

STEM for inclusive schools

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STEM for inclusive schools

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Module Critical and Innovative Thinking (Grades 11-13)

Presentation of the leading partner:
University of Paderborn



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Chair of Business and Human Resource Education II
Prof. Dr. Marc Beutner

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Example of a module: Critical and Innovative Thinking [Grades 11-13]

STEM4inclusive schools



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Welcome! My name is Albert Einstein

“Welcome, my name is Albert Einstein. Perhaps some of you already know me. I would still like to introduce myself briefly. I am a physicist who has always questioned the limits of what is known. My research into the theory of relativity has not only revolutionised physics, but has also shown how important it is to be open to new ideas and to have the courage to think big.”

“Today, I will guide you on a journey through transversal skills. These competencies are crucial for overcoming challenges and shaping the future.”

Task 1: Think about which skills help you personally to overcome challenges in your daily life.

Brainstorming: Write down on cards or post-its what you already know about transversal skills.



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Definition!



What is critical and innovative thinking?

Critical and innovative thinking refers to the ability to question one's own thoughts and beliefs while respectfully considering the perspectives of others. It is about asking questions, hearing different points of view and working together to develop solutions that work for everyone. Everyone can think creatively and critically in their own way, regardless of how they learn or think.

- **Critical thinking** means that we don't just accept what we are told, but actively reflect on whether the information makes sense and what alternative explanations or interpretations are possible. In doing so, the diversity of thoughts and experiences of others is respected.
- **Innovative thinking** includes the ability to develop new ideas to solve problems. These ideas can also be inspired by exchanging ideas with others. Sometimes it takes trying different approaches to find out what works best, always considering the well-being of all parties involved.



Critical thinking



Skill: Questioning information and considering different perspectives.

Task 1: Think of a problem from your everyday life that you would like to solve (e.g. 'How can I live more sustainably?').

Ask specific questions to critically examine the problem:

- What assumptions are behind the problem?
- What could other perspectives or solutions be?

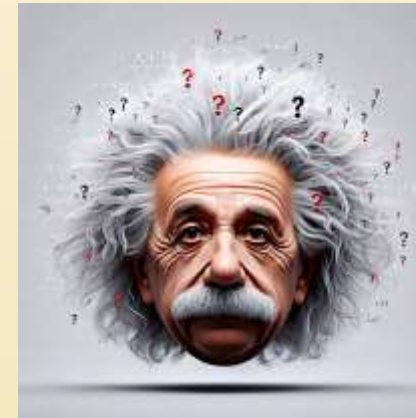


You have 20 minutes for the creation.
If you have people with special needs in your group you will get additional 10 minutes for the creation while the other groups have to check and improve their solutions



Develop three unconventional ideas: The ideas should be creative as innovative as possible:

- Develop an app that shows resource-saving alternatives nearby.
- Launch a challenge in which the whole family tries out sustainable habits



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Einstein recommends the Socratic Questioning:

This method uses targeted questions to stimulate deep reflection and provide food for thought. It encourages critical questioning and supports the development of creative ideas. Typical questions are:

- 'What would happen if we ignore assumption A?'
- 'Are there alternative points of view that we are overlooking?'
- 'What are the arguments against the current solution?'
- 'How can you look at the problem differently?'



Problem-solving skills



Skill: Analysing problems and developing solutions.

Task 2: Think about a problem that occurs in your school where inclusion plays a role, e.g. “How can we improve access to teaching materials for all students?”

Create a diagram: Work in groups and draw a fishbone-diagram. Ask yourselves:

- What are the main causes (e.g. communication, planning, resources)?

You have 20 minutes for the creation.
If you have people with special needs in your group you will get additional 10 minutes for the creation while the other groups have to check and improve their solutions

Presentation: Present your results to the class and discuss possible solutions.



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Einstein recommends the Fishbone-Diagram:

Problem solving requires a structured approach: First understand the problem in detail, then analyze possible causes and develop possible solutions. It is crucial to proceed systematically, test the solution and finally implement it.

A visual tool for problem analysis:

1. Draws the “fish body” as a line with the problem at the end.
2. Adds the main causes (e.g. organization, technology, people) as “bones”.
3. Adds sub-branches for secondary causes.



Creativity



Skill: Developing new ideas and unconventional solutions.

Task 3: Work in groups and design a school of the future together: “What are the core values of this school?”, “What does a classroom look like?” and “What is changing in the school?”

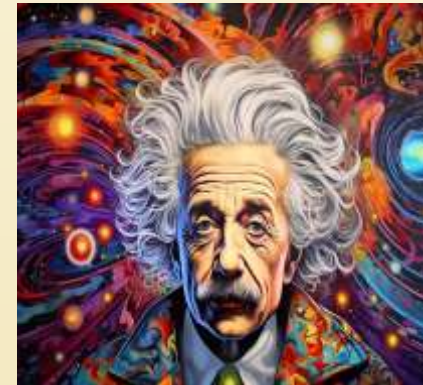
Work in groups: Uses the Design Thinking method to shape the school of the future. Be creative, there is no right or wrong. As Einsteins says: *“Imagination knows no bounds.”*



You have 30 minutes for the creation.
If you have people with special needs in your group you will get additional 10 minutes for the creation while the other groups have to check and improve their solutions



Presentation: Present your vision as a sketch, concept or video.



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Einstein recommends the Design Thinking:

Design thinking is a creative approach to problem solving based on empathy and user-centeredness. The process comprises the following steps:

1. Understanding the problem
2. Developing empathy
3. Create prototypes
4. Testing and refining



Innovative thinking



Skill: Refine existing solutions and find new ones.

Task 4: Think of a school inclusion problem, e.g. “How do we make the classroom accessible for all students?”

Using the 6-3-5 method: Write down 3 ideas in 5 minutes and pass the sheet around to collect at least 18 ideas. Feel free in your ideas, because as Einsteins says: *“Imagination is more important than knowledge, because knowledge is limited.”*



You have 45 minutes for the creation.
If you have people with special needs in your group you will get additional 10 minutes for the creation while the other groups have to check and improve their solutions



Evaluation and Presentation: Select the best inclusive ideas together and develop a concrete implementation idea and present it.



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Einstein recommends the 6-3-5 Brainwriting:

Brainwriting promotes creative ideas in groups by participants writing down their thoughts and passing them on. This results in many innovative solutions and everyone can contribute equally:

1. Everyone writes 3 ideas on a sheet of paper.
2. After 5 minutes, the sheet is passed on. The next person reads the ideas and develops them further.
3. This process is repeated 5 times.



Module summary



Albert Einstein summarizes what we have learned:

Critical thinking: Questioning assumptions, analyzing facts and perspectives.

Method: **Socratic Questioning** — targeted questions to provide food for thought.

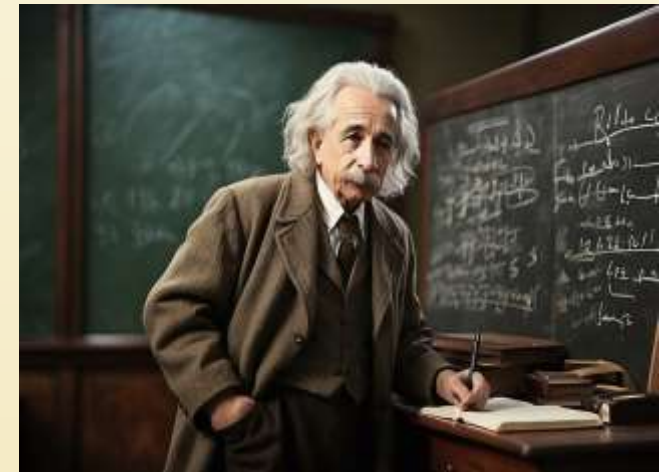
Problem solving skills: Systematic approach to solving problems, analyzing causes and developing solutions.

Method: **Fishbone diagram** — visual analysis of causes and solutions.

Creativity and Innovation: Developing new ideas and unconventional solutions.

Method: **6-3-5 Brainwriting** — collecting and developing ideas in a team.

Method: **Design Thinking** — developing empathy and testing solutions through prototypes.



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“True intelligence is not just about knowledge, but about the ability to apply it creatively. It is our curiosity and the ability to find solutions together that will help us move forward.”

Let's continue to shape the world with critical thinking, creativity and innovation!





Congratulations!

**You mastered the module
critical and innovative
thinking.**

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