Fostering Innovations and Nurturing Diversity in STEM Education
- FIND STEM –

2024-1-EL01-KA210-SCH-000249907

Continuous Professional Development Curriculum and Teacher Training

Module 1
Introduction to STEM Education

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Module 1: Introduction to STEM Education

Description

This introductory module provides an overview of STEM (Science, Technology, Engineering, and Mathematics) education, emphasizing its significance in fostering critical thinking, creativity, and problem-solving skills. Teachers will explore the integration of creative and innovative methodologies to enhance pupil engagement and improve learning outcomes in STEM disciplines.

Key Topics

- Overview of STEM Education
- Importance of STEM in developing critical thinking, creativity, and problem-solving
- The impact of creative methodologies on pupil engagement and academic achievement
- Identifying barriers and opportunities within STEM education

General Learning Outcomes

Upon the completion of the module educators will:

- Understand the fundamental principles and objectives of STEM education.
- Recognize the role of STEM in developing critical thinking, creativity, and problem-solving skills.
- Analyse the impact of creative approaches on pupil engagement, motivation, and academic performance.
- Identify barriers and opportunities in STEM education and how innovative teaching methods can address them.

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Activities

Activity 1	
Exploring STEM through Packaging Design	
Specific Learning Outcomes	Recognize the interdisciplinary nature of STEM education.
	Understand the historical, societal, and educational context of STEM.
	Reflect on personal experiences as an entry point to teaching STEM creatively.
	Experience how real-world artifacts (packaging) embody STEM principles.
	Appreciate the relevance of STEM in everyday life and future careers.
Teaching Methods and Approaches	Interactive Lecture
	Group Discussion
	Hands on activities
Duration	20 minutes
Delivery format	Face to face

Activity description

This activity introduces teachers to the concept and importance of STEM/STEAM education through an interactive and reflective exploration. Participants begin by connecting personally to creative problem-solving experiences from their childhood. Building on this, they will actively engage in a hands-on Packaging Design Challenge to experience the interdisciplinary nature of STEM. Key concepts, historical context, and fundamental principles of STEM education will be discussed to ground participants' understanding before moving deeper into pedagogical approaches in later modules.

Session Flow:

1. Introduction and Personal Reflection:
- Teachers reflect and share early childhood experiences of solving practical problems creatively (e.g., building shelters, inventing games, crafting objects).
- Icebreaker discussion to surface natural tendencies for inquiry, creativity, and engineering thinking even at a young age.

2. What does STEM stand for?
- Definition of STEM (Science, Technology, Engineering, Mathematics).

3. What is the A in STEAM?
- Brief explanation of adding 'Arts' to STEM, enhancing creativity and innovation.

4. Packaging Design Activity:
- Teachers work in small groups to analyse different real-world packages (e.g., cereal box, egg carton, juice box).
- Guided exploration of science, technology, engineering, and mathematics principles in packaging.

5. What is STEM Education?
- Video viewing and short discussion using the YouTube video: Watch: "What is STEM Education?"

6. Origins of STEM Education:
- Brief overview: Originated after the "Sputnik Shock" (1957) leading to a focus on science and technology education.

7. Aims of STEM Education:
- Understand real-world problem-solving, innovation, and preparing future generations for technological and societal challenges.

8. Why STEM Education is Important:
- Use graphic references from the "Action Plan on Basic Skills" (European Commission) Graphic Action Plan Link

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Assessment Methods	• Group discussion summaries • Participation and engagement
Resources	FIND-STEM introductory presentation (Annex 1)
	Graphic Action Plan Link
	"What is STEM Education?"

Activity 2	
Newspaper Chair Challenge: Engineering with Creativity	
Specific Learning Outcomes	Experience the power of hands-on, inquiry-based learning in a collaborative environment.
	Develop problem-solving, engineering, and creative thinking skills.
	Reflect on how design challenges engage pupils in STEM learning.
	Recognize the value of integrating low-cost materials and playful experimentation in STEM education.
Teaching Methods and Approaches	Collaborative group work
	Design thinking and trial-and-error problem solving
	Hands-on, experiential learning
	Reflection and peer feedback
Duration	**30 minutes**
Delivery format	Interactive Lecture
Activity description	
Teachers are grouped in small teams and challenged to: *"Build a small chair or stool structure using only newspaper and Sellotape, capable of holding one or two books without collapsing."* The focus is on creativity, structure, and fast thinking—not perfection. Teams will quickly brainstorm, sketch, and build their design within a limited time. After testing their chairs with books, they will reflect on design decisions and classroom potential.	
Assessment Methods	• Success in holding one or two books for 10 seconds • Informal group presentations (1–2 minutes each) • Quick verbal or written reflection: "What would you change or improve?" • Peer observation and feedback
Resources	Newspaper sheets (4–5 per group)
	Sellotape rolls
	Books for testing (1–2 per team)
	Optional: timer or bell
	Annex 2: FIND-STEM Fast Challenge Reflection Sheet

Activity 3	
Barrier Busters: Rapid STEM Opportunity Map	
Specific Learning Outcomes	Identify the most common classroom-level barriers to effective STEM instruction.

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	Generate at least one practical, innovative solution (opportunity) for each barrier using creative teaching methods.
	Recognise how peer exchange can surface unseen challenges and spark collective problem-solving.
Teaching Methods and Approaches	Think-Pair-Share
	Brain-writing on sticky notes
	Affinity-mapping & "dot voting"
Duration	10 minutes
Delivery format	Face to face
Activity description	
1. Think – Each teacher writes one major barrier to creative STEM teaching on a sticky note (e.g., time, resources, stereotypes). 2. Pair – In pairs, share barriers and jot a quick solution on the same note. 3. Share & Cluster– Pairs place their notes on a large flipchart or wall; facilitator groups similar notes into themes (Time, Equity, Assessment, etc.). 4. Dot-Vote & Mini-Pitch – Each participant gets three coloured dots to vote on the most pressing barrier clusters. The pair whose barrier receives the most votes gives a 30-second pitch outlining their proposed solution. Facilitator links winning solutions to forthcoming modules.	
Assessment Methods	• Completed barrier-solution notes. • Active participation in clustering and voting. • Clarity and relevance of 30-second pitches.
Resources	Sticky notes (1 per participant).
	Thick markers.
	Large sheet of kraft/flip-chart paper or empty wall space.
	Coloured dots or small stickers (3 per person).
	Timer or phone stopwatch.

Summary of key takeaways

- **STEM is interdisciplinary by nature**—science, technology, engineering and mathematics are most impactful when taught as interconnected ways of thinking and problem-solving.
- **Creativity is a catalyst**: integrating arts (A) or other creative approaches amplifies engagement, deepens understanding and nurtures innovation.
- **Critical-thinking & problem-solving skills** grow when pupils tackle authentic, real-world challenges rather than isolated facts.
- **Teacher mindset matters**: a willingness to experiment, iterate and reflect is the starting point for inspiring pupils to do the same.
- **Barriers are real but surmountable**: limited resources, time, gender-equality challenges (e.g., lower participation of girls), or teacher confidence can be mitigated through inclusive strategies, peer collaboration, low-cost materials and iterative design challenges.

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Opportunities for further professional development

Focus Area	PD Opportunity	Format / Provider Suggestions
1. Inquiry-Based Lesson Design	Deep-dive workshop on converting textbook topics into open-ended investigations.	• National STEM-learning centres • Online MOOC platforms (e.g., Coursera "Inquiry Teaching and Learning")
2. Culturally & Gender-Inclusive STEM	Short course on bias awareness, inclusive language, and strategies to engage girls and underserved groups.	• UNESCO STEM Teacher Training toolkits
3. Low-Cost Makerspaces	Hands-on training in cardboard engineering, recycled materials prototyping and classroom safety.	• FabLab or local MakerHub teacher evenings • "MakerEd" certification modules
4. Cross-Curricular Project Management	Coaching in agile planning (e.g., Kanban boards, Asana) and partner school collaborations	• Erasmus+ eTwinning PD events • Local teacher networks or municipalities
5. Research-Practice Partnerships	Join or initiate action-research groups to measure pupil outcomes from creative STEM interventions.	• University education faculties • Journal clubs or TeachMeet sessions

Action Step for Participants:
Select **one** PD opportunity that aligns with your classroom context and set a SMART goal (Specific–Measurable–Achievable–Relevant–Time-bound) to pursue it within the next three months. Share your goal with your group.

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