SMALL ACTIVITIES, BIG IMPACT – TRAINING MATERIAL

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Title of project	**DOTS... Development of transversal skills in STEM**
Full title of project	**DOTS... Development of transversal skills in STEM**
Title of this document	**SMALL ACTIVITIES, BIG IMPACT – TRAINING MATERIAL**
Author	**All partners**
Executive summary	**This deliverable presents the approach and the main training material that have been produced for the training courses of the project. The training material includes several cases and fields in STEM that are covering transversal skills. Also includes a structure for the training courses for teachers, that can use the material to enhance their transversal skills.**

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INTRODUCTION

Pursuing the effective teaching of science, technology, engineering, and mathematics (STEM) is a continuous process of skills acquisition. The pathway to becoming an adept professional (i.e., a “good teacher”) involves more than knowledge of the field and experience with delivering the curriculum. Indeed, it requires awareness and an effort to develop crucial professional skills.

Transversal skills are personal competences which improve human performance, facilitate effective interactions, complement the technical requirements necessary to acquire and maintain employment and support individuals and teams to excel in any field. It is a truism for which the teachers need to develop a taste for and strive to incorporate these transversal competences within the teaching of core subjects.

The DOTS project is working with professionals in the field of STEAM (Science, Technology, Engineering, Arts and Mathematics) and teacher continuous professional development (CPD), in order to address the divergence between educational systems, schooling approaches, policies etc. and societal needs, with an emphasis on transversal skills. Bringing in international expertise and enabling the members of the DOTS consortium to analyze, reshape and co-create teacher training approaches, the project aims to increase the role and impact of transversal skills in the STEM classroom.

It is a strong belief of the DOTS project, that a teacher with an understanding of the role of transversal skills and the ability to design a learning experience that fully incorporates them will be able to empower students to become active and autonomous learners and positive actors in their school, the local community and eventually in the whole of society. Transversal skills allow educators to expand pupils’ scientific literacy, critical thinking, ethical intelligence and global perspective and help them grow into confident lifelong learners and active citizens.

Consequently, target groups of this project are primary and secondary school teachers with a specific emphasis on STEM teachers and lower primary teachers. In addition, this project will focus on educators and trainers in non-formal settings, attempting therefore to reach the widest possible audience and impact young learners whether in formal or non-formal education.

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SCOPE AND OBJECTIVES

The overall scope of the project is the improvement of teachers' transversal skills in STEM as well as their ability to impart them to their students. Consequently, the project also aims to contribute to the field of school innovation which requires the exercise of such skills.

The specific objectives of this project are:

- Development of methods, materials and tools for the support of learning and teaching transversal skills.
- Training of teachers to implement the developed methods, tools and materials in their teaching practice.
- Evaluation of the applicability and usefulness of developed methods, tools and materials.

TEACHERS' PROFESSIONAL DEVELOPMENT

The project was scheduled to realize a Training activity (a Teachers' Professional Development course), but due to the COVID-19 pandemic that was not possible.

In particular, the school year of 2020-2021 was a very atypical and unexpected year. For schools it represented the need to shift quickly from a normal classroom setting to distance learning education. Teachers' needs for improvement of their digital competence profile became not only visible but also a matter in need of urgent attention. Schools had to shift between the open and close state during the whole school year.

The outbreak of the COVID-19 pandemic imposed several changes to the initial foreseen DOTS schedule for the 5-day course in order to support educators and present DOTS approach and activities. So, the DOTS project had to proceed with the necessary changes as the Training course was canceled twice. DOTS partners were ready to provide this training course so in this document we present, as an example, the course schedule that the project developed and it was ready to be realized. Instead of this 5-days course the partners will still realize their National Courses as well as are able, based on the proposed structure to organize localized courses in their countries.

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TRANSVERSAL SKILLS: WHAT DO THEY MEAN

Before proceeding with the proposed approach from the DOTS project concerning the development of transversal skills in STEM and more specifically how these skills could be developed from teachers so as to be able to transfer them to their students, it is important to understand what do transversal skills mean.

According to UNESCO;

Transversal skills are those typically considered as not specifically related to a particular job, task, academic discipline or area of knowledge but as skills that can be used in a wide variety of situations and work settings (IBE 2013). These skills are increasingly in high demand for learners to successfully adapt to changes and to lead meaningful and productive lives (UNESCO 2014c).

There have been some attempts to identify and categorize the most common of such skills. A brief overview is following:

- **Critical and innovative thinking** such as creativity, reflective thinking, rational decision making
- **Interpersonal skills** such as communication organizational, sociability, collaboration, empathy and compassion
- **Intrapersonal skills** such as self-discipline, enthusiasm, perseverance, self-motivation, integrity, autonomous learning
- **Global citizenship** such as tolerance, openness, respect for diversity, intercultural understanding
- **Media and information literacy** such as the ability to locate and access information, as well as to analyze and evaluate media content

In a slightly different approach OECD (2019) distinguishes between the following categories of necessary skills that can be transferred across sectors, fields, contexts, etc.:

- **Cognitive and meta-cognitive skills**, which include critical thinking, creative thinking, learning-to-learn and self-regulation
- **Social and emotional skills**, which include empathy, self-efficacy, responsibility and collaboration

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- **Practical and physical skills**, which include using new information and communication technology devices

A number of important observations on such skills and how crucial they have become in the 21st century have been highlighted in this approach by OECD (2019).

Creativity and critical thinking skills are essential in the process of coming up with answers to complex problems and challenges. Especially challenges that are related to the automatization of routine tasks and calculations, which often creates new problems that require creative problem-solving approaches.

Furthermore, the advances of Artificial Intelligence have also created the need for subjects which are able to exercise social and emotional skills. Indeed, it is predicted that “AI is unlikely to replace workers whose jobs require complex social interactions” and “workers whose jobs require social and emotional skills are unlikely to be replaced by technology” (OECD 2019, p.91). Skills, such as caring, sociability and respect will also be massively required in the healthcare sector, especially as populations age. Social and emotional skills underlie academic success at all levels of education. It actually seems to be a determining factor in our schools and universities.

Finally, practical skills also define success in life and in education. Students who are well-equipped to perform daily tasks with ease, from getting dressed to using smartphones appropriately, tend to be more accomplished. In an attempt to combine the two approaches offered by UNESCO and OECD, media and information literacy skills can also be viewed as belonging to this set of practical skills.

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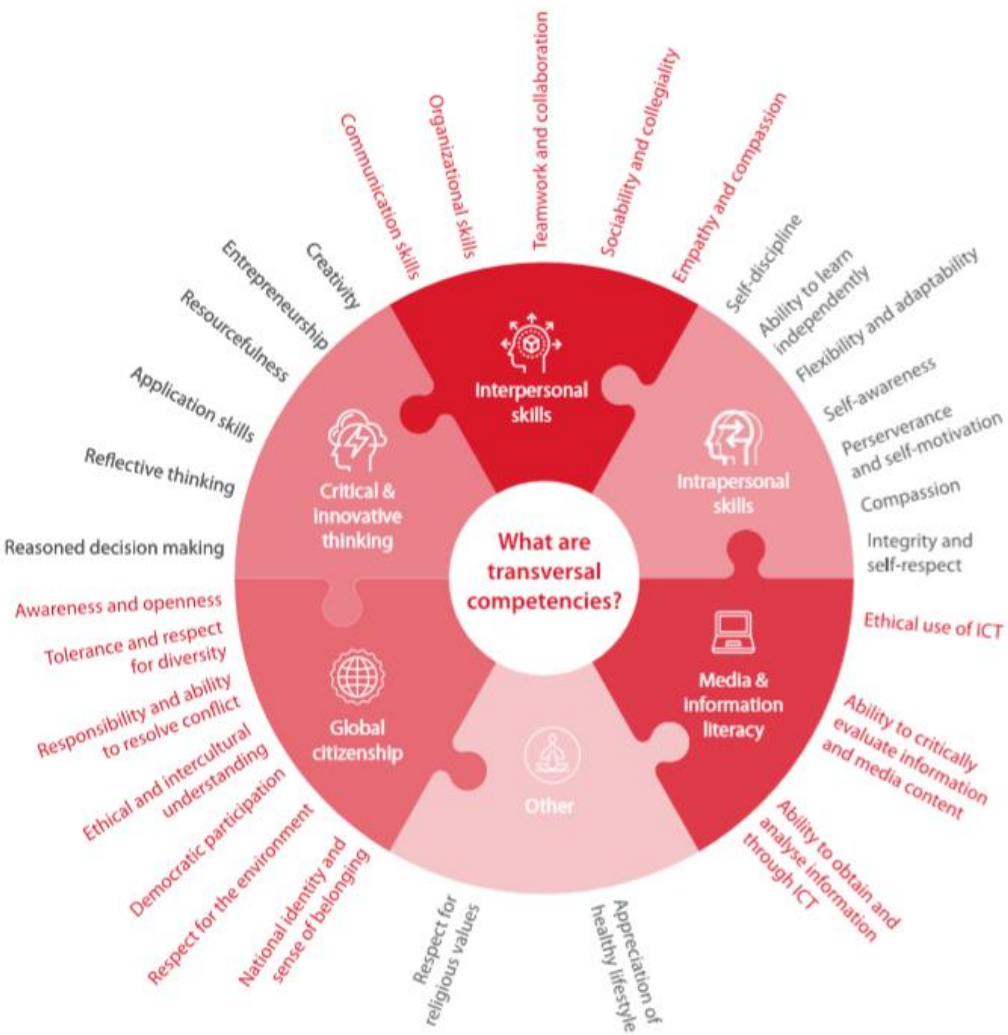
Figure 1: *Transversal skills (source: UNESCO)*



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THE DOTS APPROACH

In order to achieve its objectives, the DOTS project conducted a literature review on existing approaches as well as definitions for the transversal skills in order to conclude with the proposed approach on how to use transversal skills in STEM education. This effort concluded with the design of a table that has been adapted in the context of DOTS to act as a guide to build engaging STEM activities focusing on transversal skills for both teachers and students.

The table (presented in Annex A) includes 4 columns that correspond to the following:

- Domain: this column includes the main aspects (according to the definitions already presented) that are included in the development of transversal skills.
- Key skills, competencies, values and attitudes: for each one of the domains, we have included several skills that the DOTS approach considers to be crucial in order to achieve the aspects of transversal skills.
- Description: for each one of the key skills, a description is provided explaining what exactly we mean with the specific skill.
- Example of use in DOTS scenarios: in the last column, an example of a scenario is provided that is included in the proposed activities of the DOTS project.

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DOTS ACTIVITIES: SUPPORTING THE DEVELOPMENT OF TRANSVERSAL SKILLS

The team designed two sets of activities, one for the teacher training on how to develop students' transversal skills (toolkit & toolbox) and one with concrete examples for in-class use (scenarios).

The activities were developed to be used during the international course of the project as well as during the national workshops. The aim of the training course and the workshops is:

To improve the teachers' abilities for developing their students' transversal skills by learning how to create engaging educational opportunities while exploring the nature of science through change of methodological perspectives. By building on students' curiosity, raising their self-awareness, and empowering them with scientific values, teachers are strengthening youth participation for confronting societal issues.

The main Learning Outcomes of the course and the workshops are the following:

- Change the teaching routine with easy but effective activities
  - Explore and analyze different perspectives in science education
  - Explore variety of innovative teaching strategies and approaches
  - Activate all the possible types of skills (hands-on & minds-on) to enhance inquiry learning
  - Acquire skills of integration of scientific research practice in classroom
- Experience science as an approach to deal with everyday issues
  - Living science through raising self-awareness about the nature of science and its effects on societal issues
  - Express and analyze variety of situations where scientific inquiry is used for everyday challenges
  - Acquire basic knowledge of scientific method
  - Build up curiosity, participation, and responsibilities of their students
- Transversal skills and their integration to teaching processes
  - Raise awareness of a variety of factors which are influencing group cohesion in the classroom environment and within research collaboration.
  - Acquire basic understanding on the broad skill set needed to address problems and face issues quickly.
  - Fostering transversal skills - how to share them further down the road

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- Scientific literacy
  - Compare and analyze personal understanding of certain scientific topics and fields while practicing verbal and non-verbal approaches to share knowledge with peers
  - Practice usage of language to clarify ideas, make claims, present arguments, record, and present findings.
  - Foster basic understanding on the scientific process of acquiring and creating knowledge

To fulfill the above aims and learning outcomes, activities were proposed from all the partners. A review process was followed in order to choose the best activities in respect to the requirements concerning the development of transversal skills.

DOTS TRAINING ACTIVITIES FOR TEACHERS - THE DOTS EDUCATIONAL TOOLKIT AND TOOLBOX

The team developed a set of training activities aiming to showcase to teachers how transversal skills can be developed during classroom activities. Based on our philosophy, skills development is a fundamental part of education, and it should also be an integral part of everyday teaching and have a pervasive presence in all disciplines. Teachers need to be able to design and implement projects and scenarios focused on transversal skills but also be able to work on them during everyday teaching. To that end, the aim of our toolkit is not to deliver a predefined template to be followed for developing skills (this kind of activities is addressed in the Reverse teaching scenario's part), but rather help teachers understand what are the basic practices they should adopt and enact during any given lesson to accommodate skills' development for their students. Such practices can be used in any school context and be deployed during any type of activity, in everyday teaching, from very simple short-term activities to extended long-term projects. To that end, each of the activities found in our toolkit has its own unique format, aiming to demonstrate to teachers a large repertoire of possibilities and different approaches they can use in their class. To ensure that our training activities are equally interesting and that teachers of all disciplines can participate in them, their themes were selected so that they don't require particular background knowledge from any discipline. As these trainings aim to focus on understanding the skills themselves and the practices that can be deployed to facilitate their development in any given context, we have deliberately chosen to stage our activities using very simple themes so that the focus of the participants is

on the processes used during activities rather than the theme itself. Training activities for teachers and the materials developed are going to be part of the Toolkit and toolbox designed in O2:

Educational toolkit and toolbox (O2) for TEACHERS:

Educational toolkit – “a digital handbook with open access with detailed activities for enriching STEM teaching practices and methods while transversely boosting student transversal competences. It will incorporate multimedia content with detailed explanation on how to execute activities, which STEM concepts are tackled with those activities and how to simultaneously develop transversal skills.“ (DOTS project proposal)

The filled forms have provided us with teacher materials. We have then be able to extract these parts from the forms, and modify them into a document with multimedia content which shows the way in which the activities should be carried out.

Educational toolbox – “will offer a set of practical items and real objects which can be used as a tool to deepen the understanding of certain scientific concepts or processes while empowering students with transversal competences.“ (DOTS project proposal)

We will be able to extract the material lists from each activity and build a set of low-budget items which will serve as the toolbox, along with a manual for building any modified items. These materials will be easy-to-access, and any teacher willing to incorporate or modify our material will be able to use the box as she or he sees fit.

The box and toolkit will then be a two-part set which serves as a useful teacher tool.

DOTS ACTIVITIES FOR STUDENTS - REVERSE TEACHING SCENARIOS

The team also developed a set of activities for students called “Reverse teaching scenarios”. These are project-based activities aiming to increase students’ curiosity, engagement and appreciation of Science and STEM. The effort of the DOTS partners during the first phase of the project was to create scenarios or/and adapt already existing activities and provide them following a specific approach. For this a team has been formed in order to develop content (scenarios). After discussions (e.g., workshop in Leuven in February 2020) and analyzing several ideas the consortium came up with a specific template. All the partners proposed

scenarios in order to fit into the specific template and fulfill the aim of the project as well as the courses that should be organized during the project with teachers involved.

The selected scenarios were developed in detail following a specific template that is presented in Annex B.

Scenarios filled through this template were developed following an approach that will facilitate the work in the framework of the following Intellectual Outputs and have several results:

Reverse teaching scenarios

This intellectual output will provide at least 10 teaching scenarios for specific STEM lessons where detailed and in-depth instructions on how to guide the students, how to introduce them with the challenge, what STEM topics are acquired and needed in order to solve it, what are the indicators and types of evidence sufficient proof of the desired result. Because of its specificity and creative moment in training we estimate the production of at least 10 reversed teaching scenarios which are spread out through STEM fields.

Guidelines for introduction of transversal skills in non-formal education

Emphasis on the guidelines are the materials, tools and methods on how to work on developing transversal competences. The guidelines will explain how to guide activities and directly teach skills which is shown like a needed strategy in acquisition by students. This IO will not be as STEM-heavy as the prior ones, and as such will be able to focus solely on transversal skills competences.

Before filling this template, DOTS partners examined the DOTS Transversal skills table in order to fulfill all the needed domains.

These activities were developed in order to be demonstrated to teachers and used by them in real classroom settings. After the demonstration (e,g,, training workshops), teachers should be able to reproduce or, even better, modify the activities for their students, according to their own needs.

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LIST OF DOTS REVERSE TEACHING SCENARIOS

In the table below, are presented the list of Reverse teaching scenarios that have been selected to be used both in the courses of the project as well as in the implementation activities. This list will be updated until the end of the project as well as the description of each scenario might be updated.

Title of the Scenario	Subject(s)	Responsible institution	Relevant Transversal Skill(s)
Kinder Surprise Explosion	Maths, Physics, Chemistry	DOREA EDUCATIONAL INSTITUTE	• Reflective thinking • Organisational skills, • Ability to learn independently
3D Hologram Projector	Math, Engineering, Technology	DOREA EDUCATIONAL INSTITUTE	• Critical thinking, • Application Skills, • Ability to learn independently
Sun it up Solar bag	Environmental Science, Physics - States of matter (gas particles), Convection	DOREA EDUCATIONAL INSTITUTE	• Respect for the environment, • Reflective thinking, • Organisational skills
People on the Move	Science, Astronomy, Astronomy, Climate, Environment, Geography, Earth science, Humanities	Ellinogermaniki Agogi	• Tolerance and respect for diversity, • Creativity, • Apply knowledge and skills (such as geospatial thinking)
Bone hunt	Biology, science, career orientation	PH Wien	• Reflective thinking, • Communication skills, • Teamwork and collaboration
Profiling a vegetable	Biology, Science, career orientation	PH Wien	• Critical thinking, • Application skills,

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			• Reflective thinking, • Communication skills, • Media and information literacy.
Plastic in the Ocean	Chemistry, Biology, Environmental Education / Life Science	ScienceCenter Network	• Responsibility and ability to resolve conflict, • Awareness and openness, • Reasoned decision-making
Vision Tube	Physics, Biology	ScienceCenter Network	• Reflective thinking, • Reasoned decision-making, • Flexibility and adaptability
Gears of scientific method	Elements of research, Scientific method	Science factory	• Critical and innovative thinking: creativity & resourcefulness • Interpersonal skills: communication
Mystery tube – scientific method	The nature of science, Scientific method	Science factory	• Critical and innovative thinking: creativity & resourcefulness • Interpersonal skills: communication
Learning Science Through Theater	Physics, Mathematics, Biology, Chemistry (all STEM subjects applicable) and Arts	Science View	• Creativity, • Teamwork & Collaboration • Communication Skills
Learning Science Through Humoristic Stories	Physics, Mathematics, Biology, Chemistry, ICT (all STEM	Science View	• Creativity, • Teamwork & Collaboration

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	subjects applicable) and Arts		• Communication Skills
Using debate in teaching STEM	Mathematics, Computer science, any other subject	Srednja škola Jelkovec	• Communication skills • Ability to critically evaluate information and media content • Reasoned decision-making • Responsibility and ability to resolve conflict

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HOW TO USE THE DOTS REVERSE TEACHING SCENARIOS AND TOOLKIT

THE USE OF DOTS SCENARIOS

The main aim of proposing the scenarios that are presented in section is to use them during the organization of Professional Development courses. An approach could be to use activities that are supporting the development of relevant skills as they are presented in Annex A.

To facilitate the use of each scenario, a specific template is going to be developed, following the existing one (see Annex B), so that these scenarios are made available on the project's website. This will be the work in O4, where the DOTS scenarios will be developed so that any educator will be able to use them in order to develop specific transversal skills.

Each one of the proposed scenarios correspond to a specific transversal skill or skills as described in Annex A. So, the interested educator will be able to choose a specific skill that would like to develop and involve his/her students and a list of available activities will be shown as recommendations.

USING THE DOTS TOOLKIT AND SCENARIOS IN TRAINING COURSES

The proposed activities could be used as sessions of a training course. In the framework of the DOTS project, it was planned to realize a 5-day course with the aim to demonstrate how selected activities could be included in a professional development course. Due to the COVID-19 restrictions this course was not realized. The DOTS project is proposing, in the following table, a course schedule with selected activities in order to provide a sample structure.

The aim of such a course is to transfer to the participating teachers all the needed knowledge and information on how to implement the activities with their students as well as to transfer the know-how to other teachers in their schools.

An indicative schedule of the 5-day course is presented in the following table. In this indicative example we have chosen to present specific skills and competencies from the domain Critical and innovative thinking. The specific course schedule includes activities that are supporting the development of Creativity, Resourcefulness, Application skills, Reflective thinking and

Reasoned decision-making. This schedule could be modified according to the activities that could be included in the workshops. So, each time that this course could be realized, different activities could be presented from the pool of activities that DOTS project is providing corresponding to the domain that will be presented each day.

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Time / Day	Day 1	Day 2	Day 3	Day 4	Day 5
9:00 – 9:15	Icebreaker	Warmup	Warmup	Warmup	Warmup
9:15 – 10:00	Introduction to the course	Reflect on the previous day	Reflect on the previous day	Reflect on the previous day	Reflect on the previous day
10:00 – 11:00	Introduction to Critical and innovative thinking - Creativity	Introduction to Critical and innovative thinking - Resourcefulness	Introduction to Critical and innovative thinking - Application skills	Introduction to Critical and innovative thinking - Reflective thinking	Introduction to Critical and innovative thinking - Reasoned decision-making
11:00 – 12:00	Introduction to *Learning Science Through Theater*	Introduction to *Gears of scientific method*	Introduction to *3D Hologram Projector*	Introduction to *Vision tube*	Introduction to *Using Debate in teaching STEM*
12:00 – 13:00	*Lunch Break*	*Lunch Break*	*Lunch Break*	*Lunch Break*	*Lunch Break*
13:00 – 16:00	Practical Workshop for *Learning Science Through Theater*, and working groups	Practical Workshop for *Gears of scientific method*, and working groups	Practical Workshop for *3D Hologram Projector*, and working groups	Practical Workshop for *Vision tube*, and working groups	Practical Workshop for *Using Debate in teaching STEM*, and working groups
16:00 – 17:00	Presentations of the working groups	Presentations of the working groups	Presentations of the working groups	Presentations of the working groups	Presentations of the working groups
17:00 – 17:15	End of the day and sum-up	End of the day and sum-up	End of the day and sum-up	End of the day and sum-up	Reflection of the day and end of the course
Social Events	Free time	Sightseeing and Social dinner	Free time	Farewell dinner	Departure

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ANNEX A – DOTS TRANSVERSAL SKILLS TABLE

Domain	Key skills, competencies, values and attitudes	Description	Basic guidelines	Example of use in DOTS activities
Critical and innovative thinking	**Creativity**	Creative thinking and critical thinking are distinctly separate phenomena which nonetheless share a common focus on decision making (Wechsler et al., 2018). Creativity masters a process of making or producing, criticality a process of assessing or judging.	Empowering teachers (and consequently students) to make creative enrichment in their teaching/learning practices. Example: creating DIY and low budget teaching accessories like poles for sticky finger activity or enabling different forms of expression while presenting various content.	• People on the move • Learning Science through Theater • Learning Science through Humoristic stories
	Resourcefulness	Resourcefulness is the ability to find and use available resources to achieve goals, as well as innovative and creative means for problem-solving while optimizing the processes and improvising with limited resources.	By imagining multiple outcomes, setting objectives, experimenting with new approaches and negotiating challenges, teachers and students make important connections between knowledge and goal achievement.	• Gears of scientific method • Mystery tube-scientific method
	Application skills	In order to have a meaningful learning experience, any learner should be able to apply the skills that s/he learned in life.	Guiding teachers and students to set up experiments or measuring devices in a kitchen science format (materials which can be easily found in the household) is an example here. Empowering teachers and students to create opportunities to apply knowledge and skills in everyday situations is also relevant.	• 3D Hologram Projector • Profiling a vegetable
	Reflective thinking	Reflective thinking is a part of the critical thinking process referring specifically to the processes of analysing and making judgments about what has happened in the course of events,	Learners are aware of and control their learning by actively participating in reflective thinking – assessing what they know, what they need to know, and how they	• Kinder Surprise Explosion • Sun it up Solar Bag • Bone hunt • Profiling a vegetable

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		developments processes. Dewey (1933) suggests that reflective thinking is an active, persistent and careful consideration of a belief or supposed form of knowledge of the grounds that support that knowledge and the further conclusions to which that knowledge leads.	can bridge that gap – during learning situations.	• Vision tube
	Reasoned decision-making	Decision-related surprises arising from the decisionmaker often involve changes in the decision maker's beliefs, preferences, or criteria for decision making. Many real-world planning and decision problems are far too uncertain, too variable, and too complicated to support realistic scientific models.	Empowering teachers and students with skills and tools to bypass accountability demands from others in their networks or groups while analysing biases, beliefs, and data while evaluating processes and estimating outcomes.	• Plastic in the ocean • Vision tube • using Debate in teaching STEM
Interpersonal skills	**Communication skills**	Communication skills can be defined as the transmission of a message that involves the shared understanding between the contexts in which the communication takes place (Saunders and Mills, 1999). Successfully conveying a message is an everyday task in our lives and has more depth to it than we acknowledge.	Examples, here, include, activities which promote the presentation of accomplished work and which require communication to be accomplished. Activities which emphasise the importance of communication and presentation and empowers teachers to develop activities which require their students to communicate their work to the rest of the class.	• Bone hunt • Profiling a vegetable • Using debate in teaching STEM • Learning science Through theater • Learning Science Through Humoristic Stories • Gears of Scientific methods • Mystery tube – scientific method
	Organizational skills	The ability to use your time, energy, resources, etc. in an effective way so that you achieve goals.	Empowering teachers to create activities which engage students to think how to work through them from start to finish. Activities which will make students try different setups in order to finish them. Activities which require the students to delegate different roles in completing the task.	• Kinder Surprise Explosion • Sun it up Solar bag
	Teamwork & collaboration	Both teamwork and collaboration involve a group of people working together	Guiding the teachers to activities which involve the participants to act	• Bone hunt • Learning Science Through Theater

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		to complete a shared goal. The key difference between the collaboration and teamwork is that whilst teamwork combines the individual efforts of all team members to achieve a goal, people working collaboratively complete a project collectively.	simultaneously to achieve the wanted learning outcome, whether by working as a team, or when collaborating.	• Learning Science Through Humoristic Stories
Intrapersonal skills	**Flexibility and adaptability**	Adaptability enables the decisionmaker to persist in the pursuit of specified goals despite ignorance and in response to surprise and the discovery of error.	By empowering the teachers to improvise on the spot and learn from their mistakes.	• Vision Tube
	Ability to learn independently	Independent study consists of various forms of teaching-learning arrangements in which teachers and learners carry out their essential tasks and responsibilities apart from one another, communicating in a variety of ways for the purposes of freeing internal learners from inappropriate class pacings or patterns, of providing external learners with opportunities to continue learning in their own environments, and of developing in all learners the capacity to carry on self-directed learning (Wedemeyer, 1971.).	Having the learners engage in activities which will leave them with the possibility of continued learning even after the wanted outcomes have been reached. Such activities should encourage the possibility of working without the additional help from the teacher. Also, activities which emphasise the importance of independent learning. Activities which emphasise independent learning should encourage the teachers to produce their own innovative activities.	• Kinder Surprise Explosion • 3D Hologram Projector
	Perseverance and self-motivation	Self-motivation is enthusiasm for doing something, and perseverance is the continued effort and determination (Cambridge dictionary) to do so. While you can have one without the other, having both will aid a person greatly in tackling the tasks laid before them.	Teaching the teachers to make their students relate to the goal which they've set. Activities which will make the teachers relate to the current task and understand why they are doing it. Emphasising that they should do the same for their students.	
	Self discipline	The ability of students to monitor and control their own behaviors. Students who	Making activities which raise the teachers awareness about the importance of self-	

		are highly self-disciplined may be able to better focus on long-term goals and make better choices related to academic engagement. In addition, the concept of self-discipline focuses on students' own ability to engage in (or refrain from engaging in) particular behaviors, rather than reliance on external motivations, rewards, or punishments.	discipline. Providing the teachers and students with learning situations in which the importance of self-discipline is emphasised.	
Media and information literacy	**Ability to critically evaluate information and media content**	In the present day, information and media content on the internet are highly unreliable. A good teacher knows this and will try to raise the awareness of their students about the dangers of taking information from the internet for granted.	Raising the awareness of teachers about the presence of misinformation on the Internet by presenting them with activities which clarify this. An example activity could be providing the teachers with an article with a title named “Scientists have proven (...)” and telling them to try and find the source article of the research.	• Using debate in teaching STEM
Global citizenship	**Responsibility and ability to resolve conflict**	Classrooms are highly social and involve complex relationships between the students and the teacher. In order to maintain a healthy and productive environment, teachers should be able to teach their students the importance of taking responsibility for their actions, and should be able to resolve conflicts.	Putting the teachers in hypothetical situations which require them to take different opinions into account in order to de-escalate a possible quarrel.	• Plastic in the Ocean • Using debate in teaching STEM
	Tolerance and respect for diversity	Recent studies show that intolerance and social exclusion are increasing, with some migrant groups feeling alienated. This is leading to incidences of social tensions and unrest. Education has a key role to play in preparing societies for dealing with these phenomena. It also plays a vital role in the political socialisation of	Having activities which will raise the teachers awareness of the benefits of multiculturality in tackling challenges laid before them. Such an activity could have the participants reflect on their own cultural backgrounds and hearing from others how their experience differs in	• People on the Move

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		European citizens from cradle to grave.	academic and societal contexts.	
	Awareness and openness	In the context of global citizenship, awareness can refer to cultural awareness which enables us to have respectful interactions with others in a diverse setting, and/or awareness of global issues like climate change. Globally-minded individuals are in position to interact with their peers while being aware of the fact that other people might have a different vision of what humanity needs, and are open to reflecting on and changing their vision as they learn about these different perspectives. Openness is the capacity which enables us to demonstrate sensitivity towards, curiosity about and willingness to engage with others and their perspectives (Ramos, 2016)	Teachers need to demonstrate openess and awareness and set an example for their students. In a classroom setting, teachers need to be aware of their students' cultural backgrounds and take them into consideration while teaching. Offering examples and role models from different cultural backgrounds is a good approach. A positive mindset and encouraging students to freely speak their minds without fearing of being rejected or embarrassed in front of their peers, are key features of a well informed teacher.	• Plastic in the Ocean

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ANNEX B – DOTS REVERSE TEACHING SCENARIOS GUIDELINES

General information
Title of the Scenario Please state the title of your scenario . Feel free to make them up or use the names which you used before.
Author & institution Please state the name of the author(s) of the scenario and their organisations.
Subject Please state the subject(s) for which this scenario could be used for. Feel free to state the subjects from your country.
Keywords Enter anywhere between three and five keywords which describe your scenario . The keywords should emphasise the core of your scenario . Feel free to make them up, according to your opinion about what is the center of the scenario . Examples of keywords could be: **interactive, facts-hard, motivational, teamwork, versatile (e. g. usable for different subjects), frontal demonstration, reverse classroom etc.**
Connected to/ nested with If possible, state the connection of your scenario with other partner scenarios and elaborate how the connection can/should be made. Does your scenario come naturally before or after? Can the interpretation/narrative be used for something else which might enable the DOTS team to create the integrated training with a story/conceptual frame?
Learning outcomes Fill the learning outcomes in a way that emphasises **what** will the teachers **and** students get from the scenario . Use revised Bloom's taxonomy keeping in mind cognitive process dimension and the knowledge dimension. Use verbs such as: **will be able to reproduce, will be able to demonstrate, will be able to assess, will be able to integrate, will be able to explain, will be able to differentiate etc.**
Teacher learning outcomes: •
Student learning outcomes: •
Transversal skills (max 3 transversal skills**)** When filling this part, please refer to the **DOTS table of transversal skills**, available on Google Drive. Read the table and choose which transversal skills fit best your scenario .

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Number of participants and target age group

Please state the smallest number of participants and the largest possible. State the targeted age group, as well as the lowest and highest estimate.

Duration

Please state the total duration for your scenario and if possible elaborate if your activity can be divided in multiple standalone teaching sequences. If those teaching sequences are possible for your scenario please keep that in mind while filling in the rest of the template, particularly step by step description.

Short scenario description

Please describe your scenario in short. What is it about, what will the students and teachers get from it, and what does it emphasise. In other words, explain it shortly to your peers.

Preparation

Materials

Fill in which materials are needed for the scenario . Be as precise as you can be. For example, if a spoon is needed, please state if it is a tablespoon or a teaspoon etc. Don't forget to say exactly how much of each material is needed. Add rows as necessary.

If there are other special requirements (technical backline) such as a large free space or outdoors environment, please state them too.

Also, please state the approximate time which is needed to prepare the activity and any possible costs, also approximate.

List of materials:	**Technical backline:**
•	•

Additional preparation instruction:

Announcement

Please write a short announcement which could be used at conferences and similar events to catch the interest of students and teachers. The announcement should be short, it should tell what the training/lesson is about and should answer the question „Why should I go to this training or lesson?“.

Announcement for teacher trainings:

Announcement for students:

Hook

Each scenario will have a hook – a starting question or hypothesis which should „hook“ the students or teachers and heighten their interest in the scenario . The „hook“ should be the same for both students and teachers, and should place them in the context of the problem being discussed. The „hook“ has an underlying idea: *„Don't tell them what they are supposed to know, make them want to know“.* It represents a story or a task/assignment which plays with their curiosity while creating the natural need

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for a tool or a skill. That tool or skill should be gradually acquired through an activity without being aware of it until the very end, where the pieces of the puzzle are joined together and the concepts are categorized, classified and defined.

Scenario **type/strategy**

Please state the type of your scenario . If you can't fit your scenario in any of these types, feel free to combine them or make up a type of your own.

Lower order thinking			Higher order thinking		
Knowing / remembering	**Comprehending / understanding**	**Applying**	**Analyzing**	**Synthesizing / evaluating**	**Creating**
● Lecture ● Video ● Illustrations ● Examples ● Visuals	● Questions ● Discussion ● Review ● Test ● Reports ● Exercises	● Practice ● Demonstrations ● Presentations ● Projects ● Role play ● Micro-teach	● Problem solving ● Case Studies ● Critical Incidents ● Discussion ● Questioning ● Test	● Projects ● Problem solving ● Case studies ● Plan development ● Constructing ● Simulation	● Simulations ● Critiques ● Complex case study ● Design/ development ● Product generation ● Producing

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