THE BIG GAME: Immersive and Multidisciplinary STEM Learning through A Cooperative Story-Driven Digital Game

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R2 Handbook and Toolkit on Digital Storytelling approach in STEM

R2.1 Digital Storytelling and STEM: good practices and experiences implemented

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INTRODUCTION

The project's main goal is to promote interest and excellence in STEM education through multidisciplinary learning and problem-solving in environmental and climate change issues by providing an online and hybrid learning model based on the digital storytelling approach and digital game-based learning environment.

Therefore, this first outcome is a part of the R2 Handbook and Toolkit on Digital Storytelling approach in STEM and in particular, it refers to the R2/A1, R2/A2 and R2/A3.

The document is structured in two sections. The first section explains and describes the digital storytelling methodology, its use in STEM education and how this approach is used in the game design.

The second section focuses on collecting the existing good practices and experiences of using Digital Storytelling in STEM education and the evaluation system to be used for learning scenario assessment in the partner countries: Finland, Italy, Romania, and Estonia.

1. The Digital Storytelling Approach

1.1 Concept of Digital Storytelling

Storytelling can be seen as an ancient form of interaction and a powerful tool of self-expression and communication. Storytelling is a natural way to communicate with people and is the dominant way of interacting in all areas of human social interaction [1]. By telling their stories, people show and share their values, beliefs, perspectives, history, and important events. By telling stories, people can share their personal experiences, thoughts, and reflections on the world or, more formally, express their perspectives on some specific topic. In general, stories bring together the cultural heritage and history of the time as part of society. [2]

The term digital storytelling itself came to the attention of the American movement that began to take advantage of multimedia to allow ordinary people to tell their own “true stories” to each other through the media. Since then, the term has been used in journalism and media studies to describe similar activities in many different variations, such as web-based stories, interactive stories, hypertexts, and narrative computer games. [3]

Digital Storytelling brings a new key element to traditional Storytelling, which is digital technologies. Digital Storytelling is, quite as it says, telling stories by using digital technology. In Digital Storytelling, current digital technology is leveraged to tell stories in different digital media environments. Digital Storytelling combines narrative and digital elements into stories that can be shared openly on the Internet’s forums and platforms. [4]

According to the view of the University of Houston, College of Education, in digital Storytelling, at the heart of the action is the practice of using technology-based tools to tell stories. This practice can also be called producing digital, interactive or electrical documentaries, narratives, essays, memoirs, etc., but the main idea lies in combining the storytelling art with a variety of multimedia elements and online publishing. (Www-site of the University of Houston, College of Education at https://digitalstorytelling.coe.uh.edu/page.cfm?id=27&cid=27).

Also, Robin [5] finds that the key element of digital Storytelling is that it enables a person to act as a creative storyteller, combining traditional Storytelling with the use of different multimedia formats to tell a story and share it on the Internet. [5]

Although researchers' definitions of digital Storytelling may vary in terms of some specificities, there are perceptions of several similarities and main ideas. According to Xu et al. [1], the Digital Storytelling Association's (2002) interpretation of digital Storytelling is about expressing old forms of Storytelling in a modern way. As people deliver their insights with their stories, the new technologies give life to these stories

on screen and the Internet. Armstrong [6] claims that digital Storytelling does not differ much from reading and writing stories. Its defining feature in education is only the fact that it shares information through multimedia over some other form used. [1]

1.2 The Digital Storytelling Approach

The digital storytelling approach as an organised practice is rooted in the 1990s in Berkeley, California, in collaboration with film making practice developed by Dana Atchley, Joe Lambert and Nina Mullen, who later became the founders of the Center for Digital Storytelling (CDS; www.storycenter.org). The early approach was organised around a pedagogical goal of teaching "ordinary" citizens basic media production skills and allowing them to tell their narratives. The basic format of the approach was a workshop where participants created a 2-5 minute digital narrative, including a voice-over and self-acquired photographs that tell a meaningful, autobiographical story about an important life event or a specific moment in their lives. In these workshops, the production of stories was interactive, but the stories themselves were highly personalised. [7]
Since the early 1990s, the CDS has also provided training and assistance to different groups [8], and the Seven Elements of Digital Storytelling (as illustrated in Table 1.) authored and developed by it are often cited as a starting point when starting to create and produce digital stories. [5]

Table 1. The Seven Elements of Digital Storytelling by CDS

The Seven Elements of Digital Storytelling	
1. Point of view of the author?	What is the main point of the story, and what is the perspective
2. A dramatic question	This is a key question that keeps the viewer's attention and will be answered by the end of the story.
3. Emotional content	Serious issues come alive in a personal and powerful way and connect the story to the audience.
4. The gift of your voice	A way to personalise the story to help the audience understand the context.
5. The power of the soundtrack	Music or other sounds that support and embellish the storyline.
6. Economy	Using just enough content to tell the story without overloading the viewer.
7. Pacing	The rhythm of the story and how slowly or quickly it progresses.

1.3 Uses and Significance of the Digital Storytelling Approach

Through the ages, stories have been used to share and convey experiences, values, messages, information and learning and evoke thoughts about things, events, and phenomena. According to Karataş, Kukul & Özcan [9] and others [10, 11], stories have been with us since early childhood, helping us build our understanding of the reality around us and remember events through imagery scenes and characters. Stories are also told to create a sense of community and bond among the individuals and people of the community [2].

According to Hartsell [2] and others, digital stories build upon traditional Storytelling by utilising new technologies and digital tools. It brings new opportunities for expression, as the storytellers are now allowed to use their words and their personal voices and imagination using all the available effects. This is how the nature of digital stories is such that they reinforce the "ownership," self-representation, personal voice, and identity of the author through personal choices and solutions made in Storytelling and the digital elements used. [2, 11-13] Along with expression skills, creating digital stories also promotes critical thinking skills. In producing their stories, the storytellers have to choose certain media elements and effects that purposely support their stories. [2]

In the original approach, digital storytelling workshops were often intentionally performed for social purposes, to work with and to empower different marginal or specific groups such as refugees, victims of abuse etc., who were allowed to share their personal stories in a safe peer circle of the workshops, gaining strength from each other in the trusting atmosphere. On the other hand, another important aspect found was that stories made by individuals could also be used to portray a community or present a common perspective, create a collective identity, serve the political purposes of a group, etc., powerfully. In practice, the difference between these perspectives is that one approach emphasises the individual and the other the collective aspect in relation to technology, learning, and identity. [3]

According to Tolisano [14], digital storytelling's power lies in the fact that it allows us to **connect**, **communicate** and **collaborate** using the new technology. Stories support all these three actions – connecting, communicating, and collaborating – thus creating a natural bridge between teaching and integrating technology in any subject area.

According to Tolisano [14]:

> *"1. We **connect** emotionally with people and events in stories and **connect** them to experiences in our own lives.*
>
> *2. Stories let us **communicate** our perspectives and perception.*
>
> *3. Stories are usually a **collaborative** effort of stories' characters, actions, and points of view. Stories that have been passed down through generations allow voices from the past to be intermingled with*

voices from the present. Remixing and re-makes of stories add new twists, allow new perspectives, and shed new light on storylines."

Robin [15] emphasises writing as a central skill in creating digital stories. He refers to various research studies that have proved the results of digital Storytelling in improving students' writing skills. According to his research findings:

"It is, therefore, worth thinking about virtual worlds, which contain various multimedia components, as an ideal medium for digital Storytelling. Creating digital stories in an immersive virtual location may unconsciously attract and motivate people into writing. Ultimately, digital Storytelling may encourage people who don't like writing or have no confidence in writing."

Already the pioneer Lambert was impressed by how fast, cheap and easy ways the average people were able to produce their own powerful stories. Thinking about today, this development has only gone forward as the equipment and open, easy to use digital tools and software programs have become affordable and accessible by everyone. Currently, the use of digital Storytelling, especially for teaching purposes, has grown dramatically, with the new digital technology available and already used in the classrooms. [5].

In the Big Game project, we believe and work towards the goal that there is an increasing demand for the digital storytelling approach, the "theory" and good practices on its use, along with the currently needed hybrid models of teaching and digitalisation.

2. The digital Storytelling in STEM education

Psycho-pedagogical literature widely describes the pedagogical value of Storytelling in learning and teaching settings. [16] [17, 18] The multimedia instruments spread during the last years have favoured the development of a new narrative form, Digital Storytelling (DST), a form of short digital narratives obtained by combining different types of multimedia sources.

New and interesting perspectives have opened up with the spread of mobile devices [19, 20] and the development of platforms to support the Storytelling: Hills [21] has implemented a software guided by touch or gestures (Assimilate) that allows a group of authors to converse and cooperate in the drafting of a digital story; Liang et al. [22] have built a virtual reality environment for the collaborative realisation of stories through the gestural interface; Mulholland, Wolff and Kilfeather [23] created a platform (Storyscope) that, based on the use of ontologies, allows authors to access a digital history of integrating knowledge found on-line; Rubegni and Landoni [24] have developed two versions of a mobile application (Fiabot!), one based on text, the other enriched with images, to help primary school children in the realisation of DST.

2.1 Storytelling, Digital Storytelling and STEM

Some research studies have studied the use of Storytelling to teach STEM subjects. Casey et al. [25] investigated the benefits of Storytelling in teaching geometry to students by underlining its usefulness for improving mathematics. Another study conducted by Alexander et al. [26] showed how students used engineering design to develop and revise their final projects' digital stories; this allowed them to create a meaningful artefact over an extended period [26].

In 2014, Dr. Michael F. Dahlstrom, Iowa State University, published, *Using Narratives and Storytelling to Communicate Science with Nonexpert Audiences [27]*, stating: "*Narratives seem to offer intrinsic benefits in each of the four main steps of processing information: motivation and interest, allocating cognitive resources, elaboration, and transfer into long-term memory*".

In addition, Dahlstrom discussed both the role and impact that entertainment media, specifically "movies, television comedies and dramas, documentaries and novels", have on science communication with the general public.

Storytelling can be an effective method for engaging students in STEM subject areas**,** and this has been shown to be the case, especially for girls. According to an article by Catalyst.org, Women in STEM [28], a gender gap in STEM persists across the world. Actually, the same systems of bias that push women out of STEM careers also influence the products and services created by STEM organisations.

Recently, Spelman College and Morehouse College faculties published an article [29] where the researchers write, “It has been shown that academic success alone is not sufficient in encouraging underrepresented students to persist in STEM. Their identities, world views, and personal experiences must also be considered.”
All strategies that allow students to become storytellers by making key connections between their own experiences and learning are the most effective for this scope. This means that the creation of digital stories by the students gives them the opportunities to learn, share their ideas and understand STEM concepts collaboratively [30] because they build their learning experiences together, reflecting and responding to their interest in STEM.
In fact, the use of digital storytelling can help students capture fun moments to tell a story about their STEM learning activities via audio, video, apps or other digital storytelling assets. [31]
Moreover, based on several studies, storytelling techniques activate different brain parts beyond mere word recognition.
Neuroscientists discovered that our brains respond differently when we listen to a recitation of facts than when we listen to a story. Listening to facts mainly stimulates the two language-processing areas of the brain. However, when we listen to a story, additional brain parts are also activated - regions involved with our senses and motor movements help listeners “feel” the descriptions. As the neuroscientist Uri Hasson [32] explains, “A story is the only way to activate parts of the brain so that a listener turns the story into their own idea and experience.”
Another neuroscientist, Paul Zak [33, 34], has shown that chemicals like dopamine and oxytocin are released when we listen to a story. Dopamine increases motivation and attention, keeping listeners engaged and regulating their emotional responses. Oxytocin promotes social, empathic behaviour. These chemicals enable the listener to connect with the narrative, making the information more personally meaningful.
Therefore, incorporating stories in STEM teaching & learning allows students to connect deeper to context, content, and different subjects' perspectives.
For example, similes and metaphors can activate sensory portions of the brain, as reported in *Brain & Language,* and action words can stimulate the motor cortex, as underlined by the *Laboratory of Language Dynamics* in France.
Another example of the importance of Storytelling in STEM education is the lesson on the book Rebecca Skloot’s *The Immortal Life of Henrietta Lacks,* which tells the true story of how a poor black farmer’s cells - taken without her consent in 1951 - became one of the most important tools in medicine. These cells helped develop the polio vaccine and are crucial to advances in cloning, gene mapping, in-vitro fertilisation, and much more. In this case, reading the book can introduce students not just to cellular biology but also to issues like class, race, and bioethics.
Thus, instead of reading from a textbook, students can be engaged to think critically as they analyse the narrative of science rather than just the data.

In teaching mathematics, teachers can use digital Storytelling to let their students analyse the intricacies of M.C. Escher's artwork with their students or read "*Behind the Beautiful Forevers*" by Katherine Boo to take different perspectives into account. [35]

The National Council Teachers of Math website has some excellent resources to support the introduction of digital storytelling techniques in mathematics, particularly trigonometry. [36]

Digital Storytelling has been used mainly in the language arts in education for many years. More and more educators are now seeing the possibilities of increasing student motivation and improving learning outcomes using digital stories in science subjects, as reported by Lambert: "*The power of digital stories comes from the fact that they are natural vehicles for understanding and reflection and creating meaning. They are about valuing experiences as they happen in the present and are about rejecting on, reviewing and articulating what did and did not work*." [10]

If, on the one hand, the teachers can attract students to science and motivate them to learn just by telling stories; on the other hand, it is more beneficial for them to design, create and present their own digital stories to develop skills such as research skills (information gathering and in-depth analysis), writing skills (developing a script); organisation skills (managing the scope, the materials and the time); technological skills (learning to use a variety of tools); presentation skills; interpersonal skills (working within a group, roles); problem-solving skills (learning to make decisions and overcome obstacles at all stages of the project); and assessment skills (developing expertise in critiquing their own and others' work), and skills beyond the school curricula. [15]

Some examples:

- Math Techbook (https://www.discoveryeducation.com/programs/math/techbook/) from Discovery Education uses video storytelling to show how abstract mathematics helps to learn about the real world.
- Digital experiment from Openscied.org. (https://www.openscied.org/general/collaborative/) In the form of a game, it offers to test a scenario of sustainable co-habitation between farmers and orang-utans.
- Labster (https://www.labster.it/) brings interactive learning to the next level, providing a 3D gamified virtual learning environment to learn practical skills necessary for biological research.

3. Digital storytelling in game design

2.1 Key concepts in-game storytelling

Games — of the analogue kind — have been an integral part of human culture for as long as culture itself has existed. From the ritual significance of early board games such as Ancient Egypt's Senet or sports such as the Olympic Games [37], to the educational significance of strategy games such South Africa's Morabaraba [38], play and games have performed a variety of functions across epochs, cultures, and social contexts. The emergence of digital games as a medium in the 1970s has built on this inherent playfulness of human culture, creating new opportunities for games as a cultural form, including storytelling [39].

As video games grew into a large industry, with a growing demand for skilled professionals and a shared body of knowledge to build upon, game design — the formal study of game creation — rose to prominence as a field. Game design concerns itself with a variety of games (including tabletop, live-action roleplay, and digital games) and a broad range of aspects related to their creation, such as rule systems, player behaviours and interactions, environment design, and storytelling [40].

Digital games' key feature with regard to storytelling is their ability to respond to the player's input, thus offering them a degree of agency in the storytelling process. In a game, rather than being told a story, the player takes part in it. This feature is not unique to games — oral storytelling in traditional culture was highly interactive, as is contemporary participatory art — but digital games are arguably the most visible form of digital storytelling today that systematically relies on responsiveness to audience input [41]. A key concept in-game storytelling, then, is that of *ludonarrative*: the interplay between game's *mechanics* (basic actions the game rules allow the player to perform) and the story the game tells, or, in other words, between what the player does and how the game narrative responds to their actions [42].

Considering the game's ludonarrative is a crucial aspect of designing educational games as well, as the story of the game must support its mechanics (and the other way around), and both need to support the learning objectives. [43] For example, a fighting game may not be the best choice for an educational game about emotion management, since the metaphor of melee combat does not align well with the learning objective of staying calm and on top of one's emotions. Sometimes, however, the misalignment between game mechanics and story — known as *ludonarrative dissonance* — may be intentional and serve to prompt reflection in the player [44]. *September 12* is a prominent example: on the surface, it is a shooting game where the player must bomb terrorist bases in a Middle Eastern city; however, doing so deals with collateral damage, affecting the civilian population, which results in more of the city residents turning to terrorism. The game is impossible to win and was designed as a commentary on the US's war on terror following the 9/11 terror attacks. The authors sought to communicate that violence does not solve problems but only leads to further violence.

A related concept to ludonarrative is *procedural rhetoric*: "the art of persuasion through rule-based representations and interactions rather than the spoken word, writing, images, or moving pictures" [45]. In other words, procedural rhetoric is based on the premise that performing specific actions in the game can communicate a message to the player in a potentially more powerful way than delivering the same message using conventional narrative techniques. For example, the board game *CO2* is similar to the classic game Monopoly in that players compete to create the most successful business. Still, it is designed so that every player's actions have a carbon footprint. If the players only focus on maximizing their revenue and ignore the environmental effects of their actions, the environment will collapse, and everyone will lose. As such, the game forces the players to learn that even as they are competing, they need to work together to reduce and offset carbon emissions for the world to survive; it does so through the gameplay itself, rather than text or instructions. There is, however, a risk that players may misinterpret the procedural rhetoric of a game or try to play against it, so class discussion and debriefing are very useful tools to make sure the intended learning outcomes are indeed being achieved.

Games can tell stories in multiple ways. For example, Salen and Zimmerman [40] distinguish between two broad categories: embedded and emergent. Embedded narratives are largely pre-authored, constructed experiences that unfold according to their authors' vision. These narratives can be linear in terms of presentation, similar to those found in most works of literature and cinema, in that not just the plot points but their exact order is predetermined. In such narratives, the player's role is to overcome the challenges the game presents them with to unlock the plot in the specified order. Embedded narratives can also be branching, i.e., offer players a plural, but a limited number of possible pathways through the predetermined plot points, potentially resulting in different endings [46]. This allows the player more narrative agency but means that the designer needs more planning and playtesting to ensure all the possible paths through the story are meaningful. Genres such as adventure games and visual novels, which emphasize telling a tightly-woven story, tend to rely on embedded narratives.

On the other hand, emergent narratives are not pre-authored stories but rather rely on stories that emerge inside the player's mind based on their interaction with the system. For example, a football match, both in real life and in a simulation video game, is an emergent narrative experience, as it was not pre-written by a team of script writers but rather unfolds in its own unique way based on the interplay between game rules and the many other elements the game consists of. Genres such as simulation and most multiplayer games tend to emphasize emergent narratives over embedded ones, resulting in unique experiences and high replayability at the expense of a traditional, tightly-woven story.

2.2 Guidelines for narrative design in learning games

Based on these considerations, below are some guidelines for designing meaningful narratives for digital learning games:

1. Consider whether and how the game mechanics support your learning objectives. What is the connection between what the player does in the game (and how the game frames it) and what they are supposed to learn from it. How does the game support the transfer of knowledge or skills to contexts outside of the game? Does it rely on low-road transfer (practising routines that can be mechanically applied in another context) or high-road transfer (making an effort to connect two discrepant contexts and apply knowledge obtained from one to the other)? (See, e.g., [47])
2. Consider whether the game needs a narrative, to begin with? Many learning goals, such as word memorization, can be more easily (and perhaps equally effectively) achieved without much focus on the narrative element. If the use of narrative is warranted, then consider whether the narrative should align with the mechanics and the learning objectives or create a sense of ludonarrative dissonance to prompt reflection in the player.
3. Think of how the narrative will be delivered to the player: will it be mainly through text and dialogue (can be unengaging for players and feel disconnected from the rest of the game), or the game visuals (can be overlooked by the players), or procedural rhetoric (can be difficult to make sense of without additional narrative elements)? If you are relying on procedural rhetoric, what is the message you want the player to take away from the experience?
4. Decide on what kind of narrative the game needs and plan it. Is it a linear story? A branching narrative (if so, does it have multiple endings? How many nodes and branches are there? How do the player choices contribute to the story and the learning?)? Or is it an emergent narrative and if so, what are the “story blocks” (the basic elements that will allow the player to make sense of the game and construct a story in their mind) used by the game? These can include items, random events, character visuals, etc.

4. Existing experiences and good practices in the use of Digital Storytelling in STEM education

4.1 Existing experiences and good practices in Finland

4.1.1 "Stranded"

Title	**"Stranded"**
Country	Finland
Promoter	The free Finnish online learning game "Stranded" (Saarella) was designed and implemented with teachers, students and the game design company Eduplus Oy. The game's demo video was produced in 2013.
Context of implementation	The context where the best practice was developed **X** national level large city ☐small city
Goals of the activity	Make a sustainable living on the empty island by playing online together. Stranded is a browser game designed to improve student cooperation and digital storytelling.
Description	Students joined the game and started to explore an uninhabited island. They needed wood, fish, shelter, transportation etc. They had to collaborate and immediately made plans to get a shelter for everybody in charge of food processing, cutting the trees, fishing, etc. Decisions were made by voting online and collecting points and rewards after a certain period.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** A whole class or s group **b. Duration** 30 - 40 mins **c. Number of sessions/activities** 1 **d. Teaching methodology** An online learning game is based on changing digital narrative scenarios, aiming to develop classroom cooperation skills, joint analysis and problem-solving. **e. Type of assessment and tools used to identify the benefits.** Realtime figures of essential goods Points for the whole class every "half-year period." Throughout the game, the teacher read survival updates to tell students if their decisions resulted in life or death. They also collected points every "half-year period." The game has a built-in assessment based on the so-called "happiness meter". The happier the island's inhabitants, the better the game's rating. The happiness of the

	group inhabiting the island increases based on certain activities that accumulate "happiness points" in the game.
Organizer	a person **X** a school an NGO an organization/institution an informal group other:_company_____
Benefits and results	Co-operation and decision making together as a united group. Students who make sustainable and adequate decisions and work together manage a living on the island. Digital storytelling is the whole game and the final results.
Website/E-mail /Other info:	https://www.youtube.com/watch?v=9nfQ1lWVoCg The free version of this game is no longer available, but: https://www.teacherspayteachers.com/Product/Stranded-A-Guided-Survival-Game-3574746

4.1.2 INCLUDED storytelling workshops and iPad-working at Rovaniemi

Title	**Approaching Inclusive Education using Tangible Digital Storytelling. INCLUDED 2019- 2022**
Country	Finland, Italy, Spain
Promoter	**X** European projects National projects School curricula Research programs
Context of implementation	The context where the best practice was developed national level
Goals of the activity	INCLUDED is an Erasmus+ program whose main goal was to get more ITC-tools for pupils and organize teachers' training courses for educational inclusion through digital storytelling DST and T-DST. Each partner work on different workshops under this main topic. Several practices can be chosen for different ages, from kindergarten to further education.
Description	Rovastinkangas school organized iPad working and storytelling workshops as part of the Erasmus course. In the first workshop, they introduced children to storytelling learning, and in the other, they started to use iPads for digital storytelling (iTheatre) There are partner schools using iTheatre also at Karpinlahti school and Eräjärvi school
Implementation choices	**a. Target groups** Age of children: from 6-8 years old

(Write a brief presentation of the best practice by referencing to:)	**b. Duration** Approximately 30 minutes per lesson, **c. Number of sessions/activities** 4 lessons during the school week. **d. Teaching methodology** Storytelling, drawing, listening, critical thinking **e. Type of assessment and tools used to identify the benefits** --
Organizer	Erasmus +, Rovastinkangas school
Benefits and results	Teachers' training courses introduce and educate teachers on DST methods. These practices they use at school are just one of the primary education workshops. Young students study this method at their educational level and get to know digital methods such as iTheatre. The INCLUDED project is still going on, so the main benefits and results are expected on websites this year or next year.
Website/E-mail /Other info:	https://www.includedeurope.eu/workshops-and-storytelling-by-rovastinkankaan-koulu-finland/ https://www.includedeurope.eu/wp-content/uploads/2020/04/Course-syllabus-Virtual-Campus-2020_ENG-INCLUDED_5.0.pdf https://www.includedeurope.eu/ipad-working-by-rovastinkankaan-koulu-finland/ https://peda.net/orivesi/perusopetus/rk/erasmus-hankkeet/included

4.1.3 Storycrafting using a computer

Title	**Storycrafting using a computer**
Country	Finland
Promoter	National project
Context of implementation	The context where the best practice was developed ☐ national level **X** large city ☐ small city
Goals of the activity	The goals to this project are - To develop the logical narrative skills of the preschool child. - To develop the writing and typing skills of the older child. - To familiarize the children with the narrative structures of stories and fairy tales - To enhance collaborative skills and enhance ICT skills

Description	The younger child tells a fairy tale, facilitated by the older child. The older child types out the fairy tale on a word processor. In some cases, the groups have continued working on their story crafted fairy tales and made them into animations by using the MovieMaker application or a document camera. The animated characters have been created by drawing or by using small toys or Lego blocks.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** 6 (preschool) and 7-8 (first or second grade) **b. Duration** Time required: approximately 90 minutes. **c. Number of sessions/activities** -- **d. Teaching methodology** Co-operation with young and older students. **e. Type of assessment and tools used to identify the benefits** --
Organizer	University of Jyvaskyla
Benefits and results	The main outcome of this activity is to develop the logical narrative skills of preschool children and familiarize them with the narrative structures of stories and fairytales. The main strength for students is to work together, where younger children tell the story and older takes responsible role of facilitating the storycrafting
Website/E-mail /Other info:	https://www.includedeurope.eu/storycrafting-using-a-computer/

4.1.4 Other experiences and good practices in Finland on the BIG_GAME topics

4.1.4.1 eCraft to learn

Title	**eCraft to learn**
Country	Finland
Promoter	EU, university on Eastern Finland, UEF
Context of implementation	The context where the best practice was developed **X** national level large city small city
Goals of the activity	Promote digital technology to educational areas: - Pedagogical

	(encourage to be innovative, communicate, collaborate in a project based learning). - Technical (positive attitude to technology and science, 3D printing, and other technical visualization methods). - Business (Enables students to become project-solving and ambitiously thinking future entrepreneurs and increase awareness between technology and education).
Description	There were three days for teachers as an introduction to technical equipments (Arduino, Microbit, Rasberry Pi etc.) The Craft2Learn is a learning by making methodology, which starts with students' own ideas, planning, brainstorming, interactive designs, trial and errors and reflection upon designs and finally they share their finished projects with the open community. The main idea is to use technology as a demonstrator for example photosynthesis and share their results to a live audience or make a presentation video.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups:** Secondary school students aged 13 - 16 **b. Duration:** Students used about ten hours planning, brainstorming, making and sharing their results live or by video **c. Number of sessions/activities** Around five sessions for students and five more for teachers involved in the project **d. Teaching methodology**: Learning by making **e. Type of assessment and tools used to identify the benefits.** Call4action tool was created for communication and reflection on students learnings and progress between during the project, There were also self evaluation tools, where the students were requested to provide a self-evaluation of their own skills that they have developed during the practical activities.
Organizer	Organization/institution UEF
Benefits and results	Promote young people's creativity, critical thinking, teamwork, and problem solving skills. Also introduce futures technical equipments and make science and technology more familiar to students, specially to girls. One of the goals is also demonstrate their work and results by making a video (iMovie)
Website/E-mail /Other info:	https://project.ecraft2learn.eu/ More information: https://peda.net/joensuu/jm/lightabot-luonnos/ecraft2learn

4.1.5.2 High school students as virtual reality content producers

Title	**High school students as virtual reality content producers**
Country	Finland
Promoter	Interactive Technology in Education -conference
Context of implementation	The context where the best practice was developed **X** large city
Goals of the activity	To strengthen the learners' role in the learning process, the memory imprint generated by emotional experience and the ability to empathize and identify with the issue at hand.
Description	Students designed a virtual escape game room utilizing a digital storytelling model as a method. They created narrative content by combining into 360 ° images a wide range of digital material such as images, video, audio, text and links. The technical tools used were the paid version of Thinglink and Google's Tour Creator service.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** High school students (16-18 years) **b. Duration** Teaching experiments of varying lengths were conducted during lessons **c. Number of sessions/activities** No mention **d. Teaching methodology** Digital storytelling with technical tools **e. Type of assessment and tools used to identify the benefits** The activity has been carried out on an experimental basis. However, it can be assessed in terms of how well it supports learning, the objectives of the curriculum and the wide-ranging, cross-curricular competencies of the future upper secondary school.
Organizer	a person — an organization/institution **X** a school — an informal group an NGO — other:_____
Benefits and results	Producing an active, experiential and immersive learning experience, achieving in-depth learning.
Website/E-mail /Other info:	Case description at the conference website (Finnish): https://itk-konferenssi.fi/en/event/interaktiivinen-tekniikka-koulutuksessa-konferenssi-2019-2019-03-20-2019-03-22-2/track/lukiolaiset-virtuaalitodellisuuden-sisallontuottajina-145

4.2 Existing experiences and good practices in Italy

4.2.1 A tutta velocità…un digital story telling sui temi delle STEM

Title	**A tutta velocità...un digital story telling sui temi delle STEM**
Promoter	National project
Context of implementation	The context where the best practice was developed X national level ☐ large city ☐small city
Goals of the activity	Objectives: ✓ Developing STEM skills by using a digital storytelling approach ✓ Encouraging the gender equity in STEM education
Description	The result was a Digital Storytelling of a topic strictly linked to physics – as the speed - to build a story consisting of multiple elements of various formats (video, audio, images, texts, maps, etc.). This type of communication is the richness and variety of stimuli and meanings. This was a form of narration particularly suitable for teaching. In fact, Storytelling, supported by multimedia elements, can generate meaningful interpretative processes and conceptual correlations and convey relevant messages with a strong impact, structured according to a cause-effect logic.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** ▪ Lower secondary school students **b. Duration** ▪ One month (2017) **c. Number of sessions/activities** **d. Teaching methodology** Interdisciplinary and multidisciplinary teaching regarding technology, literature, arts, music, history and science. e. **Type of assessment and tools used to identify the benefits**
Organizer	☐ a person ☐ an organization/institution **X** a school ☐an informal group ☐ an NGO ☐other:_____
Benefits and results	Students learned to express themselves using different ways of communication, such as video, audio, painting, etc., addressing the topic from a multidisciplinary and interdisciplinary perspective, typical of STEM education.

Website/E-mail /Other info:	The event is organised in the framework of the national initiative promoted by the Ministry of Education and the Department of Equal Opportunities in Italy. https://www.noisiamopari.it/site/it/2017/06/08/a-tutta-velocitaun-digital-story-telling-sui-temi-delle-stem/

4.2.2 Environmental Storytelling for Sustainable Development

Title	**Environmental Storytelling for Sustainable Development** **Code 2018-1-EL01-KA201-047972**
Country	Greece, Cyprus, Italy, Spain and Turkey
Promoter	The European project - Erasmus+ Key Action: Cooperation for innovation and the exchange of good practices Action Type: Strategic Partnerships for school education
Context of implementation	The context where the best practice was developed **X** European level ☐ large city ☐small city
Goals of the activity	Objectives: ✓ The project aims at strengthening teachers' profiles to effectively coach pupils in working effectively on the subjects: • Health & Environmental Effects on Society • Natural Environment • Geophysical Hazards • Natural Resource Depletion • Waste disposal and recycling Through this material, students acquired practical, logistical and personal skills to lead environmental actions and spread the word about the need to live more sustainable lifestyles.
Description	EnvStories project is based on the thesis that every instructive activity aims to better communicate human beings with their environment. The experiential action, achieving successive goals, constructivism and interaction with the artificial and natural environment are teaching approaches essential to the evolution of the education process. ENVSTORIES brought together "young changemakers" from four countries to brainstorm ideas for solutions to local, national and international environmental problems. The project offered comprehensive training material for the above subjects, a teacher's guide with the pedagogical approach, and an on-line collaboration platform to be used by the students for the co-creation of interactive stories (in

	the form of e-books), spreading to their social environment tηe need for more sustainable lifestyles. Students had to work collaboratively using the platform to produce 24 stories that communicate complex concepts to others structuring information and data in meaningful and useful ways (Storytelling). Teachers, acting as coaches, assist students in developing the EnvStories triggered stories by the offered training material.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** ▪ Lower secondary school students **b. Duration** 27 months – from 01-10-2018 to 31-12-2020 **c. Number of sessions/activities** A1: Project Management A2: Pedagogical framework and training material A3: Development of the ENVSTORIES Platform A4: Pilot implementation A5: Evaluation and Exploitation A6: Dissemination **d. Teaching methodology** ▪ Digital storytelling e. **Type of assessment and tools used to identify the benefits**
Organizer	☐ a person **X** an organization/institution ☐ a school ☐an informal group ☐ an NGO ☐other:_____
Benefits and results	The teachers' and students' activities focused on creating awareness, knowledge and experience on sustainable development, which is achieved through the actions of environmental education.
Website/E-mail /Other info:	http://www.envstories.eu/

4.2.3 GOLDEN RATIO TEACHING PROJECT

Title	**Golden Ratio Teaching** Code 2020-1-BG01-KA201-079006.
Country	Italy, Bulgaria, Greece, Portugal, Romania
Promoter	European project
Context of implementation	The context where the best practice was developed ☒Europena level ☐ large city ☐small city

Goals of the activity	The main project objectives are: – To support teachers in achieving better results via improved skills for combining approaches that provide a balanced package of information/knowledge/skills to students of various learning types, including STEM subjects. Among other things, teachers are taught how to construct Storytelling innovatively and efficiently to promote the students' interests. – To replace conformity in routine teaching/learning usually causes a lack of interest and attention for the students and a sense of helplessness and lack of purpose among the teachers. In this regard, digital storytelling methodology is used to create a more dynamic and engaging learning environment. – To support the attainment of key competence knowledge and foster creativity by students in Europe by introducing an ideology of teaching that appeals to and is useful for all types of learners.
Description	Golden Ratio Teaching aims to provide teachers with a toolbox and several tested approaches and methods for addressing students' individual talents and learning styles, to quickly attract attention and combat some insecurities teachers face in their everyday work. Gradually, a shift from teacher-centred to the student-centred classroom will be reached, which would help teachers perform better, with less stress, and apply a new organisation of the process and premises in such a way that the natural curiosity of the students is enhanced.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**Target groups** ▪ Lower secondary school teachers and students **b. Duration** from 01-11-2020 to 30-04-2022 **c. Number of sessions/activities** A key activity is the development of the GRT, which is to be delivered in the form of a guidebook, consisting of tested methods and approaches and will be a selection of those deemed optimal, most useful and efficient. Another vital activity is a joint staff training event with the GRT, including peer training on all GRT elements. **d. Teaching methodology** Within the Golden Ratio Toolbox, a method was developed on how to create Storytelling that would engage students as much as possible. The guidelines are organised into the following cateogories: – Preparation needed for implementation of the method; – Materials needed (i.e. laptop, projector, printer, paper…);

	– Method description (among other things, an introductory YouTube video was created on how to create good Storytelling: https://www.youtube.com/watch?v=cEv8b1VIn1U); – Detailed instructions (i.e. How exactly do we teach through a story?, How is a good story written?); – Experiments were conducted in the different schools involved in the project. **e. Type of assessment and tools used to identify the benefits** Evaluation tools (i.e. Questions, which a teacher can use to monitor their progress with this tool and establish its usefulness and feasibility …).
Organizer	☐a person ☒ an organization/institution ☐a school ☐an informal group ☐an NGO ☐other:_____
Benefits and Results	The GRT is already reaching a number of positive long-term impacts on all involved in its preparation and implementation. This results in a competence enhancement for teachers, enabling them to be successful and more efficient, especially thanks to the digital skills they acquire. Additionally, the students can enjoy their classes more (digital Storytelling is undoubtedly contribuiting in reaching this goal), and stay focused for longer periods. In addition, the desired impact is that, due to the use of new technologies-based methodologies, their overall performance at school is also improving. Students with learning difficulties are already obtaining better-targeted content from their teachers and are experiencing a positive impact on their inclusion and results.
Website/E-mail /Other info:	Project Website: http://golden-ratio-teaching.eu/ YouTube Channel: https://www.youtube.com/channel/UCXj2ilRVTHTHMF3wjT0tmqA. For further information, please contact Antonio Giordano (antonio@pixel-online.net)

4.2.4 THE TIK PROJECT

Title	**The TIK - Tradition and Innovation @ Kindergarten project** (Erasmus+)
Country	Italy, Lithuania, Romania, Spain
Promoter	European project

Context of implementation	The context where the best practice was developed ☒ European level ☐ large city ☐ small city
Goals of the activity	The TIK project aims to implement a multidisciplinary and holistic approach to pre-primary education to develop children's cognitive and pre-cognitive social skills through innovative educational materials such as the use of the digital Storytelling methodology to increase the interest and attention of the children involved.
Description / Benefits and Results	In the framework of the TIK project, the experts developed and tested a successful application of the Storytelling methodology to create and make accessible a Didactical Toolkit to be used by pre-school teachers with their pupils. The Toolkit provides preschool teachers and pupils' families with innovative, media-based tools to be used with children to make them autonomously learn about different traditional tales, start to face the diversity of cultures, and interpret the story and describe them through creativity, i.e. drawings, collages etc. and promote cognitive and transversal social skills among the children through the discovery and presentation of traditional tales through images, pictures, photos and videos. The Toolkit and the storytelling methodology behind it successfully impacted its target groups by: – Strengthening the capacity of pre-school teachers and pupils' families to build cooperation patterns; – Providing pre-school pupils basic and transversal competencies through the transnational comparison of traditional tales linked to the local territory in which they live with the ones linked to the cultural backgrounds of pupils coming from other countries/ethnic minorities; – Enhancing pre-school comprehension and communication through innovative audio-visual based approaches and tools; – Promoting a multidisciplinary and holistic approach to preschool education supported by innovative educational materials and references methodological concepts to develop children's cognitive and social skills.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**Target groups** – Kindergarten Teachers; – Kindergarten Children; – Parents. The project, exceeding by far its initial yet ambitious expectations, has been directly involved in the project activities and impacted on, a total of:

	– 25 kindergartens; – More than 100 pre-school teachers; – More than 1000 pupils; – More than 500 among parents, grandparents, relatives and child-carers. **Number of sessions/activities** Through a cooperative effort carried out at the transnational level, the project partner experts and the Kindergartners involved developed the Toolkit's contents based on the Storytelling approach's application. The contents are divided into two different products: 1. The Storytelling section provides useful and replicable information about how the preschool teachers involved pupils and their families in the learning and telling of the tales; 2. The Storyplot and Didactical Toolkit section provides access, for each of the selected tales, to a complete package of didactic tools to be used with children. The Storytelling section provides evidence of the activities in each country, project partners' experts cooperated with the teachers and pupils' families, asking them to tell traditional tales during classroom activities. The tales represent both the local traditions of the area in which the kindergarten is located and the traditions of those pupils who are part of other countries/ethnic/religious backgrounds. For each Tale, the collection hosts more than 140 of them, the following information is provided: – The summary of the tale – If it is related to a local or intercultural tradition – Who was the storyteller – A tale gallery collects the images of the products (that can take the form of drawings, collages, paper works, tools, clay models etc. etc.) produced by children and represents their understanding of the story – A media gallery collects images of the activities in which the children and their relatives participated.
Organizer	☐a person ☒ an organization/institution ☐a school ☐an informal group ☐an NGO ☐other:_____

Website/E-mail /Other info:	All the materials are easily accessible from a dedicated section of the Portal at https://tik.pixel-online.org/storytelling.php and can already be used as a reference for enriching classroom activities based on the Storytelling based approach. The Storyplot and Didactical Toolkit section is fully accessible directly from the Portal at https://tik.pixel-online.org/storyplot.php for free and without any limitation.

4.2.5 Other experiences and good practices in Italy on the BIG_GAME topics

4.2.5.1 GAME@SCHOOL 2020

Title	**GAME@SCHOOL 2020**
Promoter	National projects
Context of implementation	The context where the best practice was developed X national level ☐ large city ☐small city
Goals of the activity	Objectives: ✓ Develop and improve the student's analytic skills ✓ Speed the learning process and develop creativity in solving problems and difficult situations ✓ Improve high cognitive skills through taking the risk, failing and trying again to complete the task of the level
Description	An initiative aimed at demonstrating how the video game can take on positive values if inserted in daily teaching inspired by active methodologies, in which the student acquires reflective and analytical skills. The basic idea is that the video game can be valued as a means of communicating students' creativity and vision of the world, cultivating cognitive, problem solving and divergent thinking skills. The competition will offer teams of students the opportunity to create a video game or a demo on a specific topic that will be communicated only at the beginning of the competition. Students will have nine hours to design, develop and deliver the video game or demo on THEME, which will be unveiled.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** ▪ Primary, lower secondary and upper secondary school students **b. Duration** ▪ One Day (9 hours) - Last edition 4th edition / 15 February 2020 / various locations in Italy **c. Number of sessions/activities**

	▪ The race will be held in one day, from 8.30 to 18.30, at the institution's headquarters chosen during registration **d. Teaching methodology** ▪ Discover the themes of previous editions to get an idea of what has been done in the past: Discover the 2017 theme https://videogioco.imparadigitale.it/wp-content/uploads/2017/12/Num3ri-in-g1oc0.pdf Discover the 2018 theme https://videogioco.imparadigitale.it/wp-content/uploads/2020/01/TEMA-GAME@SCHOOL-2018.pdf Discover the 2019 theme https://videogioco.imparadigitale.it/wp-content/uploads/2020/01/Tema_Game@School-2019.pdf **e. Type of assessment and tools used to identify the benefits**
Organizer	☐ a person **X** an organization/institution ☐ a school ☐an informal group ☐ an NGO ☐other:_____
Benefits and results	The prizes to the students were provided thanks to the contributions of sponsors and partners: Digital Bros Game Academy, AK Informatica, Acer, Epson, C2 Group, LeaPat, Milestone, and Nacon.
Website/E-mail /Other info:	Impara Digitale and Indire organise the event. The rules of the race and all the instructions can be found on the site: https://videogioco.imparadigitale.it/ https://videogioco.imparadigitale.it/preparati-alla-sfida/ where it is also possible to view the winning projects of previous years.

4.2.5.2 Among US REVERSE

Title	**Among Us REVERSE**
Promoter	School curricula
Context of implementation	The context where the best practice was developed ☐ national level **X** large city ☐small city
Goals of the activity	Objectives: ✓ Enhance good practices relating to environmental issues ✓ Develop scientific knowledge on environmental problems ✓ Create environmentally active citizens
Description	The classrooms are divided into crewmate teams who are responsible for the environment. The aim is to enlarge the group of crewmates. The students

	have six environmental related tasks. Moreover, they have an Oxygen Room where they can share important information about ecology. The winning team should have the largest crewmates, the highest mark in the tasks and the most interesting Oxygen Room.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** ▪ Lower secondary school students **b. Duration** ▪ One school year **c. Number of sessions/activities** ▪ Six tasks **d. Teaching methodology** ▪ Discover the themes of previous editions to get an idea of what has been done in the past: https://www.icdavincirodari.edu.it/userfiles/doc/Among%20us%20Reverse.pdf The method used is "Learning by doing". It's a task-based learning project. The students should find creative solutions to complete their tasks. **e. Type of assessment and tools used to identify the benefits.** The teachers will communicate the testing and evaluation on the CLASSROOM PLATFORM. The process will give the students feedback about their attitude towards the environment to improve it.
Organizer	☐ a person ☐ an organization/institution **X** a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	The project's main activity is to face the environmental problem affecting the school/town and to produce solutions using the STEM approach. Participants will develop basic skills, creating a culture of collaborative work. Cooperation between students will increase and they will be more sensitive to environmental problems. At the end of the project, STEM-focused solutions will be developed for each task.
Website/E-mail /Other info:	https://www.icdavincirodari.edu.it/userfiles/doc/Among%20us%20Reverse.pdf

4.3 Existing experiences and good practices in Romania

4.3.1 CAVE project

Title	**Cave - Communication And Visual Education in homeschooling** Code 2020-1-IT02-KA226-SCH-095188
Country	Italy, Lithuania, Romania, Poland, Spain
Promoter	European projects
Context of implementation	The context where the best practice was developed ✓national level ☐ large city ☐small city
Goals of the activity	Objectives The project identifies three main specific objectives: ● Provide teachers with basic and transversal digital skills to transform teaching methodologies by emphasising the opportunities for relationship and participation online platforms offer. ● Work on the innovation of sharing strategies of teaching materials in social platforms close to the daily online relational experience of young people, as well as on better communicability of teaching materials through the adoption of visual languages and Storytelling as narrative methods of more engaging content. ● Provide transversal digital skills (e.g. critical analysis, user awareness, creative content production) for greater autonomy and online behavioural responsibility.
Description	CAVE intends to work on two dimensions of the European Education Area of quality and that inclusion to counter forms of sociocultural inequality, linguistic and psycho-cognitive inequalities and reduce the main misalignments in education emphasised during the COVID-19 period: 1) Misalignment of a methodological nature related to the modes of delivery and organisation of the content of the so-called "emergency teaching" anchored to methodologies of the traditional didactics, offline, with languages far from the interest and curiosity of younger generations, compromising their involvement; 2) Misalignment linked to the risk of students dropping out of school as a result of demotivation emerged during the social isolation at

	home, as well as the need for tutoring and listening to overcome anxieties and fears that emerged from the COVID 19 situation; 3) Misalignment related to disintermediation, accentuated by the individual isolation of students in the private space of the home, intervening on the critical interpretation difficulty of the multiple information conveyed by different media, as well as awareness related to the appropriate use of media and shared content.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** ● Headmasters ● Teachers ● Primary School Students **b. Duration** from 01-03-2021 to 28-02-2023 **c. Number of sessions/activities** 1) **School-telling:** Online training course for teachers of different disciplinary orientations focused on the use of infographic language and the application of visual Storytelling in education to narrate, disseminate, transmit and communicate educational content more inclusively and innovatively; 2) **Social Media Platform** addressed elementary school teachers in the role of content creators and students in the role of follower creators of the social platform. The Visualsocial media platform (AGORA') is a virtual learning environment that contains educational audiovisual content for use with teachers and students in the classroom within educational paths. The platform is also a space for sharing knowledge and exchanging information between teachers and students: a modern agora; 3) **Tools and Methodologies for evaluation** develop tools to evaluate teachers' digital skills and the effects on students in terms of increased learning and school participation. **d. Teaching methodology** Digital Education and digital platforms have become the main virtual space for the design and delivery of teaching, as well as for the relationship and organisation of educational “e -activities”. **e. Type of assessment and tools used to identify the benefits** **Representatives of the project partners** have to fill out a questionnaire midway through the project and for the final evaluation of the project results providing an internal point of view; **End users** (i.e. teachers, students, and policymakers involved in testing activities) have to give feedback and comments on the intellectual

	products of the project both through the completion of questionnaires and by describing their experiences through direct testimonies; **Associated schools** have to test the project's outcomes and fill out evaluation forms that verify the quality and relevance of what has been produced in relation to the needs and expectations of primary school teachers.
Organizer	☐ a person ☐ an organisation/institution ✓a school ☐ an informal group ✓an NGO ☐ other:_____
Benefits and results	The main project results include: ● An Online Training Course for teachers of different disciplines focused on using infographic language and applying **visual Storytelling in teaching to narrate, disseminate, transmit and communicate educational content to students more inclusively and innovatively.** ● A Social Media Platform addressed both primary school teachers in the role of content Creator and students in the role of Follower Creator. ● A set of Tools and Methodologies for evaluation is capable of assessing teachers' digital skills and the impact on students in terms of increased learning and school participation. **Benefits** At least 250 teachers (direct beneficiaries) involved in the project are: – acquiring digital skills of access, critical analysis and creative production of content, such as the creation of digital Storytelling to break down communicational barriers and develop potential cross-communication and fruition with respect to different user cultures; – being able to implement visual and multimedia online didactics to improve the communicability and transferability of educational content for new generations (i.e. digital Storytelling); – improving their professional skills to be translated into a better organisation and school planning within online platforms as learning environments; About 3000 students (indirect beneficiaries) involved in the project by their teachers through their classes (on average we have calculated approximately from 20 to 230 students per class) are: – benefiting from the improved digital skills of their teachers; – actively responding to the solicitations of the teachers, improving their involvement and motivation to learn despite the physical distance; – acquiring digital skills of collaboration and communication, as well as the production of multimedia content; Digital Storytelling is designed as a tool to increase these benefits.

Website/E-mail /Other info:	https://www.projectcave.eu https://www.youtube.com/playlist?list=PLF-VDib0SzSMbdQhMQlZtv2ziRDh9ioD_

4.3.2 Parsifal

Title	**Parsifal, the Legends Researcher** Code: 2018-1-PL01-KA201-050865
Country	Poland, Italy, Lithuania, Bulgaria, Romania
Promoter	European projects
Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	● Improvement of secondary school students' achievements in literacy and digital skills due to the use of IT tools in research for traditional tales and stories ● Promotion of multidisciplinary approaches in education based on historical, cultural, geographical and artistic aspects ● Promotion of a learner-centred pedagogical approaches ● Integration of ICT in the learning process
Description	Young people make extensive use of the technical potential of ICT based devices. This, without appropriate guidance, might lead to insufficient reading and writing skills. Consequently, the educational system needs to teach how to exploit technologies to promote and reinforce literacy skills, benefiting from their attractive potential. The project activities were organised in the following phases: **Phase 1 - Identification of legends and traditional tales** This phase was devoted to creating an online repository of legends and traditional tales related to the cultural heritage of the regions involved in the project. The repository was available both in English and in the national language of the country the legend belongs. **Phase 2 - Elaboration of transnational comparative analysis** The traditional tales and legends presented in the online repository were analysed and compared at the transnational level to identify the common European roots. **Phase 3 - Creation of an online interactive map** The Interactive online map - also available on mobile as an App - allowed the student to identify the hot spots where there were places/objects with a

	cultural relevance that were presented through the legends and traditional tales. **Phase 4 - Testing** Each of the deliverables was tested with the representatives of the target groups. The testing phase allowed the collection of relevant feedback from the end-users to improve further the deliverables produced and create results that are entirely consistent with their needs and expectations.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** ● School Teachers ● Students ● School Directors ● Policy Makers in the Field of Education **b. Duration** 01 October 2018 and finishes on 30 September 2020 **c. Number of sessions/activities** Phase 1- Identification of legends and traditional tales Phase 2 - Elaboration of transnational comparative analysis Phase 3 - Creation of an online interactive map Phase 4 - Testing Phase 5 – Multiplier events **d. Teaching methodology** Storytelling **e. Type of assessment and tools used to identify the benefits** Each of the deliverables was tested with the representatives of the target groups. The testing phase allowed the collection of relevant feedback from the end-users to improve further the deliverables produced and create results that were entirely consistent with their needs and expectations.
Organizer	☐ a person ☐ an organisation/institution ✓ a school ☐ an informal group ✓ an NGO ☐ other:_____
Benefits and results	Results ● An on-line repository of legends and traditional tales ● Essays with transnational comparative analysis ● On-line interactive map
Website/E-mail /Other info:	https://parsifal.pixel-online.org/project-description.php

4.3.3 GoScience

Title	**GoScience – creativity and enhanced comprehension in science teaching and learning** Code: 2017-1-BG01-KA201-036209
Country	Bulgaria, Germany, Latvia, Spain, Italy, Lithuania, Romania
Promoter	European projects
Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	The project aimed to develop the youth culture of gaining comprehension in science subjects (mathematics, physics, chemistry, biology) and to promote students' creativity, thus making scientific knowledge better understandable and with a higher probability of implementing it in real life.
Description	The idea of the project was to develop methodology and pedagogical tools for science teaching and learning focused on the coherence of the educational content with the comprehension model of students. This allowed science education in schools to be more motivating and open and students to have greater responsibility for their own learning process. The project outputs gave the teachers the freedom to relate concepts in scientific subjects, which are often situated in different grades in the curricula for students to study, making students forget and lose the connection between the different knowledge units, decreasing their comprehension and functional literacy.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** *30 science teachers* from the partner countries were trained. The training activity aimed at training science teachers in the developed methodology for enhancing comprehension in science teaching and learning. *Students* **b. Duration** 1.12.2017-30.11.2019 **c. Number of sessions/activities** **d. Teaching methodology** The research was necessary for creative pedagogical approaches, tools and practices to be identified and chosen for developing the methodology for enhancing comprehension in science teaching and learning. The methodology was the cornerstone to building and implementing a systematic approach to science teaching and learning focused on comprehension and active student involvement in the educational process. https://www.goscience.eu/models.php

	https://www.goscience.eu/connections/ **e. Type of assessment and tools used to identify the benefits** The testing and evaluation were done by teachers and students from all involved schools (partners and target groups representatives). The process gave the partnership feedback on the level of applicability, usability, effectiveness and other characteristics of the project results developed, and they will be improved according to the received feedback.
Organizer	☐ a person ☐ an organization/institution ✓a school ☐ an informal group ✓an NGO ☐ other:_____
Benefits and results	*Main project results:* 1. Research on creative pedagogical approaches focused on enhancing comprehension in teaching and learning sciences. 2. Methodology for enhancing comprehension in science education in high schools. 3. On-line teaching and learning platform for enhancing comprehension in teaching and learning sciences: the platform gives access to all pedagogical tools developed under the project. The pedagogical tools created to support the developed approach and methodology interpreted theoretical science concepts by expressing them through familiar phenomena and natural, conventional relation which the student can intuitively perceive through an associative image, video, or fiction story. It allowed the creation of user-generated content as per the individual needs of the teachers and students. *Result:* The on-line tool allowed creation of user generated content as per the individual needs of the teachers and students, the main users. It contains all project results – methodology and pedagogical tools in particular.
Website/E-mail /Other info:	https://www.goscience.eu

4.3.4 Other experiences and good practices in Romania on the BIG_GAME topics

4.3.4.1 E-Learning from Nature

Title	**E-Learning from Nature**
Country	Italy, Belgium, Ireland, Greece, Italy, Lithuania, Portugal, Romania
Promoter	European projects
Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	• Improve students' low achievements in scientific subjects • Motivate secondary school students to learn science • Consolidate student knowledge of science subject
Description	The European project E-Learning From Nature had the aim to improve secondary school students' basic skills in scientific subjects, providing them with teaching materials exploiting the communicative potential of new technologies. The project was also based on engaging students in the production of lessons which can be shared with other students abroad.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** • Science and English teachers in secondary schools (students aged 14 to 19) • Secondary school students **b. Duration** Start Date: 01.09.2015 End Date: 30.08.2017
Organizer	☐ a person ☐ an organisation/institution ✓ a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	CT based collection of Research Action tools: Learning Science through Nature. The Research Action tools: Learning Science through Nature provides access to: • A collection of information sheets, direct sources (photos, videos, drawings etc. available in digital format) about the flora, the fauna, the natural elements and any other human intervention of scientific interest in a specific environmental area • Related small lessons aimed at identifying the connection between the above mentioned natural elements with school

	scientific curricular activities and the related basic skills to be acquired **Teachers' Guide** The guide for science teachers focuses on innovative methods to enhance students' motivation towards studying scientific subjects and improve their basic skills in science.
Website/E-mail /Other info:	http://enature.pixel-online.org/files/download/dissemination/Project_brochure_HD.pdf

4.3.4.2 CODE-IT

Title	**CODE-IT *Enhancing Teachers'professional development through algorithmic and programming*** Code: 2017-1-1PL01-KA201-038494
Country	Poland, Cyprus, Italy, Romania, Latvia
Promoter	European projects
Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	It concentrated on the programming competence of teachers of non-IT subjects. The project aimed to help teachers enhance their professional development by raising programming competencies through the development of innovative resources.
Description	The huge technological progress has forced the situation in which IT, and in particular, programming, has become the key competence of the 21st century. Today, digitisation and technology development make programming a language of communication. So the children who are currently enrolled in school should be aware of performing professions that do not yet exist, and the only thing we can say about these jobs is that they will be technology-based.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** The primary target group are non-IT teachers from elementary schools (grades 4 and higher) and gymnasiums with special attention to teachers of Chemistry, Geography, Math and Physics. The secondary target group is students schools mentioned above. **b. Duration** From 01.10.2017 to 30.09.20 **c. Number of sessions/activities** **d. Teaching methodology**

	e. Type of assessment and tools used to identify the benefits In the workshops, the students worked in mixed teams in the workshops "Ups-Direction-Siem, "Let's build our Bridge, ”I need a helmet, and "A new Kaunas Tower", through which students were presented with a new perspective on the learning process, putting their knowledge, skills and creatiVIty into practice. The students participated in the Vilnius Robotics Institute, where they participated in the Engineering Design, Electronics and Arduino workshops. Within them, the students were presented with how to use the design applications and the basic components of the future robots. Decreasing the interest in science among young people has led to programs that encourage students to discover the fascinating world of accurate science through practical applications and examples that will highlight their potential, creativity and passion for STEM, and teachers must be trained permanently depending on the real needs of the future because it is known, it is not enough to know Something, more important is to do something with that knowledge.
Organizer	☐ a person ☐ an organization/institution ✓ a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	• TRAINING MATERIALS FOR TEACHERS • VIRTUAL LEARNING ENVIRONMENT FOR TEACHERS • HANDB0OK FOR TEACHERS Virtual Learning Environment for Teachers containing training materials in algorithmic and programming and its didactic in other than IT subjects. Model lesson plans incorporating programming for Chemistry, Geography, Maths and Physics. Handbook entitled "Advance your teaching skills with the use of algorithmic and programming".
Website/E-mail /Other info:	https://www.codeit-project.eu

4.3.4.3 STEP – STEM TO ENVIRONMENTAL PROBLEMS

Title	**STEP – STEM TO ENVIRONMENTAL PROBLEMS** Code 2018-1-LV01-KA201-046976
Country	Turkey, Bulgaria, Poland, Romania, Latvia
Promoter	European projects

Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	STEM education aims to develop students into lifelong learning of science, technology, engineering and mathematics. The project's main aims were to create a common mind and conceptual framework and to ensure that the organisations of different countries are brought together to research environmental issues, providing proposals for innovative solutions and facilitating students' interest in STEM. Hands-on environmental education projects enrich STEM learning and offer an exciting opportunity to engage more students in STEM.
Description	The project contributed to creating a strong network to find a global solution. Environmental problems are among the main challenges that concern the whole world. Unfortunately, many different institutions' work on this issue is only about raising awareness of it. The STEP project aimed to produce engineering-oriented solutions with STEM understanding to real environmental problems within this context. The objectives of the STEP project were to establish a theoretical framework and to ensure that different countries cooperate to solve environmental problems and develop solutions to global problems by acting on close environmental problems. In other words, to provide solutions to solve big problems with small STEPs.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** College students, education authorities, secondary school students, teachers, youth clubs **b. Duration** 2018-2021 **c. Number of sessions/activities** n. 5 Mobilities **d. Teaching methodology** The methodology behind the STEP project was the context-based method. The project started with the understanding of STEM, and then different solutions were developed according to specific contexts. The project's main activity, which began with theoretical frameworks, was transformed into practice and contributed to developing creative solutions. **e. Type of assessment and tools used to identify the benefits**
Organizer	☐ a person ☐ an organization/institution ✓ a school ☐ an informal group ☐ an NGO ☐ other:_____

Benefits and results	The project's main activity was to visit every partner country, to determine the environmental problem that affected that region and to produce solutions using the STEM approach. The prepared reports were shared with the others on the next visit. The host country itself implemented the solution after the visit was over. At the end of the project, STEM-focused solutions were developed for each country's environmental problem. Participants developed the ability to produce engineering-based solutions to environmental problems, and they developed basic skills, creating a culture of collaborative work. Besides, all work was collected in a booklet. The book's name is "Story of Small STEPs".
Website/E-mail /Other info:	https://stemtostep.wixsite.com/home

4.3.4.5 STE(A)MonEdu

Title	**STE(A)MonEdu** Code 612911-EPP-1-2019-1-EL-EPPKA3-PI-FORWARD
Country	Germany, Greece, Italy, Romania, Spain
Promoter	European project
Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	The STEAMonEdu project aimed to increase the adoption and impact of STE(A)M education by investing in the community of stakeholders and the professional development of educators. As a result of research and creative techniques that were instrumental among the community members, the STE(A)M education framework was produced, which included competencies, policies, methodologies, educational objects, etc.
Description	The approach of the project was to nominate educators as the pillars of implementation of STE(A)M education policies and support their professional development either by blended training or by their participation in a community of stakeholders. The exchange of experience, collaboration and creative work of this community were supported by online peer learning and crowdsourcing platforms. The project adopted a bottom-up participatory approach to deliver: ● An online community of educators that collected good practices and collaboratively developed STE(A)M education policies,

	• A STE(A)M education framework, including STE(A)M body of knowledge, template curricula and learning activities, with a focus on diversity issues, • The STE(A)M competence framework, which detailed the competencies necessary to design and implement STE(A)M education activities (STEAMComp specialises Digital Competence Framework for Educators – DigCompEdu with STE(A)M-specific competencies) • The STE(A)M educator profile was designed on the principles of ESCO (European multilingual classification of Skills, Competences, Qualifications and Occupations) • A blended course delivered via the online platform and using its content (OERs), including a MOOC targeting STE(A)M educators. • Guide of STE(A)M educational practices, • The STE(A)M policy influencer toolkit, • Guide for STE(A)M education policymakers (Policy recommendations), • A STE(A)M readiness self-assessment online tool for educational organisations that implemented STE(A)M education policies or expanded SELFIE.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** Educators **b. Duration** 01/01/2020 - 31/12/2021 **c. Number of sessions/activities** • On-line community organisation • Roles, competencies and capacity for STE(A)M education • Professional development support • Competence-based tools development • Integrated STE(A)M education framework preparation **d. Teaching methodology** Participatory approach **e. Type of assessment and tools used to identify the benefits** STE(A)M self-assessment online tool
Organizer	☐ a person ✓an organization/institution ☐ a school ☐ an informal group ✓an NGO ☐ other:_____

Benefits and results	Training plan / handbook Guide on STE(A)M Education Policies and Educators' Needs Guide of STE(A)M Education Practices Guide for STE(A)M Education Policy Makers STE(A)M educational objects meta-data profile STE(A)M educator competence framework and profile STE(A)M education framework STE(A)M learning activity templates
Website/E-mail /Other info:	https://steamonedu.eu/

4.3.4.6 VR@School

Title	**VR@School** Code 2018-1-RO01-KA201-049411
Country	Romania, Italy, Portugal, Lithuania
Promoter	European projects
Context of implementation	The context where the best practice was developed ☐national level ✓ large city ☐small city
Goals of the activity	• Open up teachers to use new technologies & online educational resources in their classes by offering them a ready-made collection of online tools & platforms to facilitate & the teaching process &attract pupils to become more motivated & involved in learning; • Train teachers with the Virtual &Augmented Reality use in the classroom & motivate them to use this technology in the classroom; • Develop VR lessons for science disciplines & for transversal topics with an impact on a student's development, such as motivation to study, job orientation, foreign languages, inclusive education, and prevention of school dropout; • Guide school principals & teachers on how to implement the VR School Laboratory in their schools; • Implement VR School Laboratories in the partners' schools & organise simulation lessons for science & transdisciplinary school disciplines using VR.
Description	In today's digital world, teachers are struggling to find new ways to engage students. When home technologies such as mobile phones, tablets and games consoles are highly advanced, widely available and

	hugely popular with young children, finding educational engagement with technology in the classroom can be even harder, especially if the technology deployed there is less engaging than that of technology children use at home. Virtual Reality can become an innovation and an added value in school education and can deliver experiences and interactions for students that are either not practical or not possible in the 'real world', providing an unparalleled way to immerse and captivate students of all ages. Virtual Reality can become a teaching methodology that helps students feel immersed in an experience, gripping their imagination and stimulating thought in ways not possible with traditional books, pictures or videos. It facilitates a far higher level of knowledge retention.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** • Teachers (including science teachers), • Students (secondary school), • Students with lower opportunities, from disadvantaged areas/schools, with disabilities, in dropout situations or with poor school performance, • School principals, • Trainers in school education. **b. Duration** 01.09.2018 – 28.02.2021 **c. Number of sessions/activities** O1: Teach@School Online Library - Educational Technology and Open Education Resources O2: Teachers Guide on Virtual Reality in school education O3: VR Educational Resources for science and transdisciplinary school disciplines 2 International Learning/Training Activities on Use of VR for teachers and on How to implement VR laboratories in your school for teachers and school principals 5 Multiplier Events on VR@School - Virtual and Augmented Reality for education and training in the classroom **d. Teaching methodology** Introducing a new concept in educational technology: Virtual and Augmented Reality, the VR@School project created a completely different classroom. VR@School was a ground-breaking project offering a student-teacher friendly interface, practical resources and guidelines, embedded educational resources and simple-to-use VR lessons designed to help raise engagement and increase knowledge retention for students. **e. Type of assessment and tools used to identify the benefits**

Organizer	☐ a person ☐ an organization/institution ✓a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	Teach@School Online Library - Educational Technology and Open Education Resources Open / on-line / digital education – Open Education Resource (OER) Teachers Guide on Virtual Reality in school education Methodologies/guidelines – Evaluation method and tool VR Educational Resources for science and transdisciplinary school disciplines Learning/teaching/training material – Audiovisual material VR School Laboratory (Simulation Lessons using VR@School with students and teachers) Practical Activities Short-term joint staff International Training Events Learning/Teaching/Training Activities
Website/E-mail /Other info:	https://vr-school.eu

4.3.4.7 Cultural Agora @ Your Library

Title	**Cultural Agora @ Your Library**
Country	Romania
Promoter	National Association of Librarians and Public Libraries in Romania (ANBPR)
Context of implementation	The context where the best practice was developed ✓national level ☐ large city ☐small city
Goals of the activity	Raising awareness of the cultural diversity and strengthening the intercultural dialogue
Description	The idea of the project came from Romanian society's need to find real landmarks and cultural values in contrast to the anti-patterns promoted by the media. The lack of knowing authentic cultural values was significantly influenced by the unfortunate "interference" of the mass media of Romania, the internet, newspapers, and television, which are more interested in disseminating controversial and unstrained cultural content.

	Cultural Agora @ Your Library: The project's specific objective is to use digital stories to reflect the history and culture, the beliefs and values of the community. The digital story involves multiple disciplines, including literary and artistic skills, use of technology and inter-cultural exchanges. To that effect, libraries aim to encourage interaction between ethnic minorities represented in Romania, thus promoting cultural diversity and tolerance for minority ethnic values. The digital story provides the tool by which the memory of the communities can be known and shared. A digital story is a creative construction in itself. To complete digital stories, you only need to use your imagination and communication skills. The overall result is expected to attest to the potential of digital communications to revolutionise the sharing of knowledge, ideas and culture with the participation of the ethnic minority groups. The activities proposed will promote the community's involvement in valuing the cultural specificities of minorities. Using the digital stories technique, the librarians and the community members will share their unique cultural experiences, valuable in terms of ethnic diversity. By accessing the Cultural Agora, people can create and share their own stories, videos, texts, and photos and voice their values and beliefs of their own ethnic group. Thus, the libraries become an area of interethnic dialogue. The digital stories provide a pleasant way to preserve the community's collective memory and facilitate the exchange of knowledge and experiences among all users of library services.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** • creators, artists and cultural experts, including librarians; • cultural institutions at both local and national levels; • employees of cultural institutions such as libraries, museums, cultural centres, theatres etc. • non-governmental organisations, as well as artistic and cultural associations; • cultural events organisers, ethnic diversity experts and cultural operators active in the minorities area; • public universities, academic communities; • local minority communities, including the Roma minority; • media representatives; • general public. **b. Duration** - **c. Number of sessions/activities** - **d. Teaching methodology**

	- **e. Type of assessment and tools used to identify the benefits** Specific activities of the project involve the transfer of know-how using innovative methods based on Digital Storytelling (DST) as a way to share the collective memory of the community, offering creative workshops enabling people to create their own stories using video, text, photos, which eventually, will become library materials.
Organizer	☐ a person ✓ an organisation/institution ☐ a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	The project's innovative approach involves managing users' cultural knowledge and personal stories using public libraries. Suggesting a shift from the traditional library as the supplier of materials to the modern library as the facilitator for the creation of material by the users, the project offers an original interpretation of the idea of a digital story and a creative rethinking of the role of libraries in the community, in terms of intervention in the cultural diversity field. In the future, any library, seen as a community area, will be able to facilitate knowledge sharing using digital stories. In future, the consortium of partners intends to build a more complex communication interface between Romania and Norway and to engage in the development of broader scope, cross-border cultural programs. Thus, partners from the two countries will help strengthen the intercultural dialogue and understanding of the cultural diversity in Europe.
Website/E-mail /Other info:	https://www.agoraculturala.ro/en/

4.4 Existing experiences and good practices in Estonia

4.4.1 Eco Tweet

Title	**Eco Tweet** Code 2018-1-EL01-KA229-047995
Country	Greece, Estonia, Norway, Turkey, Iceland, Sweden
Promoter	European project
Context of implementation	The context where the best practice was developed ☐ national level ☑ large city ☐small city
Goals of the activity	Nowadays, environmental problems require urgent actions to maintain life on our planet. This planetary emergency motivated the collaboration of 6 educational institutions aiming to raise environmental awareness. Children's personality traits were determined at preschool age. Therefore, the consortium aimed to play a pivotal role in the acquisition of inquiry skills of preschoolers through STEM activities, which stimulated concern about environmental issues. Exploratory learning became a great tool to investigate and observe the natural surroundings. Students learned how to respect their natural heritage and protect the environment. Little learners visited facilities of alternative resources or places protected by UNESCO, which grew their desire to get involved in actions promoting reconnection with the environment. Experiments provided another perspective to their way of thinking, as they made assumptions and reinforced problem-solving skills. Our general objective was to make our children responsible European citizens, as they shared a common purpose: "Eco Tweet".
Description	Programme: Erasmus+ Key Action: Cooperation for innovation and the exchange of good practices Action Type: School Exchange Partnerships As a result, the project aimed at multilateral development of preschoolers while raising their environmental consciousness as future citizens for a sustainable society through project activities and outcomes. The final products, categorised in tangible like leaflets, posters, awards, brochures, magazines etc., and non-material such as videos, presentations, animations, eBooks, digital stories etc., gave merit to our institutions, which became centres of our local communities. Parental and local community involvement supported our effort effectively. Also, the opportunities provided by LTT meetings improved the knowledge and upgraded the educational techniques, enhancing teaching approaches. Institutional effectiveness was improved by developing E.U. projects and reframing the vision of school policy for environmental education.

Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** Preschoolers students **b. Duration** From 01-09-2018 to 31-10-2020 (three years) **c. Number of sessions/activities** • Communication between partners to share and exchange information and experience, as well as good practices; • Monitor progress of activities via posters, leaflets, brochures, magazines, newspapers etc.; • Creation of digital materials and publishments (website, Facebook page, Instagram, eTwinning, Pinterest etc.); • Use of ICT tools • Excursions and meetings with specialists; • Joint activities; • Dissemination of project results; • Collaboration with University of Aegean/Department of Environment, environmental organisations etc.; • Members of Eco-Schools (Green Flag). • Foster a sense of European citizenship (environmental protection as a common purpose) **d. Teaching methodology** Peer learning, discussion, experimentation, brainstorming, questioning, mimicking, and Storytelling, were some methods we used to ensure the adaptation of sensible habits. **e. Type of assessment and tools used to identify the benefits**
Organizer	☐ a person ☑ an organization/institution ☐ a school ☐an informal group ☐ an NGO ☐ other:_____
Benefits and results	An increased knowledge on rivers as ecosystems.
Website/E-mail /Other info:	http://ecotweet-erasmus.com/

4.4.2 Other experiences and good practices in Estonia on the BIG_GAME topics

4.4.2.1 River Emajõgi as an Ecosystem

Title	**Elurikas Emajõgi | Interactive quiz**
Promoter	**National projects.** (Made for an interactive exhibition in the Natural History Museum of the University of Tartu) **Research programs**
Context of implementation	The context where the best practice was developed ☑national level ☑ large city ☐small city
Goals of the activity	An interactive quiz teaches the players about the ecology of a river, focusing separately on 1) water pollution, 2) climate change, and 3) invasive species.
Description	An interactive quiz focused on the ecological quality of one of the major rivers in Estonia (River Emajõgi). The initial idea was also to compile different development scenarios that would be visualised at the end of the game/quiz based on the choices that the player made. In the current implementation, this part is missing. Still, a player can get instant feedback on their choices - their influence on the river's ecological condition is explained with text and pictures.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** The game/quiz targets exhibition visitors all over Estonia, and the game is also playable online (https://emajogi.metsamang.natmuseum.ut.ee/emajoe-viktoriin/; in the Estonian language) **b. Duration** Some minutes to an hour, perhaps. **c. Number of sessions/activities** The player can answer multiple-choice questions (so only one type of activity, a quiz rather than a game). The full topic is divided into 3 main (climate, pollution, invasive species) subtopics and 3 additional ones. **d. Teaching methodology** Reading texts + watching the visuals; getting instant feedback on your choices. **e. Type of assessment and tools used to identify the benefits** **None** (a player can see the number of points collected)
Organizer	☐ a person ☑ an organization/institution

	☐ a school ☐an informal group ☐ an NGO ☐ other:_____
Benefits and results	Increased knowledge of rivers as ecosystems.
Website/E-mail /Other info:	https://emajogi.metsamang.natmuseum.ut.ee/emajoe-viktoriin/

4.4.2.2 U-OS (Digi 3D)

Title	**U-OS (Digi 3D)**
Promoter	National and European projects
Context of implementation	The context where the best practice was developed ☑ national level ☐ large city ☐ small city
Goals of the activity	Learning in a game environment how to act as a citizen of a utopian planet.
Description	A graphical first-person immersive game with a "build a life" strategy. Start with no ID and 100 euro on your bank account, and evolve and level up as a citizen. Learn how to use (an Estonian) ID card in doing this.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target Group** Citizens or citizenship applicants of Estonia. **b. Duration** Days **c. Number of sessions/activities** Different activities include reading and answering e-mails, applying for a job, applying for a car driver's licence, and driving a car… **d. Teaching methodology** Experiencing everyday tasks in a game environment **e. Type of assessment and tools used to identify the benefits** None; a player can observe their progress
Organizer	☐ a person ☑ an organization/institution ☐ a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	Increased knowledge of the different uses of Estonian ID-card
Website/E-mail /Other info:	https://digi3d.ekuubis.eu/

5. Existing experiences and good practices in the use of Digital Storytelling in STEM education on the assessment system applied to the digital storytelling scenarios

5.1 Existing experiences and good practices in Finland

5.1.1 The STEAM Junior Challenge Competition

Title	**The STEAM junior challenge (yearly competition for Junior high students (classes 7-9; 13-16v))**
Country	Finland
Promoter	City of Turku
Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	The aim of the junior challenge competition is linked to support the following subject-specific objectives and pedagogical principles: Social studies: • T2 to guide the student to practice their ethical judgment in relation to various human, social and economic issues • T3 to guide the student to outline the principles of the rule of law, the universal model of human rights and to deepen their knowledge of the functioning of the Finnish legal system • T6 to instruct the student to look at social activities as well as different communities and minority groups in a diverse and open-minded manner Craft: • T1 to guide the student to plan their work and to come up with ideas to explore and experiment • T6 to guide the student to use the possibilities of information and communication technology in craft design, production and documentation, and the production and sharing of community information Visual arts: <u>Visual perception and thinking</u> • T2 to encourage students to discuss their own and others' observations and thoughts as well to justify their views

	• T3 inspire the student to express their observations and thoughts visually through a variety of tools and information using different production environments <u>Pictorial production</u> • T4 to guide the student to apply a variety of materials, techniques, and means of expression as well as deepen their visual production skills • T5 to guide the student to an exploratory approach in both independent and collaborative pictorial work • T6 to encourage students to express their opinions and apply pictorial communication and means of influencing their own images <u>Interpretation of visual culture</u> • T7 to instruct the student to apply pictorial, verbal and other methods of image interpretation • T8 to instruct the student to look at the importance of art and other visual culture to an individual, a community and a society from both historical and cultural perspectives • T9 to inspire the student to apply the ways of expressing images from different times and cultures in their pictorial production <u>Aesthetic, ecological and ethical valuation</u> • T10 to guide the student to take a stand-in art, the environment, and other visual culture values • T11 to encourage the student to take cultural diversity and sustainability into account in their expression development as well as to influence through images
Description	Through the yearly competition of STEAM experiments and challenges of the City of Turku, children and young people have the opportunity to learn about science and technology, develop their skills and be involved in solving the greatest challenges facing humanity and our planet. Instructions given: Each category can enter the competition with only one video. However, more videos can be implemented when the final video participating in the competition will be selected from the video options by voting, for example, by closed ballot The challenge competition in 2019 had three categories: 1. Climate change, 2. The impoverishment of nature, 3. Pollution of the seas Each topic was opened by a top expert in the field from the University of Turku. Assignments of different themes and related competition entries are shown in the videos at: https://www.turku.fi/steam-turku/steam-junior-haaste/steam-junior-haaste-2019

	The challenge competition in 2019 had three categories: 1. Climate change, 2. The impoverishment of nature, 3. Pollution of the seas Each topic was opened by a top expert in the field from the University of Turku. Assignments of different themes and related competition entries are shown in the videos at: https://www.turku.fi/steam-turku/steam-junior-haaste/steam-junior-haaste-2019 The challenge competition in 2022 had one common mission: ” How to utilize technology in making the world a better place for everyone. Viewing equality from a global perspective.” • Think of and write a short animated film about a given topic. Make a device, a robot, or other technical implementation that would promote equality, and present it as an animation. The animation can be implemented in many ways, for example, by filming or using various programs (see tips in the help video). Edit and use the background sounds as you prefer. In the animation, you can take advantage of all resources that the school has to offer materials. • Make an animation using Stop Motion or iMovie, for example. Instructions: The film must be an animation and consist of consecutive images. Take advantage of applications. 2) Think about how you implement the sounds in the film. They should be implemented in the animated film always as dubbing. 3) The film should have some sort of plot, i.e. start, middle and end. The story content is one of the evaluation criteria. 4) The subject is very informal: equality and its improvement, creativity will be rewarded. 5) The device or some kind of technical solution you invent must be featured in the film. 6) Additional tip: students can take advantage of e.g. recycled materials when building inventions.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** 13 – 16-year-old students **b. Duration** Short animation **c. Number of sessions/activities** 3-4 activities: 1)Planning, 2)Writing, 3)Making a technical implementation, 4) Filming/animation making **d. Teaching methodology** DigitalStoryTelling

	e. Type of assessment and tools used to identify the benefits The competition's assessment criteria were: students' ingenuity, collaboration, creativity, video clarity and story content.
Organizer	☐ a person X an organisation/institution X a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	Through Digital Storytelling based on STEAM experiments and challenges, children and young people have the opportunity to learn about science and technology, develop their skills and be involved in solving the most significant challenges facing humanity and our planet.
Website/E-mail /Other info:	https://www.turku.fi/steam-turku/steam-junior-haaste

5.1.2 STORIES - project foSTering early childhOod media liteRacy competencIES

Title	**STORIES - project foSTering early childhOod media liteRacy competencIES**. Erasmus+
Country	Finland
Promoter	**X** European projects National projects School curricula Research programs
Context of implementation	The context where the best practice was developed ☐ national level ☐ large city ☐small city
Goals of the activity	The goals of this case story was to study 1) How does a child experience a digital tool in storytelling? How does the child experience involvement in the digital storytelling process?
Description	A case study DIGITAALINEN TARINANKERRONTA LAPSEN KOKEMANA — digitaalisen välineen käytön ja osallisuuden kautta tarkasteltuna Digital storytelling as a child experience - viewed through the use and inclusion of a digital device. In this qualitative case study children used iTheatre, a digital storytelling tool, that facilitates easy access to a child either to use their planned characters or use the already existing ones. They can also record voices or

	music. This tool is specially designed for group working. They also used iPads and similar kinds of applications such as iMovie, iMotion, Puppet Pals and Book Creator. The assessment: 10 to 20 minutes half structured interview in small groups, in which the researcher and the children first watched the videos and then discussed the children's experiences and feelings during the storytelling process. The interview was recorded and littered later. The interview was held in a safe and familiar place (kindergarten) and the researcher got familiar with the children as well.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** A small groups (2-5) children aged 3 - 6 **b. Duration** -- **c. Number of sessions/activities** -- **d. Teaching methodology** iTheatre, iMovie, digital storytelling in a small group. Adults were guides and supervisors. **e. Type of assessment and tools used to identify the benefits** Recorded interview
Organizer	☐ a person X an organisation/institution X a school ☐ an informal group ☐ an NGO ☐ other: Xa person Susanna Isotalo, University of Jyvaskyla
Benefits and results	Two main results were connected to tools children used and the storytelling process itself. Most of the children felt that the tools they used were easy to use and they were already familiar (iPad specially) iTheatre is specially designed for young children, and it is motivating and very easy to use. Storytelling process taught children to stay still and quietly while filming, listening skills, improved reading and crafting skills. Children also mentioned the improved use of imagination and co-operation. Children taught also that they were in a big role attending to the storytelling process for example by drawing or choosing the characters or the background or the story itself. The process was meaningful and funny. Children also underlined their own personal role in storytelling by emphasizing their role as a speaker, creators or “actors”. One of the important result was also the role of co-operation and interaction during the whole process. Adults' role was to guide with the tools, be a partner in the storytelling process as well as supervisors.

Website/E-mail /Other info:	https://ec.europa.eu/programmes/erasmus-plus/project-result-content/fede56b0-7a42-4bde-9b4d-463871c653c2/GUIDELINE_English%20language.pdf BN:fi:jyu-201908023749.pdf https://jyx.jyu.fi/bitstream/handle/123456789/65187/1/URN%3ANBN%3Afi%3Ajyu-201908023749.pdf

5.1.3 Kamerakynä oppimisen välineenä- Let the camera be your pen.

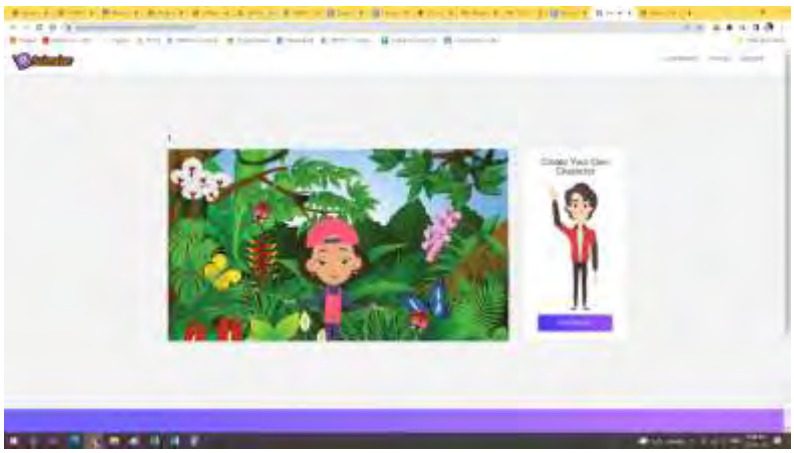
Title	Kamerakynä oppimisen välineenä- Let the camera be your pen
Country	The country where the best practices is developed Finland
Promoter	**X** European projects **X** National projects **X** School curricula Research programs
Context of implementation	The context where the best practice was developed **X** national level ☐ large city ☐small city
Goals of the activity	The goal of this pedagogical approach is to use a camera as your pen. Students make a short video of any chosen topics (math decline, a good habit, Spring, nature…) and videos are immediately shared to other students. The goal is not to learn how to make an admirable video but to learn multiple situation specific skills and teach students to promote their own goals in a variety of assignments.
Description	A video of a certain topic is short, about 10 to 30 seconds long and it is normally taken on one shot. The student can take as many shots she or he likes and there is no need to edit the video. It is not about the technique, it is about the doing.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups:** Any from kindergarten to upper secondary school **c. Duration** One hour or lesson might just be enough **c. Number of sessions/activities** -- **d. Teaching methodology** Short video, shared immediately **e. Type of assessment and tools used to identify the benefits**

	Self evaluation, equal evaluation.
Organizer	☐ a person ☐ an organization/institution ☐ a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	This approach concretises, visualizes and puts thoughts into action. It also gives observations structure and meaning. Students have to be specific and they learn operation control. Students can take as many shots as needed, they learn how to focus on the main points and learn also by repeating. Assessment: self evaluation and vertical evaluation. Students can evaluate themselves by thinking - What was successful in this video? - where the mistakes came from and why? Making a mistake and noticing it is a valuable thing in learning. - What I should do better next time Instead of points and scores, other students watching the video are encouraged to think "I learned from this video that…" and "I liked this video because of…" After a few videos of different topics students can write a text about a good movie clip, how to shoot a video successfully, how to use voices and music or what to avoid.
Website/E-mail /Other info:	https://www.nordicom.gu.se/sites/default/files/kapitel-pdf/jaakkola2.pdf https://docplayer.fi/4124507-Kamerakynan-pedagogiikka.html http://www.kamerakyna.fi/kamerakynan_pedagogiikka_-_opettajan_kasikirja_(2017)_web.pdf

5.2 Existing experiences and good practices in Romania

5.2.1 Jules Vernes - Insect World

Title	**Jules Vernes - Insect World**
Country	Romania
Promoter	EuroEd - School curricula
Context of implementation	The context where the best practice was developed ☐ national level ✓ large city ☐small city
Goals of the activity	The purpose of the video is to introduce children to the activity and to attract their attention.
Description	The teacher created an Animaker video related to the Tales of Daring Voyages & Discoveries: The Jules Verne's Collection, introducing the fantastic world of insects to students. A special, interactive and IT&C way to introduce a new theme in class. The video can be translated into any language and presented on the laptop, interactive board or PC. Video-making is a tried-and-true way to get kids engaged in building, demonstrating, and sharing knowledge, from slideshows and stop-motion animation to short films and remixes. Creating videos goes way beyond the clunky hand-held cameras. Instead, students can not only edit live-action sequences but also include images and animation to augment their knowledge. These video and animation apps and sites offer user-friendly tools and features that make it more fun to get kids' productions created, edited, and polished. Video-based formative assessment so that kids can record and share their video reflections. A kid's mind is a creative paradise with limitless imagination and unlimited potential. Every attempt must be made to encourage and guide their inherent talent. Apart from being so much fun, the animation tools also help kids develop their cognitive capabilities. The kids learn drawing, storytelling, creativity, and various other skills. This video is tailor-made for the little ones. The features are simple, buttons and commands are easy to understand, and the interface is interactive, fun, and user-friendly.
Implementation choices (Write a brief presentation of the best practice by referencing to:)	**a. Target groups** Primary School Children **b. Duration** 40 min

	c. Number of sessions/activities 1 session **d. Teaching methodology** School StoryTelling **e. Type of assessment and tools used to identify the benefits** It evaluates the understanding of listened material by asking questions about the message from the video.
Organizer	✓ a person ☐ an organisation/institution ✓ a school ☐ an informal group ☐ an NGO ☐ other:_____
Benefits and results	Teaching Science in a new interactive and innovative way. The kids learn drawing, ***storytelling***, creativity, and various other skills.
Website/E-mail /Other info:	https://app.animaker.com/animo/qai8oH6cRYXGDe7H/ 

Conclusion

Based on the information and good practices collected, the results revealed that the national and European STEM education experiences and initiatives that combine game and digital storytelling approach with building the game mission or challenge are rare if present at all. Another critical issue is a few examples of how to evaluate and assess the learning scenarios constructed by the student using digital storytelling in STEM education. A common standardized method is still lacking, but rather an individual system carried out by a single or group of teachers according to the activities to realize with their students.

Therefore, the next step of the project task is to provide teachers and educators with clear instructions and guidelines to replicate and transfer the experience based on the project methodology.

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