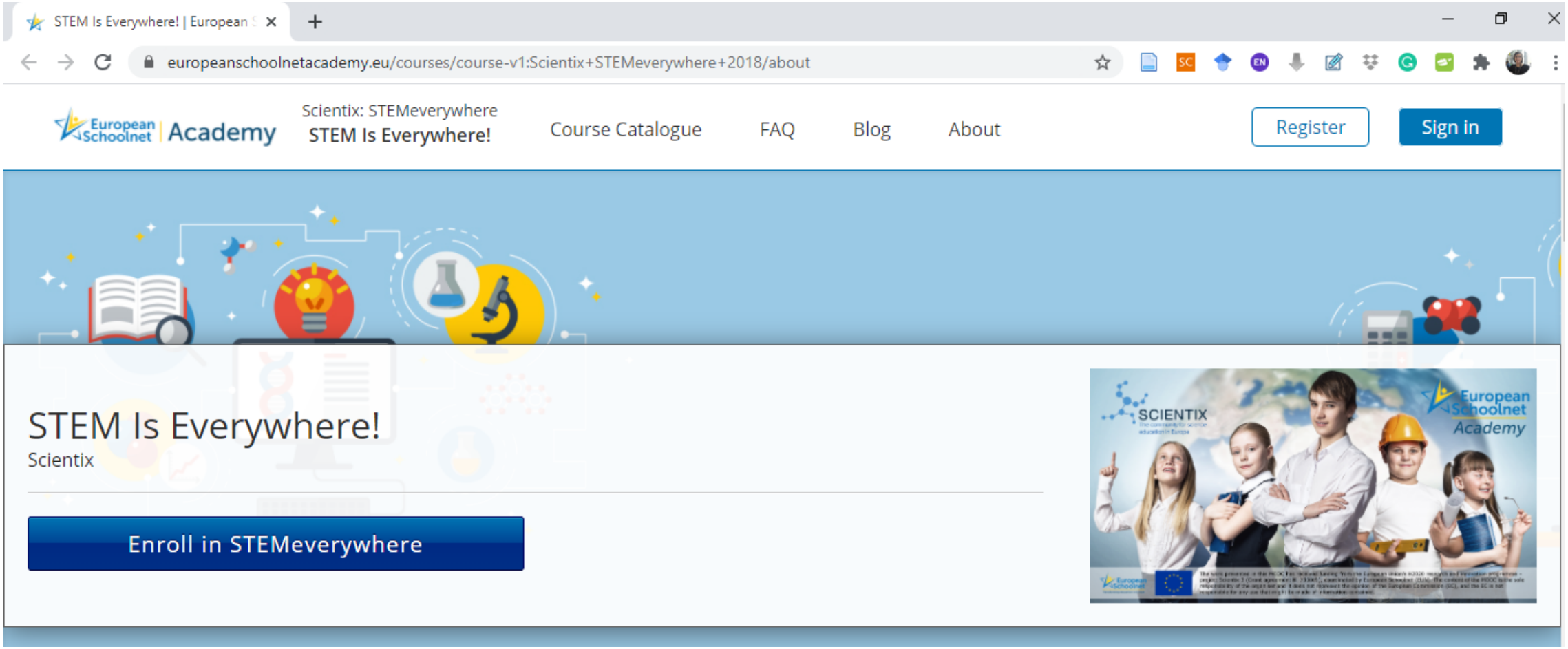

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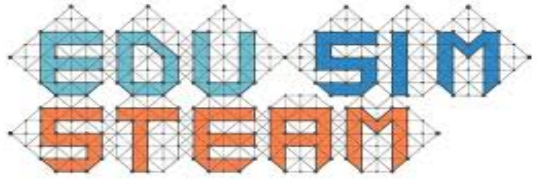

- **Course name:** **STEM is Everywhere!**

- **Content:** «Modules»
  - Module 1: Towards 21st-century STEM education
  - Module 2: Real-world problems for STEM subjects
  - Module 3: Interdisciplinary STEM teaching with real-world problems
  - Module 4: Submit your real-world STEM lesson plan!
- **Duration:** 4 weeks

- **Place:** Online

Learning Objectives

- Identify STEM in everyday life and learn how to integrate real-world STEM problems in your lessons
- Build confidence in trying out new methods in the classroom, such as an interdisciplinary approach
- Explore a range of resources, tools and strategies for activities that enhance STEM in real life
- Learn about 21st-century skills and how to address them in the classroom
- Review the work of course peers
- Connect with other course participants
- Reflect on your professional practice, beliefs and learning

Learning Objectives

STEM in everyday life STEM problems in your lessons

confidence new methods interdisciplinary approach

resources, tools and strategies

STEM in real life

21st-century skills

course peers

- Connect

professional practice, beliefs and learning

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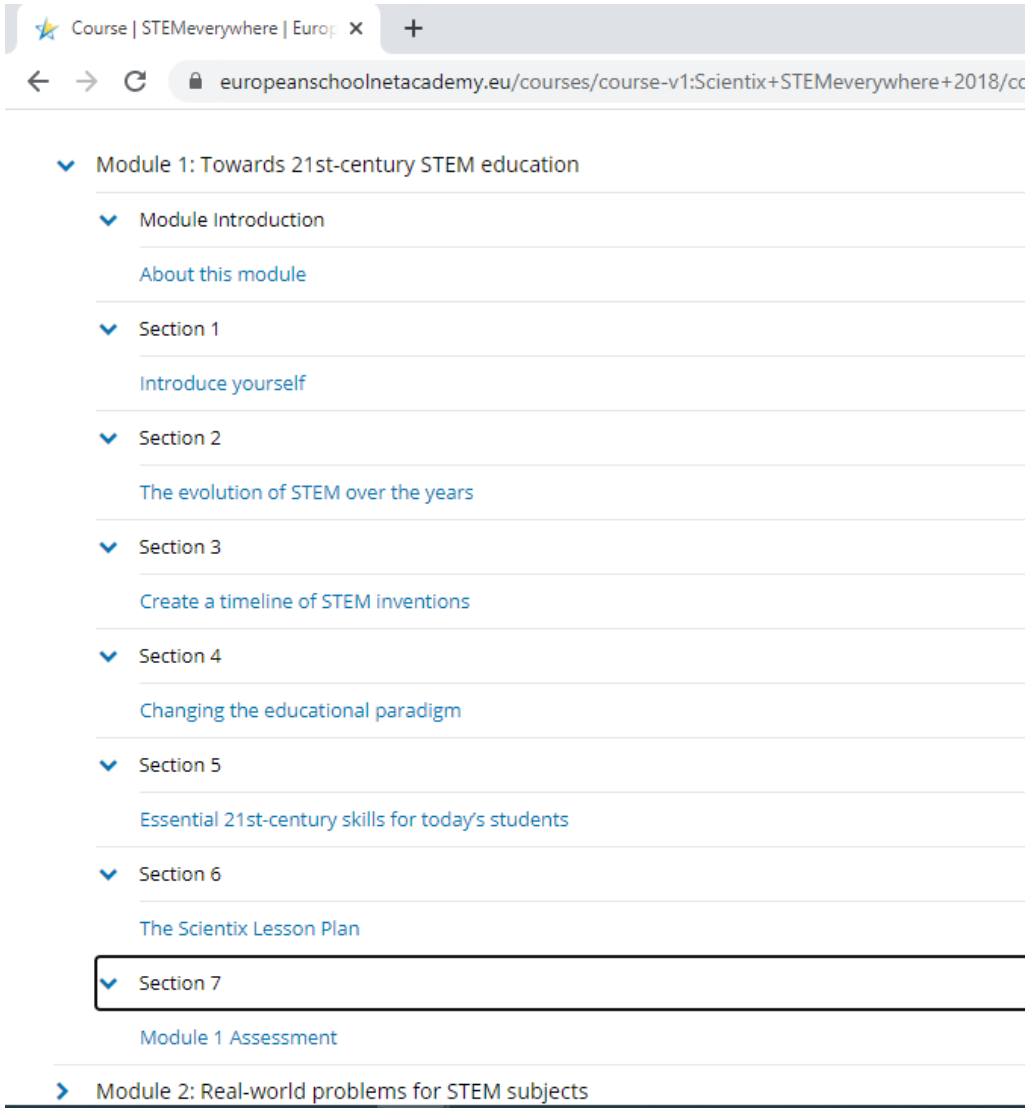

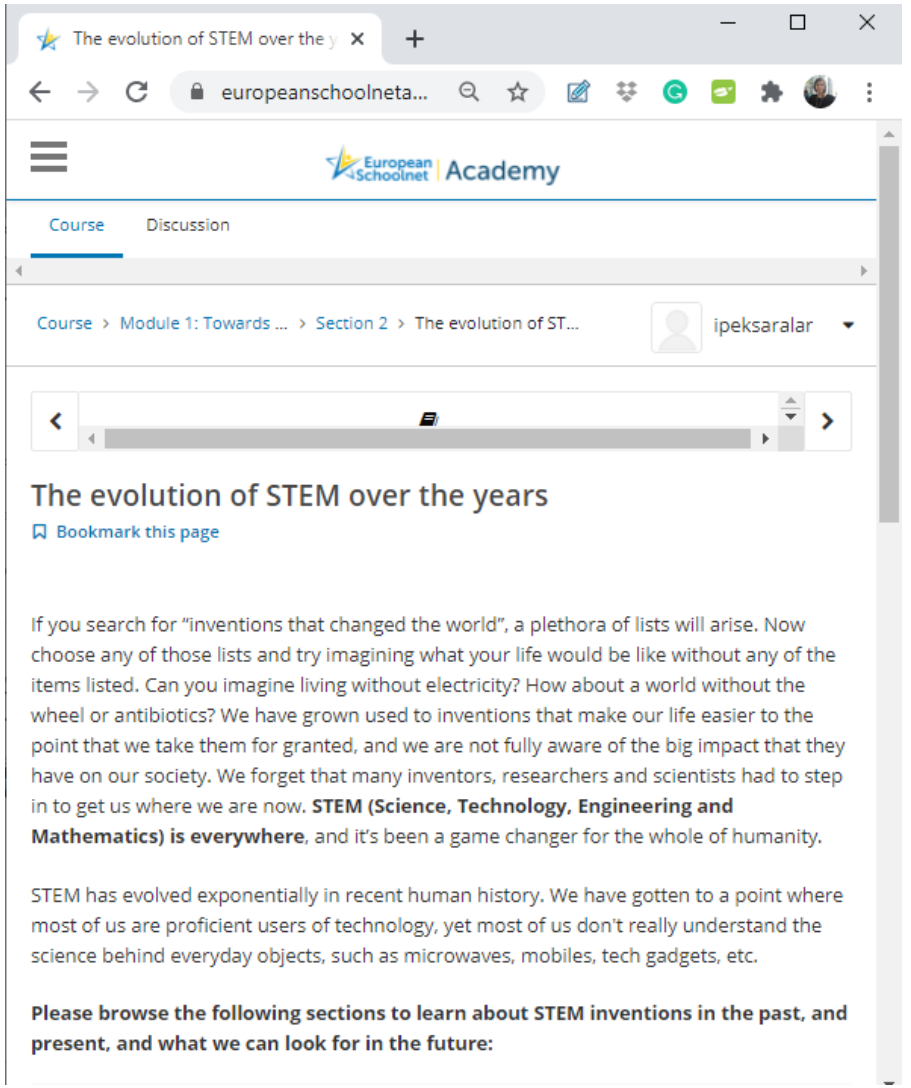

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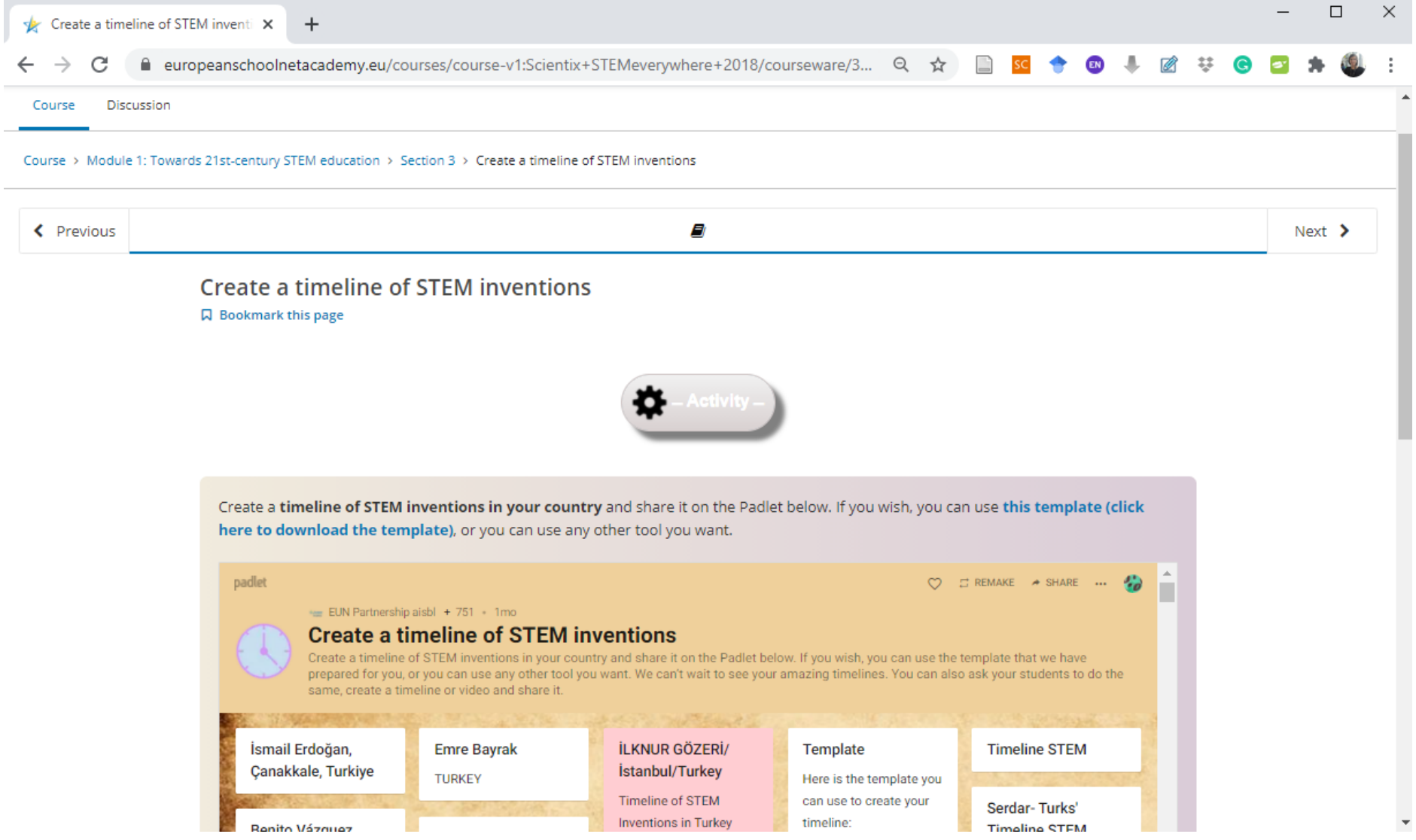


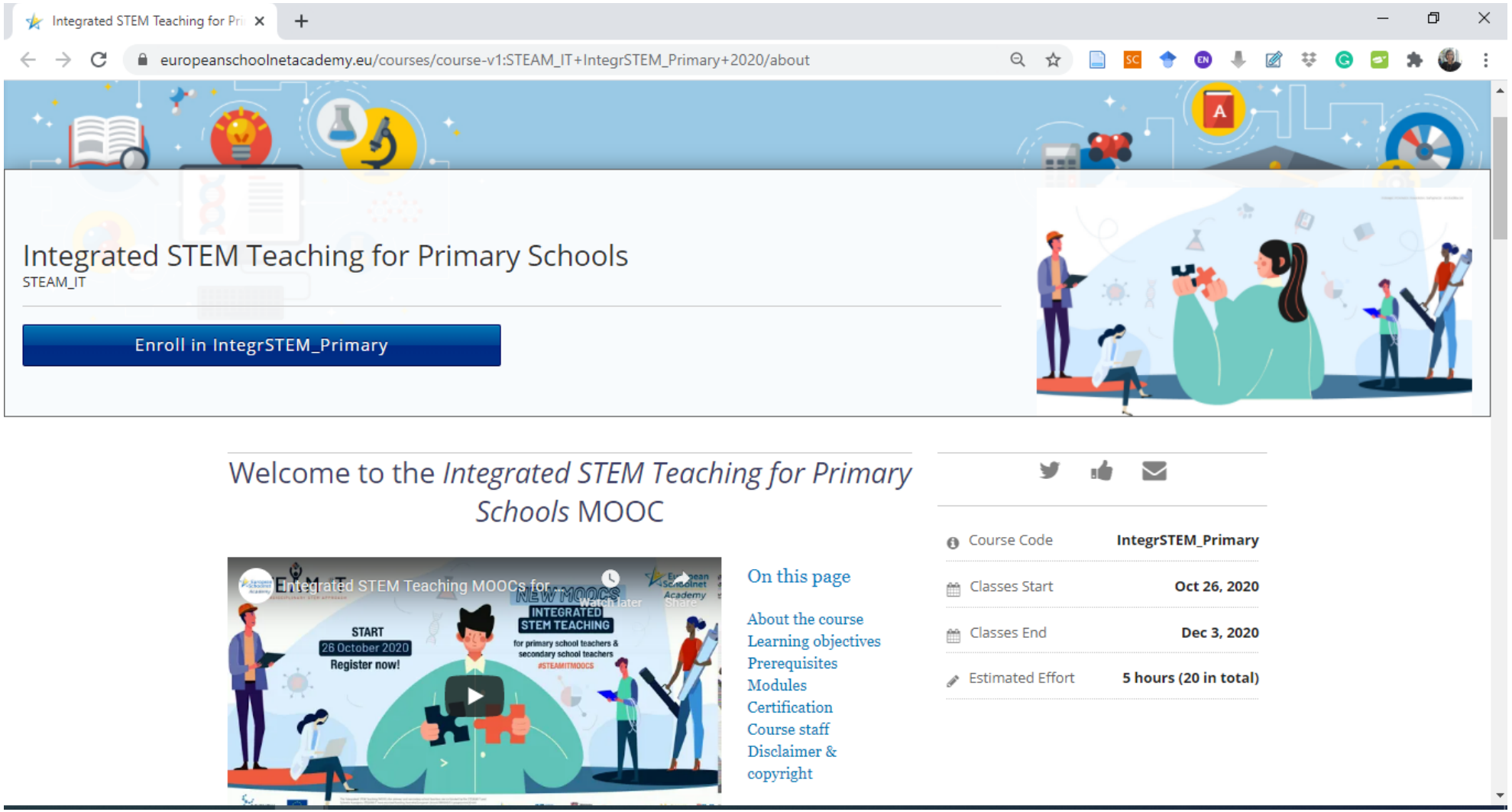
European SchoolNet Academy

- **Course name:** Integrated STEM Teaching for Primary Schools

- **Content:** «Modules»
  - Module 1: Introduction to integrated STE(A)M teaching & relevant pedagogies - opens on 26/10/2020
  - Module 2: STEM subjects and how STEM careers are contextualized at school - opens on 02/11/2020
  - Module 3: Examples of Integrated STEM teaching and Learning Scenarios - opens on 09/11/2020
  - Module 4: Create your learning scenario and peer-assessment - opens on 16/11/2020
- **Duration:** 4 weeks

- **Place:** Online

European SchoolNet Academy



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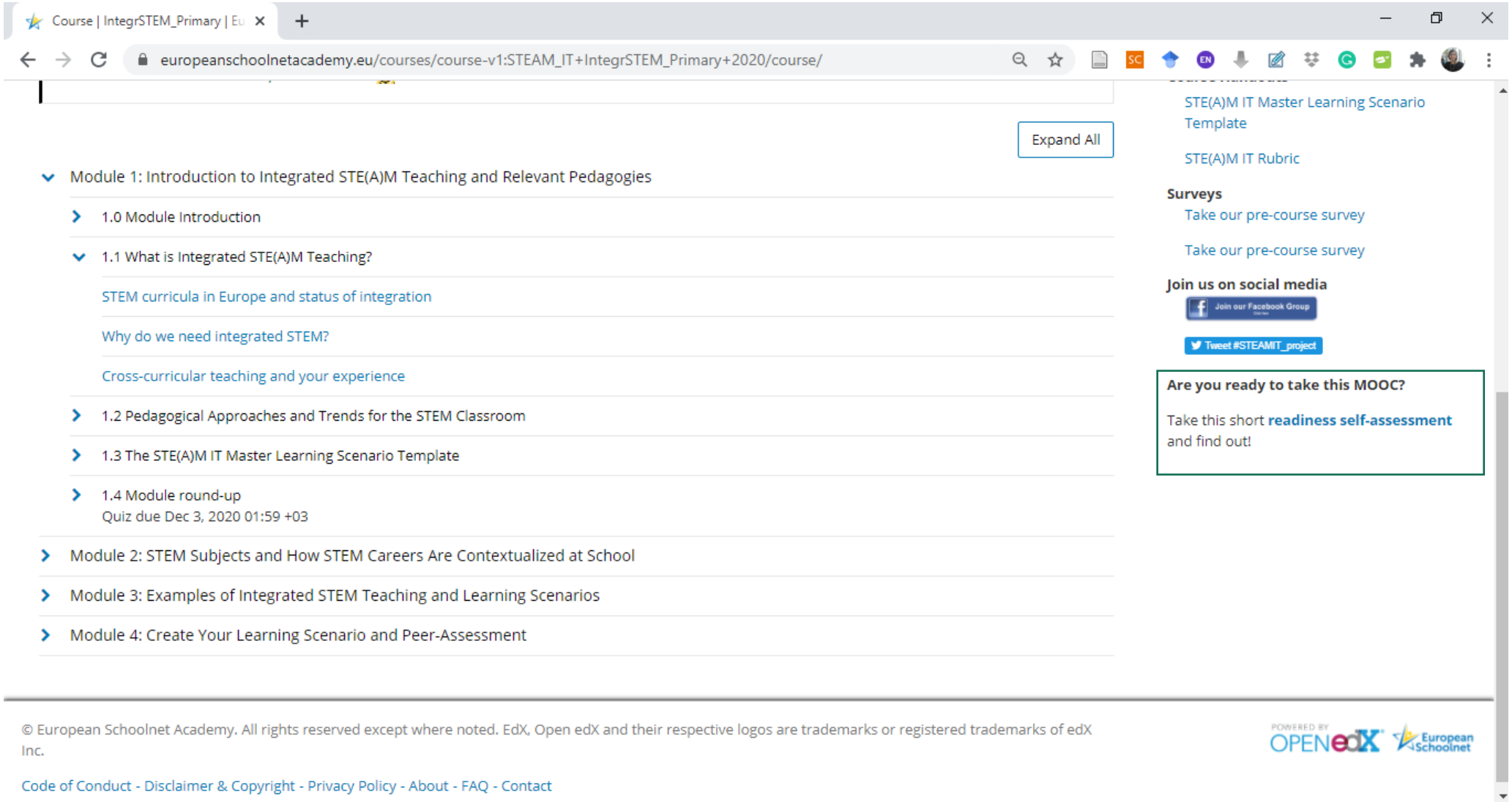

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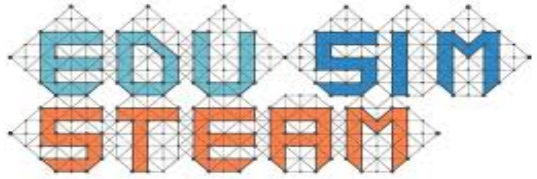

STEM curricula in Europe and sta

europeanschoolnetacademy.eu/courses/course-v1:STEAM_IT+IntegrSTEM_Primary+2020/courseware/27749d07780e4bf...

Course › Module 1: Introduction to Integrated STE(A)M Teaching and Relevant Pedagogies › 1.1 What is Integrated STE(A)M Teaching? › STEM curricula in Europe and status of integration

Previous | Next

STEM curricula in Europe and status of integration

Bookmark this page

STEM education is recognised as a priority in Europe by public and educational authorities. However, students' interest in pursuing STEM-related studies and careers has not been increasing despite the rapid developments in science and technology. In an effort to reverse this trend, the combination of all of the four disciplines of science, technology, engineering, mathematics as well as non-science classes (**the (A) as in "all"**) into one class, unit, or lesson that is based on connections between the subjects and real-world problems, led to the idea of **Integrated STE(A)M teaching.**

Integrated STE(A)M teaching reflects the effort to combine some or all four disciplines of **Science, Technology, Engineering, and Mathematics with at least one non-science subject (i.e. literature, history, economics, language classes etc.) into one learning unit or lesson.**

In Europe, there is no **integrated STE(A)M education framework** of reference, and the STE(A)M IT project leads the way in the creation and testing of the **1st Integrated STE(A)M framework.** More particularly, the objective is to develop more coherence in STE(A)M education by defining collectively with **Ministries of Education (MoEs), industry and STEM teachers (via a co-construction process) the concept of integrated STE(A)M education**. This is supported by the development, with a focus group of STE(A)M teachers, of interdisciplinary innovative teaching and learning scenarios that will be used to test the proposed framework of reference for integrated STE(A)M education In addition, the STE(A)M education movement provides the possibility to develop innovative and creative approaches for interdisciplinary STEM education projects enabling the integration of STEM and non-STEM subjects to be interlinked.

In this MOOC, we will explore the aforementioned concepts and ideas.

Previous | Next

European SchoolNet Academy

- **Course name:** Integrated STEM Teaching for Secondary Schools

- **Content:** «Modules»
  - Module 1: Introduction to integrated STE(A)M teaching & relevant pedagogies - opens on 26/10/2020
  - Module 2: STEM subjects and how STEM careers are contextualized at school - opens on 02/11/2020
  - Module 3: Examples of Integrated STEM teaching and Learning Scenarios - opens on 09/11/2020
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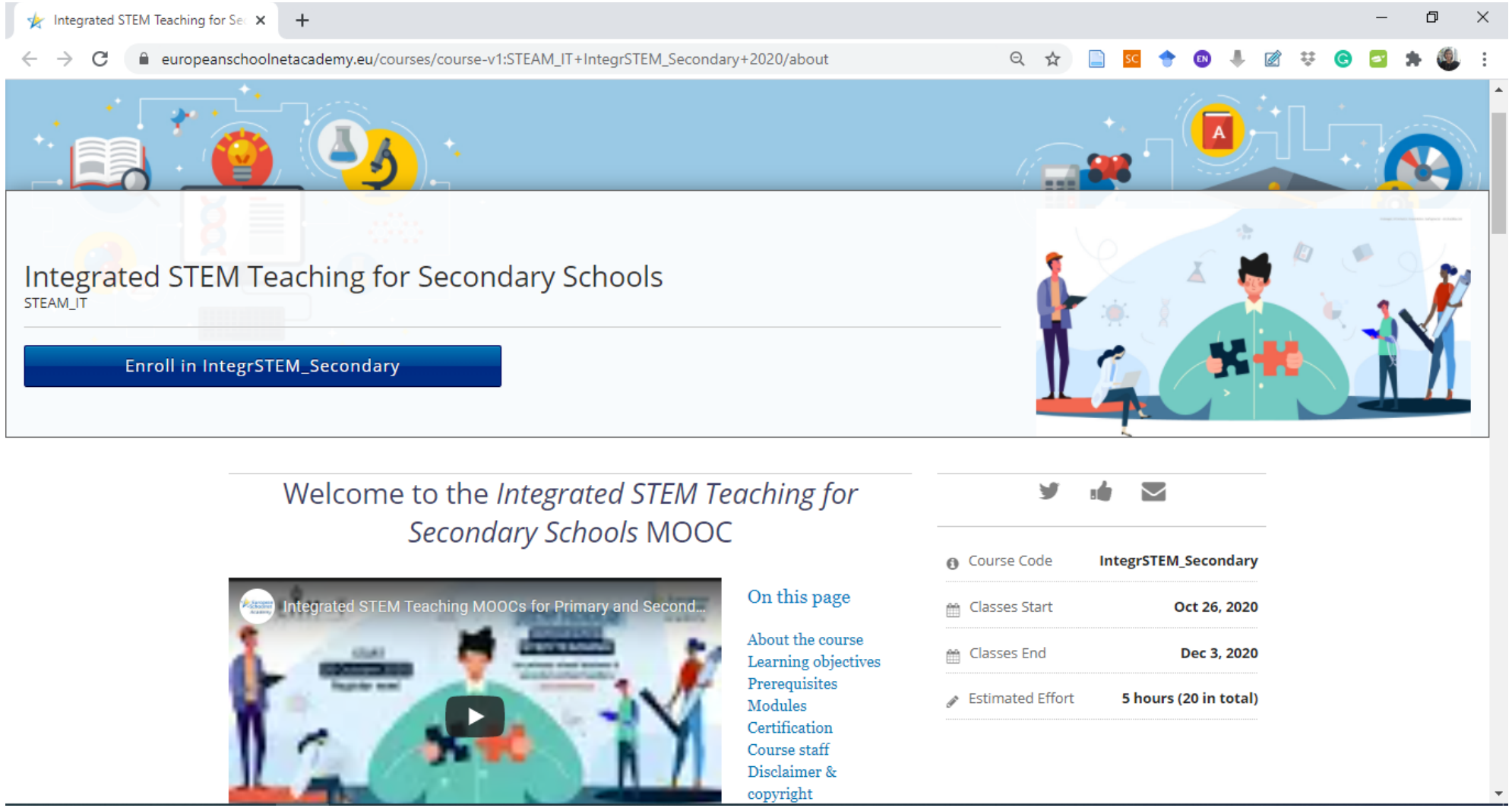
- **Duration:** 4 weeks

- **Place:** Online

European SchoolNet Academy



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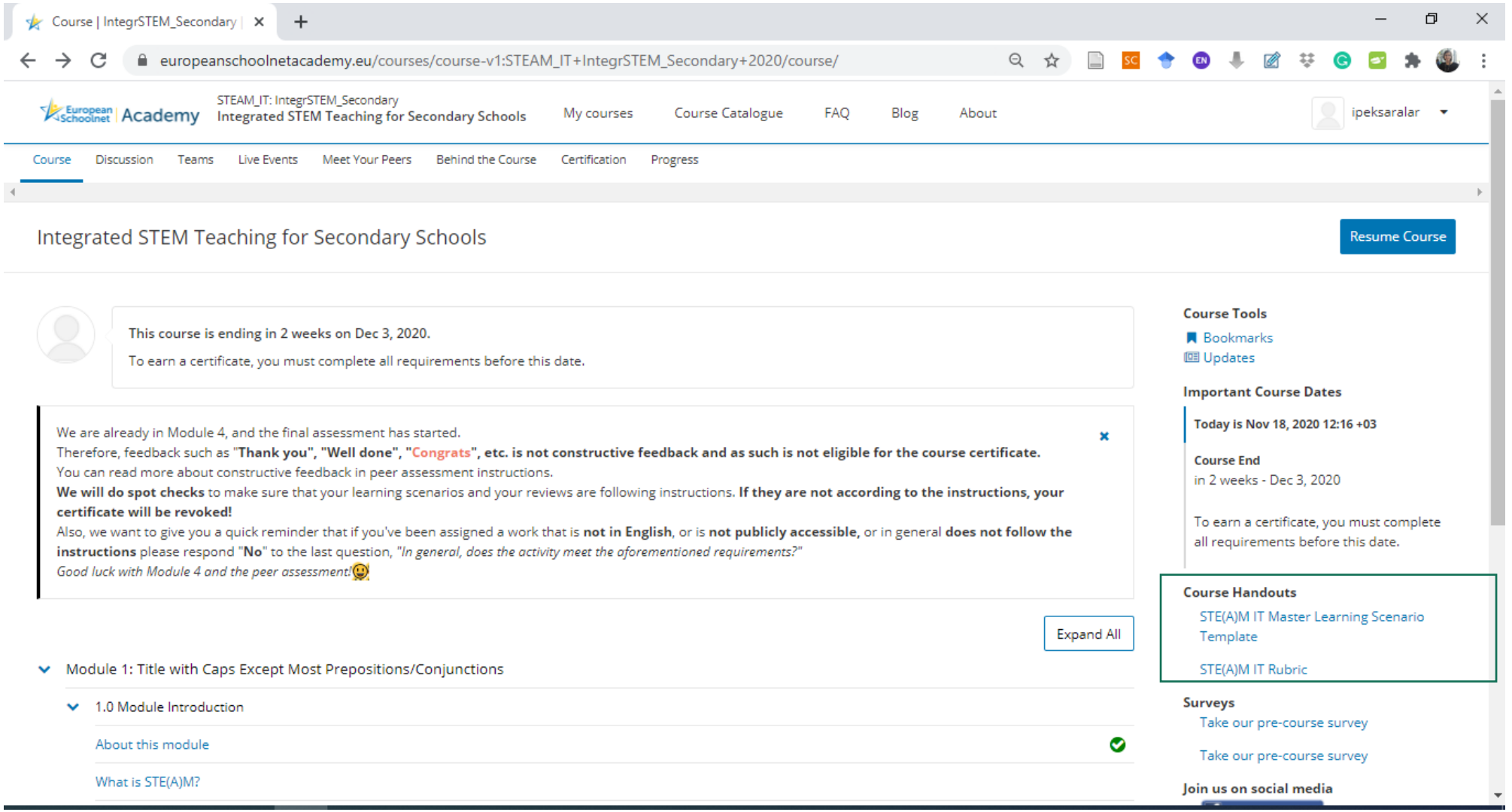

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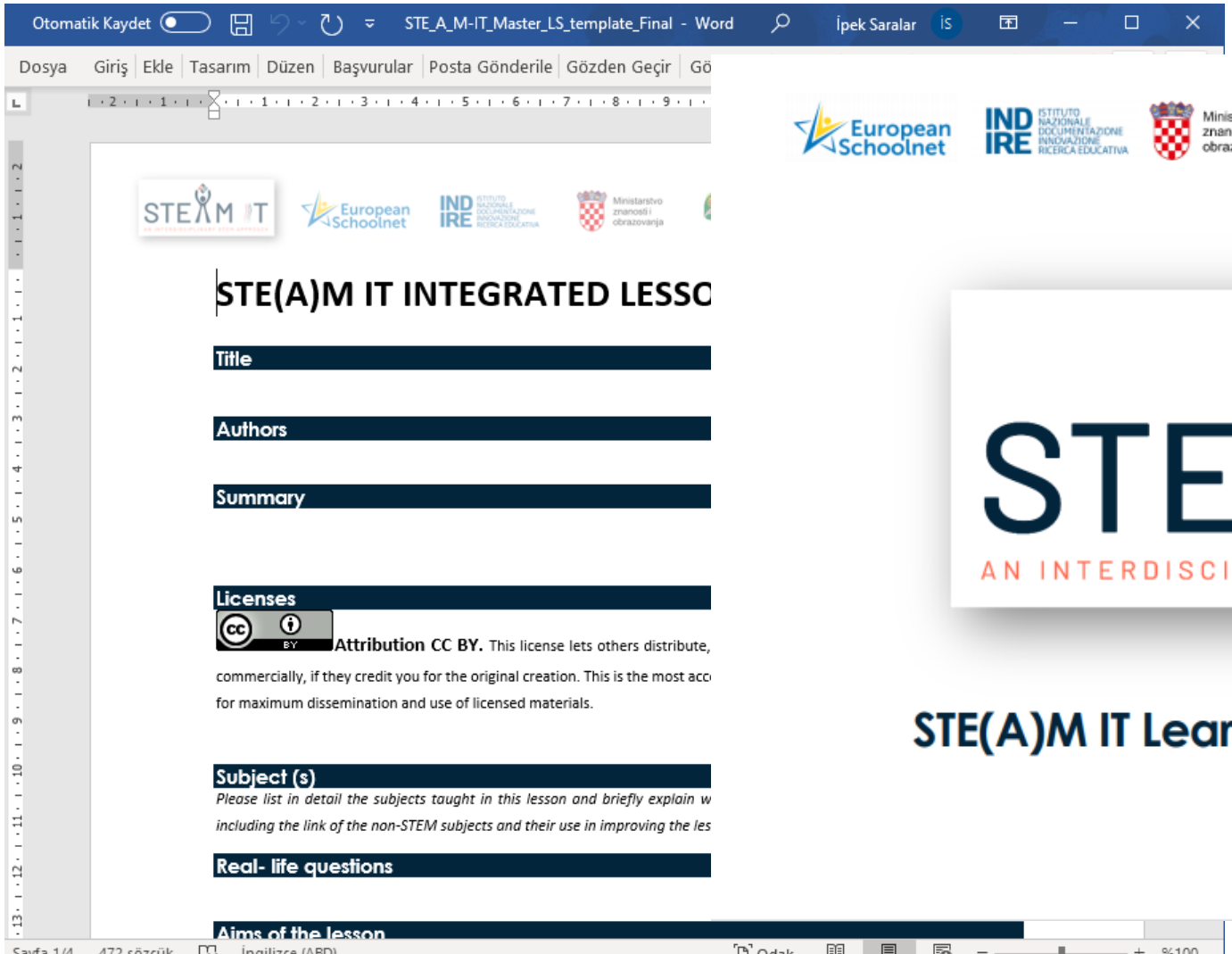
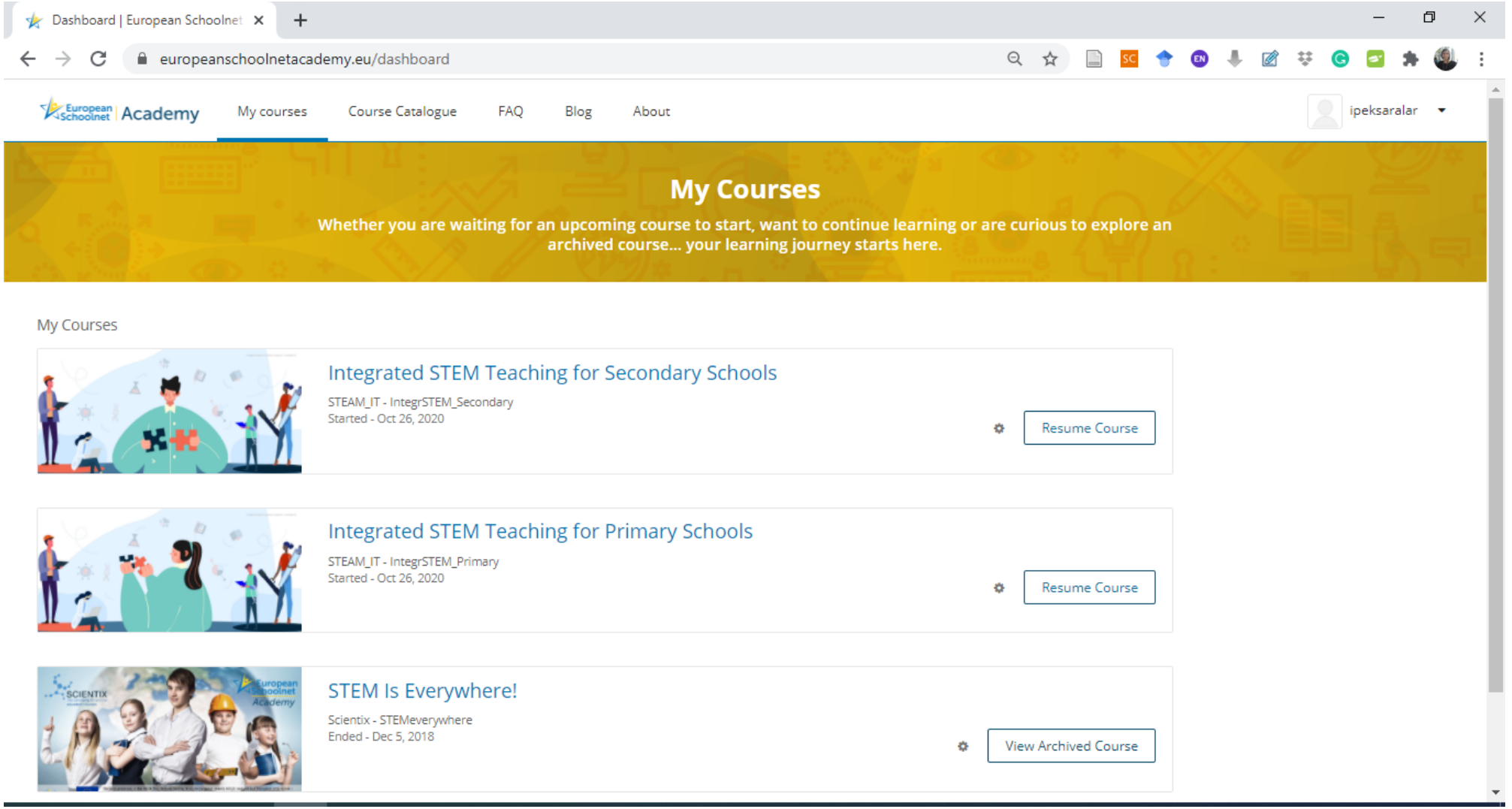


STE(A)M IT

AN INTERDISCIPLINARY STEM APPROACH

STE(A)M IT Learning Scenario Evaluation Rubric

European SchoolNet Academy



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FACE-TO-FACE COURSES ONLINE COURSES LOCATIONS FUNDING ENROLLMENT

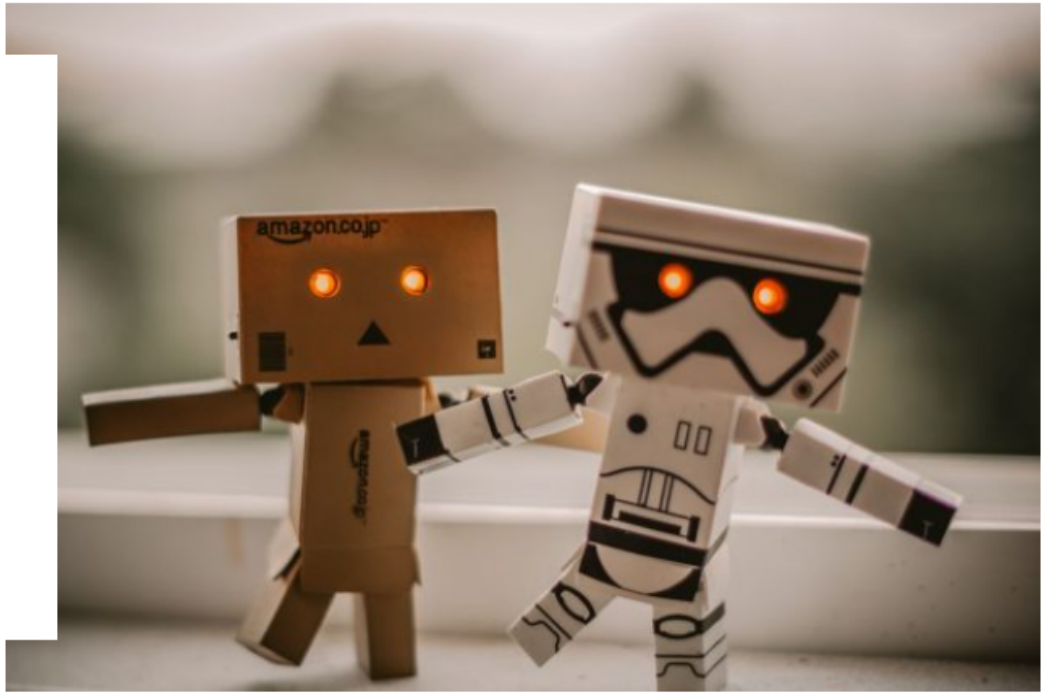
Code: ART.1.STEAM

From STEM to STEAM Education: A New Learning Approach

One-Week course in Barcelona, Berlin and Nice

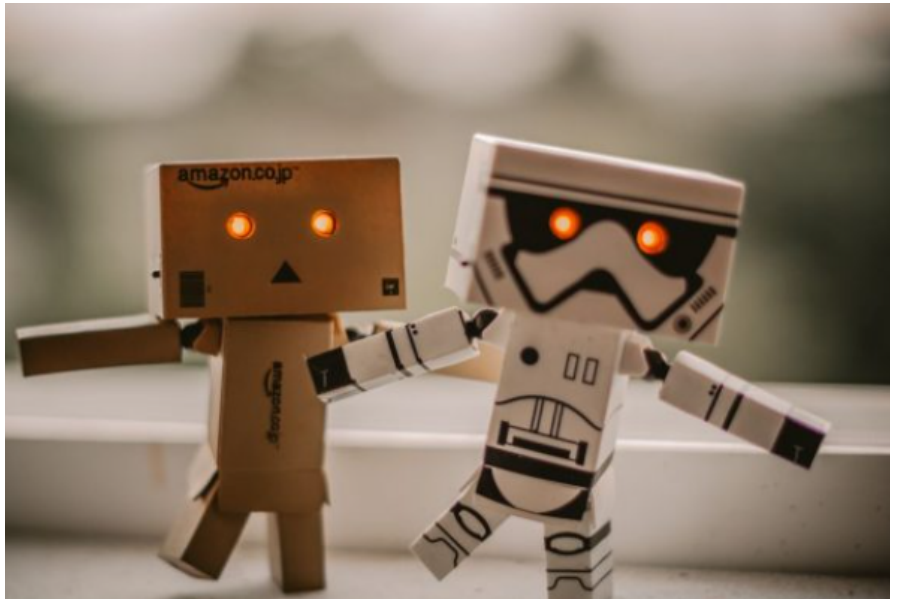
- Description
- Learning Outcomes
- Audience

Register here



Teacher Academy

- **Course name:** From STEM to STEAM Education: A New Approach
- **Frequency:** Every month
- **Duration:** A week
- **Place:** Barcelona, Berlin, Nice



Teacher Academy

- From STEM to STEAM Education: A New Approach

Audience

- Primary, secondary, vocational, adult, special needs teachers
- Teacher trainers;
- Headteachers;
- Principals;
- Managers of schools.

Learning Outcomes

- Identify the key features of STEM and STEAM.
- Define learning objectives that integrate STEM and Art & Design subjects to increase student engagement in learning.
- Connect and relate different subjects through creative STEAM activities, based on real-life and concrete experiences.
- Build an authentic STEAM lesson.
- Trust the importance of play, fun, and engagement in learning.
- Incorporate art and design-related skills into the general learning environment and curriculum.

Learning Outcomes

key features of STEM and STEAM

learning objectives that integrate STEM and Art

real-life and concrete experiences

an authentic STEAM lesson

play, fun, and engagement in learning

general learning environment and curriculum

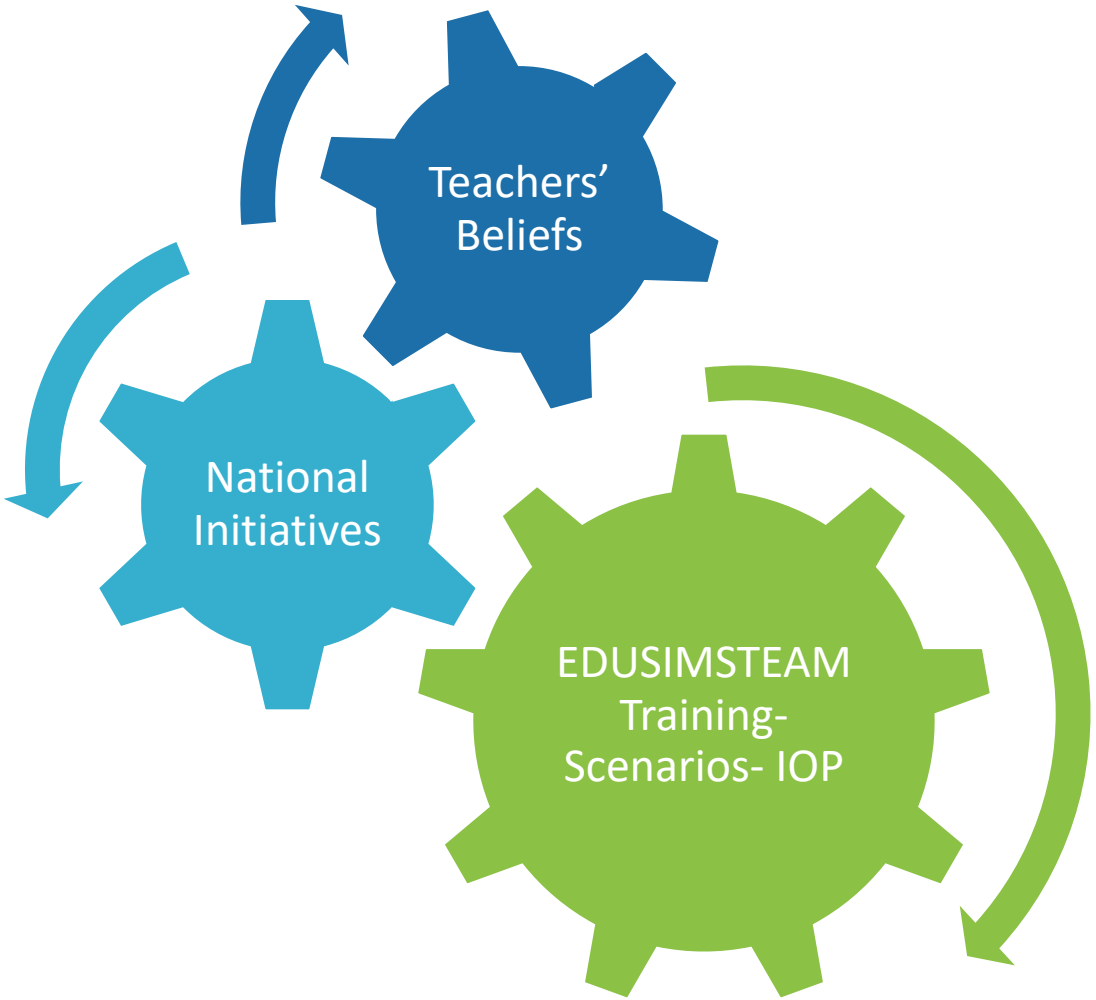
Conclusion

- Different ways of STEAM Professional Development
- Collaborative, Integrative, Project-based Approaches

- Teachers are used to webinars, and MOOCs: Need analysis
- There is a need for interactive, practice-based PD for STEAM

- Real-life/Daily life and concrete experiences
- Interdisciplinary approach and new methods

Discussion


Teachers' Beliefs
National Initiatives
EDUSIMSTEAM Training- Scenarios- IOP

Discussion

Which frameworks could be used as a reference to build such STEAM platform for teachers?

Which training models/ modules could be integrated?

Which training model could be developed to connect WPs? (WP-2,3,4)

REPUBLIC OF TURKEY
MINISTRY OF NATIONAL EDUCATION

THANK YOU

EDUSIMSTEAM Project Management Team

http://edusimsteam.eba.gov.tr/

20/11/2020

Ideas for Training Curriculum

Project „Fostering STEAM Education in Schools (EDUSIMSTEAM)“

2020-11-20

WP2 Teacher Training & Training Curriculum

- The aim is to **provide online training to all teachers in K12** schools by using the data results of WP1 in order to be able to incorporate STEAM skills into their curriculum.
- Project team plan to focus on **robotic and algorithmic thinking for teacher trainings**; they will use STEAM approach through the medias of robots and robotic programs.
- Then, a **curriculum will be prepared for teacher education** in order to **gain the skills of robotics literacy and algorithmic thinking** at the international level.
- The prepared curriculum will be used during the teacher training process and will **be open to access for teachers after the project.**

Problems related to STEM-oriented skills integration

Integration STEM-oriented skills into the school curriculum related with such **challenges as:**

- using technological toys;
- increasing the role of the teacher as a mentor in STEM classes introducing after-school activities related to STEM;
- focusing on active learning based courses.

Problems Related to Technology

The choice of appropriate technological tools:

- in creating adequate technological infrastructures to support collaboration;
- for monitoring and programming easiness;
- using the fully configurable user interface;
- making improvements in STEM learning using robotics.

Pedagogical Methods, Activities and Resources Include

Pedagogical methods, activities and resources include:

- providing learners' research, problem solving,
- critical computational thinking,
- collaborative learning skills
- making and tinkering activities,
- including robotics activities.

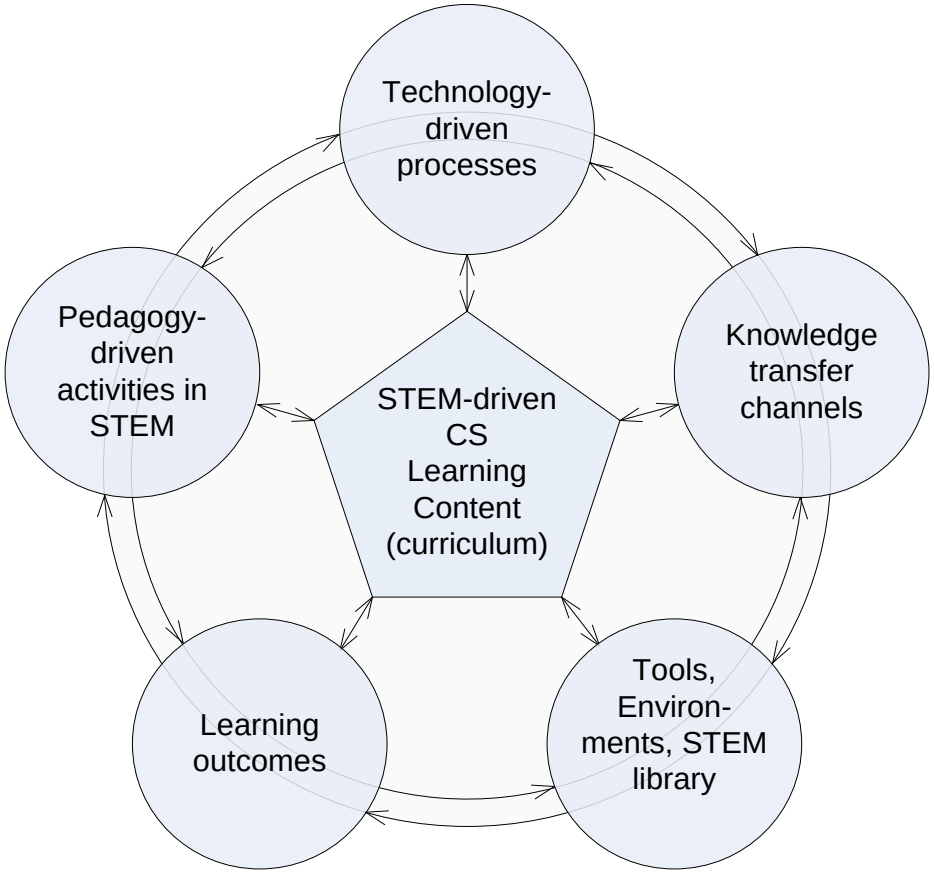
From interview: "...skills like collaboration, creativity, critical thinking, and problem solving are part of any STEAM PBL."

The others include: implementing consequential, side-by-side, inquiry-based, design-based, game-based, project-based learning.

Computational Thinking

- Computational thinking complements critical thinking as a way of reasoning to solve problems, make decisions and interact with our world.
- Computation thinking concepts are such as task decomposition, abstractions and generalization of patterns, developing algorithms, data types, data representation, iterative and parallel thinking, conditional logic, debugging and systematic error detection, etc.
- Creativity and computational thinking have some complex relationship, which leads us to deepen our knowledge regarding these associations by using empirical, objective measures for both constructs.
- From the pedagogical perspective, robotics can make STEM courses more alive, since students can build robots by themselves as well as to program them, and can therefore learn directly from them.

A Framework to Implement STEM



A framework to implement STEM-driven conceptual model of the CS curriculum

Bloom’s taxonomy

Bloom’s taxonomy defines Knowledge and Cognitive Process.

Knowledge process depends on:

- Factual knowledge,
- Conceptual knowledge,
- Procedural knowledge,
- Metacognitive knowledge.

The Cognitive Processes' Dimension Based on Bloom's Taxonomy

A lower order thinking skills	Category	Cognitive processes
	Remembering – retrieving relevant knowledge from long-term memory.	Recognizing Recalling
	Understanding – determining the meaning of instructional messages, including oral, written, and graphic communication.	Interpreting Exemplifying Classifying Summarizing Inferring Comparing Explaining
An upper order thinking skills	Applying – carrying out or using a procedure in a given situation.	Executing Implementing
	Analyzing – breaking material into its constituent parts and detecting how the parts relate to one another and to an overall structure or purpose.	Differentiating Organizing Attributing
	Evaluating – making a judgement based on criteria and standards.	Checking Critiquing
	Creating – putting elements together to form a novel, coherent whole or make an original product.	Generating Planning Producing

Computational Thinking Skills

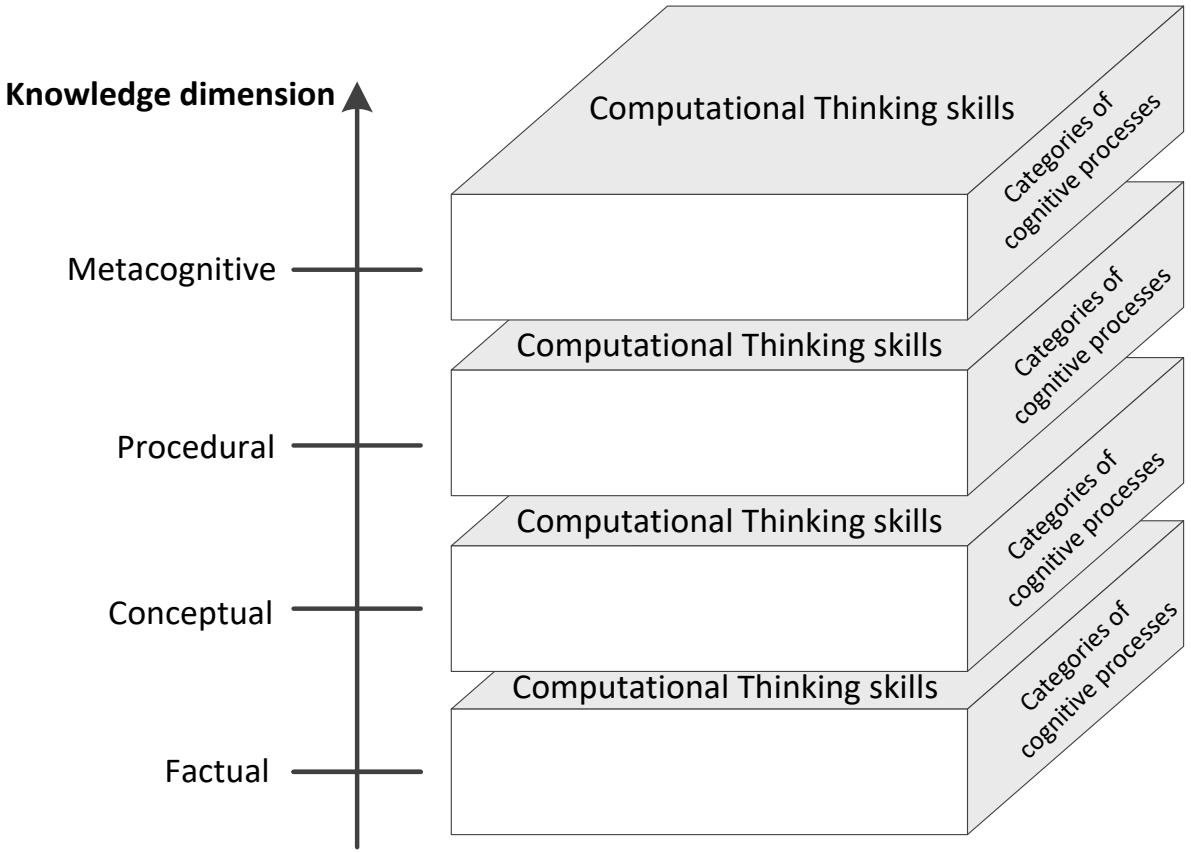
Skill	Explanation
Abstraction	It is the process while simplifying from the concrete (something complicated) to the general as solutions are developed (by leaving out irrelevant details, finding the relevant patterns, and separating ideas from tangible details).
Decomposition	It is the process of breaking down problems into smaller parts that may be more easily solved.
Generalization/ Pattern recognition	It is transferring a problem-solving process to a wide variety of problems and allows to expand an existing solution in a given problem to cover more cases.
Data representation	It is any sequence of one or more symbols given meaning by specific act(s) of interpretation. It is something more fundamental than an algorithm.
Algorithm	It is a practice of writing step-by-step specific and explicit instructions for carrying out a process.

What Is Algorithmic Thinking?

An Algorithm is a method to solve a problem that consists of exactly defined instructions.
Abilities that are connected to constructing and understanding algorithms:

- the ability to analyze given problems;
- the ability to specify a problem precisely;
- the ability to find the basic actions that are adequate to the given problem;
- the ability to construct a correct algorithm to a given problem using the basic actions;
- the ability to think about all possible special and normal cases of a problem;
- the ability to improve the efficiency of an algorithm.

Connection between CT Skills, Knowledge Dimensions and Categories of Cognitive Processes



Suggested Topics for R-Learning (1)

Subjects	Topic / problems	Examples	Comments
Natural sciences	Pollution measurement at classes	Robot measure carbon dioxide amount in class	
Natural sciences / physical education	Heart rate measurement	Robot measure heart rate of every schoolchildren	
Foreign languages	Engagement into foreign language learning process	Robot listen to he commands and go to right or left, forward, back (listen to the commands)	Speech recognition
	Vocabulary enhancement	Robot announces the sensor results, or tells about the environment in which it moves	Speech synthesis

Suggested Topics for R-Learning (2)

Subject	Topic / problems	Examples	Comments
Mathematics	Abstract thinking development / Understanding addition and subtraction	Robot gather or carry out balls and shows main math actions	
	Abstract thinking development / Understanding fractions	Robot divides the wooden fruit into certain parts	
Art	Maintaining symmetry	Robot draw mandalas	Line following accuracy calculation
Physics	Main physics concepts explanation	Robot measure resistance of fruit / Measurement of air temperature change	

Training Framework

Need analysis, requirements, participants capabilities
Learners profile
Learning space – online

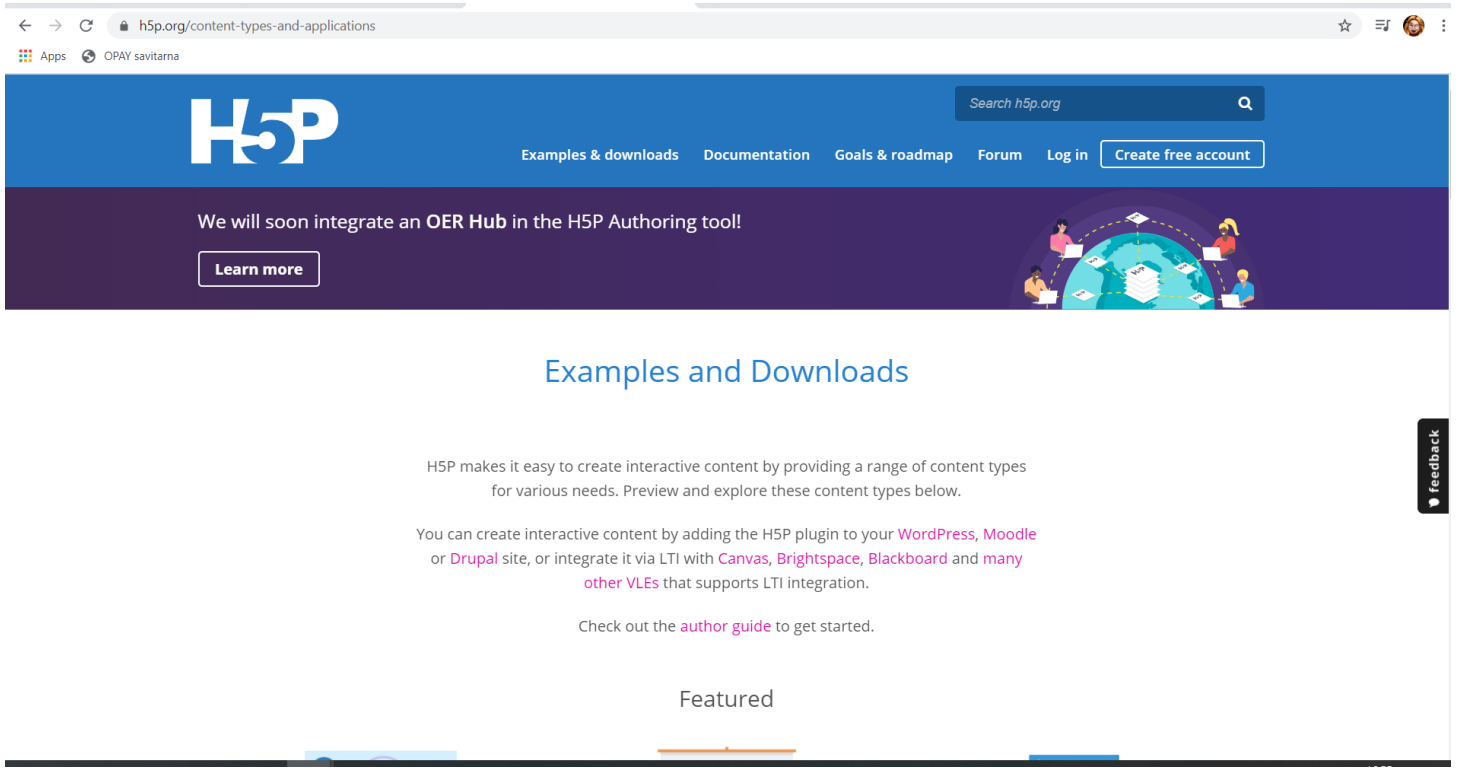
Training objectives
Online learning space
Technology options
Repository usages….

Curriculum creation (prototype creation)
- Problem solving,
- creative Thinking,
- Critical thinking,
- Collaborative learning,
- Making and tinkering

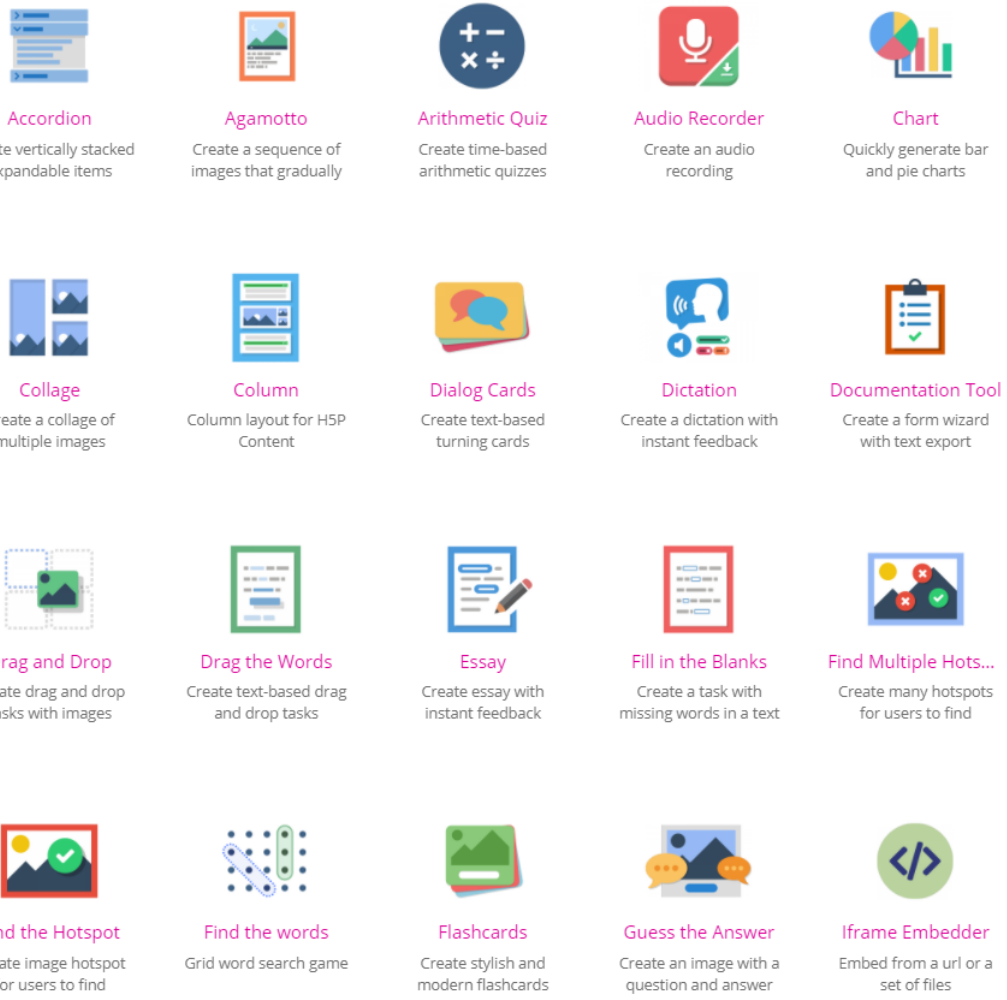
Training implementation
Motivation
Engagement
Delivery

Training Evaluation

Tools for the Online Platform Building (1)



Tools for the Online Platform Biulding (2)



Comparison Between Micro and Macro Learning

		Macrolearning	Microlearning
1	Learning context	formal learning	informal learning
2	Time spent	several hours	a few seconds up to about 15 minutes
3	Content type	learning modules, comprising and structuring a broader range of ideas or topics and combining learning objects	microcontent as small chunks of information, focusing on a single definable idea or topic
4	Content creation	content created by subject matter experts, usually with authoring tools	content co-created by learners with Web 2.0 and rapid e-learning tools
5	Content aggregation and fragmentation	learning objects usually need to be combined with other learning objects to enable full understanding; content can be easily split for re-use and restructuring	microcontent units are self-contained as they can be understood without any additional information; microcontent cannot be divided into smaller pieces without the loss of meaning
6	Content retrieval	courses or topics retrievable through a unique URL, however single learning objects are not addressable	microcontent has a unique URL (permalink), which make even small chunks of information retrievable
7	Structure of the learning cycle	hierarchic, sequential, pre-planned structures consisting of a number of units or lessons, each combining a number of learning objects, such as texts, images, audio, video	dynamic, flexible structures created by learners in the process of learning through syndication, aggregation and modification, based on such data as social tags and bookmarks
8	Target group	learners aiming at gaining an insight into topics defined by domain experts	learners aiming at exploring concepts or solving practical problems
9	Learner's role	learners as consumers of content, attempting to build mental structures similar to those of experts	learners as prosumers of content, building own mental structures through exploration and social interaction
10	Learner participation	focuses on learner-content interactions	focuses on social interactions between learners

Problematic Questions

How will we differentiate the curriculum for different classes?
If we reject robotic and algorithmic thinking, will we reach the purposes of the project?
Do all the K12 schools have internet connections? According Interview Analysis (Case of Turkey):
„Our school is a village school. Internet connection is required at first.“;
Another problem motivation:
„Only two teachers out of 80 are aware of the fact that STEM is essential for our education. That’s why there are no exact goals for STEM teaching at my school unfortunately.“
What approach we will use for problems solving independent from a specific programming language?
What is our approach to technical infrastructure problems?

Thank you for your attention ☺