Best Practices Guide

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Best Practice Guide

”The Classes on the Moon” is an Erasmus+ project co-funded by European Union in coorperation with the following organisations:

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www.liceulsanitar.ro

IES La Sénia
www.ieslasenia.org

Associação para a Educação e Valorização da Região de Aveiro
www.epa.edu.pt

IIS Lucrezia della Valle
www.liceolucreziadellavalle.it

Union of Bulgarian Mathematicians - Varna
sites.google.com/view/t-ubm

Burdur Mesleki ve Teknik Anadolu Lisesi
www.burdureml.meb.k12.t

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“The Classes on the Moon” project is supported by all sectors of the teaching and learning organisations, including professional institutes and institutions, regulatory bodies, unions, and local and central government.

It was submitted in the 2021 Erasmus+ call under KA220-VET - Cooperation partnerships in vocational education and training, and it was granted with number

2021-1-RO01-KA220-VET-000028172

The funding period is February 2022 until February 2024. Nevertheless, the partners are committed with the sustainability of the project after this date with their own resources.

Website: https://moon.aeva.eu/

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February 2024

Experiences on IT Tools

1. Aim

Our goal is to improve the teaching skills of each partner's teachers to face the sudden teaching challenges like the ones imposed by the pandemic.

Our teachers are free in the sense of time and place with the help of CODING and ROBOTIC trainings although they have monoton business approach and burnout syndrome because of teaching lessons by using traditional methods before this education. Catching up with an educational environment in which lessons are more efficient so the students are willingly active participants and with the integration of the technology which is necessity of our future will contribute to our teachers professional development and motivate them.

Our teachers have attendes 6 LTT's of 3 days, in order:

- To increase interests in digital lessons (Maths, Science, Computer Sciences,Languages, etc) by making them more attractive and more comprehensive with the help of robots.
- To learn CODING and ROBOTIC Programming language and also how to oparate it,
- Not to have technology just to use it but she/he will have a chance to create his/her own style by coding.

Thanks to this partnership and the project our teachers:

- Started using computational thinking approach in their lessons.
- Computational thinking activities were learned. Our education level was internationalized.
- Algorithmic thinking was realized, cooperation with ICT teachers was be provided, and students' problem-solving skills were developed in real life.
- Teachers gained awareness about learning environments using coding / robotic tools and their mentality.
- Got a different perspective on the working principles of IT tolos.
- Improved their coding skills and digital capacities, professional careers.
- Improved their self-expression skills through dissemination activities, institution visits and meetings.

Our teachers increased their self confidence by having international education, improved themselves by having a chance to practice their English in abroad so their internal motivation increased. And it contributed to the development of qualified human power needed for our countries.

We overtook the need for experience exchange in the field of distance teaching that was imposed by the pandemic. We think that a transnational point of view lets the partner grow looking at the experience of success and pitfalls stories experienced in other countries, as each government decision was modelling each school strategy.

According to results of survey conducted in our educational institutions, it is clear that our teachers are eager to bring technology to classroom but have

some knowledge and practice deficiencies.The general purpose of our Project is to be able to use CODING activities effectively in interdisciplinary education and to be able to manage integratation of it to our educational system.

An individual who has computational thinking skills can solve problems using a computer or another tool, and find answers easily through algorithmic thinking. As it can be understood from here, teachers who are guider of students ,need to develop new learning techniques for effective learning. In order for students to develop their research, inquiry, critical thinking, problem solving and decision-making skills, and to be lifelong learning individuals, they need to be developed in terms of COMPUTATIVE thinking skills.

For this reason teachers should include more activities in the lessons where students can use or develop their computational process skills.

It will be useful to integrate coding activities into curriculum and take advantage of digital learning environment in place of traditional one.

Participants had the opportunity to update their methodology on the use of computational thinking approach in the classroom.

2. Robotics

In the next ten years, it is predicted that there will be a new Industrial Revolution and the highestdigital technology will be integrated to the production and value chain. (Boston Consulting Group, 2015) That's why it can be said that it is expected coding and programming will be more important than ever for those in all sectors in 21st century. It is a known fact that those who are looking for and developing new ways to learn and teach coding will be one step ahead.

In today's rapidly evolving technological landscape, teaching coding and robotics in schools has become increasingly important. The integration of these subjects into the curriculum equips students with essential skills that are crucial for their future careers and personal development. Coding and robotics foster critical thinking, problem-solving, and creativity, allowing students to understand and engage with the digital world in a meaningful way.

One of the primary reasons for teaching coding is the ubiquity of technology in almost every aspect of modern life. From smartphones to smart homes, understanding how software works can empower students to innovate and improve existing technologies. Coding skills are not just for future software engineers; they are valuable in various fields such as medicine, finance, art, and even agriculture. By learning to code, students develop a logical and structured approach to problem-solving, which is beneficial in any discipline.

Robotics, on the other hand, provides a tangible way for students to apply coding skills. It bridges the gap between theoretical knowledge and practical application, making learning more engaging and hands-on. Working with robots can help students grasp complex concepts in physics, engineering, and mathematics. Moreover, robotics encourages teamwork and collaboration, as students often work in groups to build and program robots. This collaborative effort enhances their communication and interpersonal skills, which are essential in any career.

Furthermore, teaching coding and robotics can help close the digital divide. By providing all students with access to these subjects, schools can ensure that everyone has the opportunity to participate in the digital economy. This is particularly important for underrepresented groups in STEM fields, such as girls and students from low-income backgrounds. Early

exposure to coding and robotics can spark interest and confidence in these students, paving the way for a more diverse and inclusive tech industry in the future.

Working with robots doesn't mean that you must know how to code. They can also be used to learn programming from the beginner level. Using different colored markers to denote different directions, users can draw paths for them to follow and give commands such as slow down, speed up, or stop.

There are several platforms that can be used for this purpose and several robots. To use some of them we need an account, but most can be used without having an account too. One of them is ozobet.

Through ozobet games, you can develop several essential skills, including:

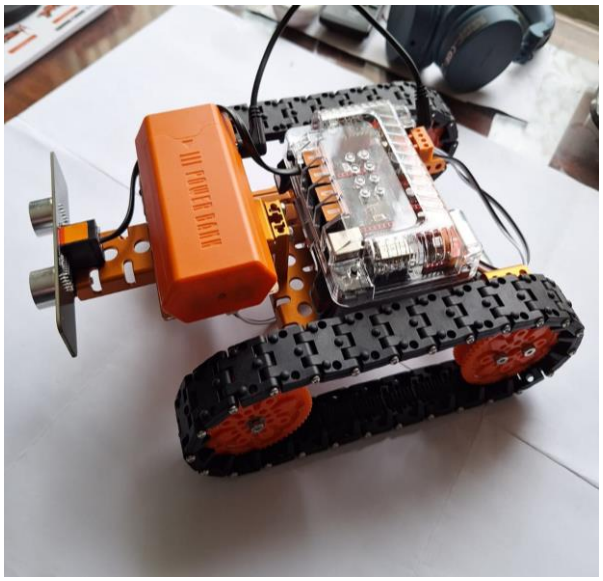
- Creativity
- Collaboration
- Communication
- Perseverance
- Problem solving

These tiny robots come in a few forms:

- the Bits model having only wheels and a sensor

- the more advanced Evo model has Bluetooth connectivity and programming capability as well.

The weight of the robot is 17g and the size of the robot is 2.5 x 2.5 x 2.5 cm.



Ozobot Evo is recommended for children aged 9 years and is equipped with:

- a durable polycarbonate housing
- 1 on / off button
- 8 optical sensors for detecting lines and color codes
- 7 LEDs
- 2 wheels and 2 engines
- proximity sensors

3. 3D Printing

3D printing, or additive manufacturing, is a production technique that creates a three-dimensional object from a computer-aided design (CAD) file. The term covers several different processes that see one or more materials – typically plastic, metal, wax or

composite – being deposited layer by layer to build a shape.

The entire process is controlled by a computer which makes 3D printing a cost-effective, efficient and accurate method to create objects of almost any geometry or complexity. Today, 3D printing is used in every industry to produce prototypes, tools and jigs, components and end-use parts.

3D printers come in various sizes, from small enough to fit on a benchtop to large-format industrial machines.

The goals of 3D printing encompass a broad range of applications, from revolutionizing manufacturing processes to enabling rapid prototyping and fostering creativity. At its core, 3D printing aims to transform traditional production methods by allowing for the creation of complex, customized objects with unprecedented precision and efficiency. This technology reduces waste, lowers production costs, and shortens the time required to move from concept to finished product. Beyond manufacturing, 3D printing is making significant strides in fields such as healthcare, where it is used to create patient-specific implants and prosthetics, and in education, where it brings abstract concepts to life with tangible models.

Teaching 3D printing in schools is of paramount importance as it prepares students for a future where this technology will be integral to numerous industries. By integrating 3D printing into the curriculum, schools can enhance students' understanding of design, engineering, and technology. It encourages hands-on learning and problem-solving, allowing students to experiment with ideas and see the results of their creativity in real time. This practical experience not only makes learning more engaging but also helps students develop critical thinking and technical skills. Moreover, early exposure to 3D printing can inspire students to pursue careers in STEM fields, fostering innovation and keeping pace with the technological advancements that are shaping the world.

The are many advantages of 3D printing in education, including:

- Helping to keep students engaged
- Simplifying complicated subjects and concepts
- Bringing theoretical ideas to life
- Encouraging collaboration
- Introducing students to modern manufacturing processes
- Preparing students for the future workplace and careers

Thanks to 3D printing, learners have the freedom to design, think, create and engage with the world in new and meaningful ways. Additionally, the excitement and interest surrounding 3D printing boost learner engagement, especially in those who prefer hands-on experiences.

3D printing enables students across every level to produce highly complex, unique objects that would be hard if not impossible to make any other way. What's

more, such designs can be made quickly, easily and customized. Another advantage is the opportunity to become familiar with a technology used in a wide array of sectors and professions.

Several factors lie behind the rapid growth of 3D printing in education like a greater appreciation of the technology and its benefits and the ever-expanding database of open-source teaching resources and guides. 3D printers have also become more widely accessible and affordable, as well as more intuitive and easier to use – important for novice and younger users.

While 3D printing in education initially focused on science, technology and art lessons, the technology is increasingly used across almost every subject area, from history and math to geography and drama.

4. Conclusions

Thanks to innovative educational environments, the social success of the school will increase.

Integrating coding and robotics into school curricula is not just about preparing students for specific careers; it is about equipping them with a versatile set of skills that will serve them well in a technology-driven world. It enhances their cognitive abilities, promotes innovation, and ensures that all students have the opportunity to succeed in the digital age. As technology continues to advance, the importance of these subjects in education will only grow, making them indispensable components of modern schooling.

Gamification

1. Aim

IIS Lucrezia Della Valle has been experiencing Gamification in education as a revision activity in digital and traditional contexts.

Gamification means to use some elements of games, such as to earn scores, to achieve higher levels, to win awards, to show gifts, in other contexts.

Gamification is mainly employed in marketing, e.g. the fidelity cards of shops and supermarkets to collect points.

Gamification is one of the most effective strategies to increase student's engagement.

For us GIMKIT was highly beneficial in digital context while CARDS and QUIZ GAMES were in traditional context. The different approaches gave students the possibility to choose the most suitable one.

2. GIMKIT

Gimkit is a tool to study and review topics in a competitive game format. Teachers create a kit (learning games, quizzes that can be turned into different games) and then a login code is given to students. Students can use any device to access and from there they can participate in the scheduled game.

Teachers generate a kit adding questions in several ways: manually, from question banks, importing from a spreadsheet or using flashcards (Flashcards speed up the process, because Gimkit will autogenerate incorrect answers for you).

After the kit has been created, teachers choose from several different games.

3. EVERGREEN GAMES

The different types of evergreen games selected for our pupils were MEMORY, QUIZ GAMES, CARDS GAMES and ROLE PLAYING. A brief but thorough description of each is advantageous for teachers who desire to insert them in their daily teaching-learning process.

MEMORY. At the beginning of the game, all the cards are mixed up and laid in cols and rows, face down on the table. Player 1 starts and turns over two cards: if the two cards do not match, they are flipped back down and player 2 starts playing, otherwise they are considered a pair and the player 1 has the right to continue. The game is over, when all the pairs have been found. The player who has the most cards wins!

The teacher can choose two immages, a picture and a phrase or two phrases that have a link.

QUIZ GAME 1. At home, teachers select a topic and write down some questions. In the classroom, the class is divided into two groups and a question is asked. The groups work in teams to solve a problem writing the answer on a sheet. The group leader runs to the Whiteboard and gives the sheet with the written answer to the teacher. If the answer is right the group scores a point, otherwise it loses a point.

QUIZ GAME 2. Pupils line up. The teacher asks a question to the first student in line. If the pupil provides a correct answer, the student ends up at the end of the line. The second in line becomes the first one and has to answer a new question. If the pupil provides a wrong answer, the student must get out of the line. The second in line becomes the first one and has to answer the same question. The winner is the last one standing in line.

CARDS GAME AND ROLE PLAYING. The activity is made up of three different steps: playing cards and filling in the form; each team corrects the sheet of the other group; the teacher checks the activity, uses the Whiteboard and generates a discussion with the students. In detail.

First step (playing cards and filling in the form): each pupil has three cards containing a question on a shared topic. One player at time, clockwise, selects one card with a question. The player on the right has to answer the question. If the player gives a correct answer, it is written on the sheet and the card is left on the table. Otherwise, if the student gives a wrong answer, all the cards on the table must be collected, while the other players have to explain the right answer, writing it down on the sheet. The winner is the pupil who collected the least number of cards.

Second step (role playing): each team corrects the other group's answer sheet with a red pen like a real teacher.

Third step (teacher's correctios): the teacher corrects the activity, uses the whiteboard and generates a discussion with the students.

Educational Benefits for Teachers are:

- **To repeat questions and to offer continuous review:** The primary goal is to help students improve their understanding of concepts through gamification. By using games, students can review content and remember information. This strategy can be used in all subjects.
- **To engage technology for learning:** Gimkit can make learning more engaging and interactive for students. By using the game, students are more likely to stay motivated and develop a positive attitude.
- **To create a «fun» learning environment for students:** Using typical elements of game playing, like challenges and rewards, a fun learning process is created students can repeat topics**.**

Educational Benefits for Students are:

- The games offer continuous review. Students can repeats topics using them.
- Rewards are given as questions are answered correctly in Gimkit: students earn virtual money that can be used during the game for various things (music, extra points, etc.)
- Repeats questions that have been answered incorrectly: questions can be answered many times, as the game just repeats itself

4. Conclusions

Gimkit is a great tool to be used in:

- Reviewing: by using games, students can review content while trying to answer correctly
- Teaching: Gimkit can make learning more engaging and interactive for students
- Rendering learning fun: Students had a lot of fun during games and they were concentrated and motivated while trying to answering correctly.

During **memory** activity the teacher can observe each player's method:

- There is no standard school behaviour
- Serenity is a major feeling
- Strategies are employed
- Playing is fun

For what concerns **quiz game 1** students loved running around the class:

- They worked in team and every member of the team tried to contribute to the victory
- They had the opportunity to share their knoledge without shame
- They corrected wrong concepts without realizing it.

Quiz game 2 is an individual activity, but students supported each other enhancing sense of belonging to the class and empathy:

- Pupils correct wrong responses
- They repeat the concept out loud
- They expressed themselves better.

If the students had studied well the teacher risked finishing all questions, while many of them would still be standing in line.

Cards game and role playing is a complex activity because it starts off as an individual one and gradually becomes a group task. People interpret two different roles: players and teachers with two distinctive approaches:

- Pupils have to be able to argue their answers
- They have to be able to correct the mistakes of others.

In conclusion, students carry out the review actvities without realizing it. Each activity strengthened the team spirit and self-awareness. Furthemore, pupils developed collaborative learning because they had to work together on a shared aim.

Gamification helps pupils review content and remember and retain information.

Web 2.0 Tools

1. Aim

Web 2.0 tools provide enormous opportunities for teaching and learning, yet their application in education is still underdeveloped. What is more, it is no longer possible for teachers to ignore such a technological advance, while they are expected to provide students with opportunities to take control of their learning. However, teachers are still reluctant with technology integration.

The use of Web 2.0 tools can add interactivity to language teaching and learning environments and materials used in the classroom. We believe that, if used appropriately, these tools will have a positive effect on the teaching and learning process. On the Internet, language teachers can find a great many Web 2.0 tools that can be used in language teaching. These tolos such as: Padlet, Kahoot and Podcast can bring dynamismand interactivity to the language teaching and learning environments. If Web 2.0 tools used properly by the teacher in line with the objectives of the language lesson, after a careful planning, it may support the language learning process of the students. The tools introduced briefly in this list are based on practical experiment and experience.

2. Padlet

As a virtual notice board, it can be used in a variety of ways depending on the creativty of the language teacher. Unlike real notice-boards, padlet allows students to post stickies with multimedia elements. Teachers and students can also export”the digital wall” they created in a variety of formats including pdf, image, csv., etc. and share it via social media sites.

3. Kahoot

As an assessment strategy, Kahoot is an excellent tool for diagnostic and formative assessments, allowing faculty to check-in on students' knowledge quickly and easily. As a learning strategy, it is a great way to apply the science of learning principle, retrieval practice, allowing students to recall information learned in a previous class and strengthen their knowledge of the content. As part of a connection activity, you can use Kahoot to assess the prior knowledge of students on a specific topic.

4. Podcast

The podcast is the tool of Web 2.0 which can be used as a part of education. It can help students to improve their listening skills, critical thinking, and motivate them to bury their heads in listening, to develop the taste for listening. The use of the Web 2.0 tool podcast has a huge impact in teaching English, especially on the considerable improvement of respondents' listening skills.

5. Conclusions

Teachers, especially language teachers, are becoming more and more interested in and enthusiastic about integrating ICT into their teaching environments. Web 2.0 tools can create a more student-centered language learning environment since they allow students to become creators of their own knowledge rather than passive recipients. Language teachers have started to realize that Web 2.0 tools are providing opportunities to enrich and support their students’ learning. However, they have to choose the most appropriate ones of these tools, most of which are freely available on the Internet.The tools may become beneficial for teaching a foreign language in the hands of creative and knowledgeable language teachers. It is therefore crucial to raise awareness of language teachers about choosing appropriate Web 2.0 tools and to guide them how to integrate these tools into their own language teaching environments.

Interactive White Boards

1. Aim

The primary objective of using smart boards in schools and classrooms is to enhance the educational experience by integrating technology into teaching and learning. Smart boards transform traditional lessons into dynamic, interactive sessions that captivate students' attention. By allowing teachers to incorporate multimedia elements such as videos, animations, and interactive simulations, smart boards make complex concepts more accessible and engaging. This technological integration helps cater to diverse learning styles, ensuring that visual, auditory, and kinesthetic learners all benefit from the enhanced presentation of information.

Another key objective is to foster a collaborative learning environment. Smart boards support interactive activities where students can participate directly in the lesson by solving problems, making annotations, or manipulating objects on the screen. This interactivity encourages student participation and engagement, making learning a more active process. It also promotes collaboration among students as they work together on group tasks, fostering essential teamwork and communication skills. The real-time feedback and hands-on involvement provided by smart boards help to reinforce learning and improve student retention of information.

The importance of smart boards in the classroom extends beyond just enhancing engagement and collaboration. They provide teachers with a versatile tool that can streamline lesson planning and delivery. With access to a vast array of online resources and educational software, teachers can quickly find and integrate high-quality content into their lessons, saving time and effort. Additionally, the ability to save and revisit lessons means that students who miss a class can catch up easily, and teachers can build upon previous lessons more effectively.

Furthermore, smart boards prepare students for a technology-driven world. As digital literacy becomes increasingly important in the 21st century, familiarizing students with interactive technology from an early age equips them with the skills they will need in higher education and the workforce. The use of smart boards in classrooms bridges the gap between traditional education methods and modern technological advancements, ensuring that students are not only absorbing content but also becoming adept at using the tools that will be prevalent in their future careers.

2. Conclusions

In summary, the objectives and importance of using smart boards in schools and classrooms are multifaceted. They aim to create a more engaging, interactive, and collaborative learning environment, enhance teaching efficiency, and prepare students for the digital age. By integrating smart boards into the educational process, schools can provide a richer, more effective learning experience that meets the needs of both students and teachers.

Adaptation to Mathematics with"Scratch Programming Language"

1. Aim

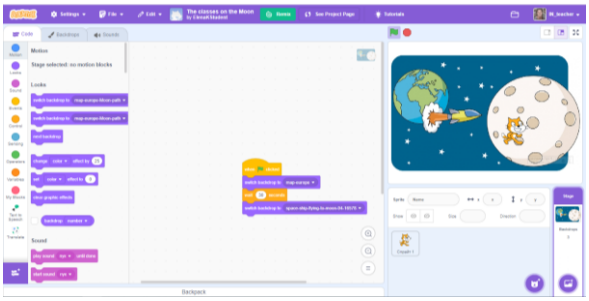
1. **Enhancing Mathematical Understanding**: The primary goal is to help learners improve their understanding of mathematical concepts through the application of Scratch programming. By engaging in programming projects related to mathematics, students can visualise abstract concepts, experiment with mathematical principles, and develop a deeper understanding of how mathematical ideas apply in real-world contexts.
2. **Promoting Computational Thinking**: Through Scratch programming, students can develop computational thinking skills, which involve problem-solving, algorithmic reasoning, and logical thinking. These skills are not only valuable in mathematics but also in various other domains and are essential for success in the digital age.
3. **Fostering Creativity and Innovation**: Scratch programming allows for creativity and innovation in problem-solving. By working on mathematical projects in Scratch, students have the opportunity to explore different approaches, experiment with ideas, and develop unique solutions to mathematical problems. This fosters a sense of creativity and encourages students to think outside the box.
4. **Improving Digital Literacy**: In today's technology-driven world, proficiency in programming languages like Scratch is becoming increasingly important. By integrating mathematics with Scratch programming, students not only improve their mathematical skills but also enhance their digital literacy and computational proficiency, preparing them for future academic and professional endeavours.
5. **Increasing Engagement and Motivation**: Integrating Scratch programming into mathematics instruction can make learning more engaging and interactive for students. By working on hands-on projects and seeing immediate results, students are more likely to stay motivated and develop a positive attitude towards mathematics.

2. First animations

The aim of creating animation in Scratch, a block-based visual programming language, encompasses several educational and creative objectives:

- **Engagement and Motivation**: Animation in Scratch is used to engage learners, especially children and beginners, in programming and computer science. The dynamic and interactive nature of animation capture students' interest and motivate them to explore coding concepts further.
- **Understanding Programming Concepts**: Animation provides a hands-on way for learners to understand fundamental programming concepts such as sequencing, loops, conditionals, and variables. By creating animations, students can see how these programming constructs come together to produce dynamic and interactive visual effects.
- **Creativity and Expression**: Scratch allows users to express their creativity by designing and programming custom animations. Through animation projects, students can explore their imagination, experiment with visual elements, and bring their ideas to life in a digital format.
- **Problem-Solving Skills**: Building animations in Scratch involves problem-solving as students work to achieve specific visual effects or behaviours. They must break down tasks into smaller steps, identify patterns, and troubleshoot errors to create the desired animation sequence.
- Integration with Other Subjects: Animation projects can be integrated into various subject areas, including storytelling, art, science, and mathematics. Students can create animations to illustrate concepts from literature, explain scientific phenomena, visualise mathematical equations, or demonstrate historical events.
- Digital Literacy: Creating animations in Scratch helps develop digital literacy skills by familiarising students with programming concepts and digital media production tools. They learn how to navigate the Scratch interface, use programming blocks effectively, and communicate their ideas through multimedia content.
- Collaboration and Sharing: Scratch encourages collaboration and sharing within its online community.

Students can collaborate on animation projects, provide feedback to peers, and explore animations created by others. This collaborative environment promotes peer learning and fosters a sense of community among aspiring programmers.



3. Remix - shared animation “The classes on the Moon”

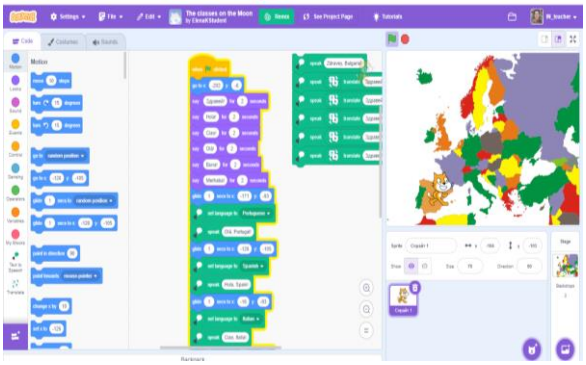
Working together on shared (remix) animation projects in Scratch serves several important aims:

1. **Collaborative Learning**: Collaborating on shared animations allows participants to learn from one another. By observing how others approach animation design and programming challenges, individuals can gain new insights, techniques, and perspectives that enhance their own skills and understanding.
2. **Community Building**: Shared animation projects foster a sense of community within the Scratch platform. Participants can connect with like-minded individuals, share ideas, and collaborate on creative endeavors. This sense

of belonging encourages active participation, mutual support, and the exchange of feedback and encouragement among members of the Scratch community.

3. **Creativity and Innovation**: Collaborative animation projects provide opportunities for collective creativity and innovation. By combining their unique talents, perspectives, and skills, participants can produce animations that are more complex, visually appealing, and engaging than what they might create individually. Collaborative environments often inspire new ideas, experimentation, and the exploration of innovative approaches to animation design and programming.
4. **Skills Development**: Working on shared animation projects allows participants to develop a diverse range of skills beyond programming and animation design. Collaboration requires effective communication, teamwork, problem-solving, and time management skills. Participants learn how to coordinate their efforts, resolve conflicts, and contribute to the project's success while honing their technical and creative abilities.
5. **Exposure and Recognition**: Collaborative animation projects provide participants with exposure to a wider audience within the Scratch community. By sharing their work publicly, contributors can receive feedback, recognition, and appreciation from other users. This exposure helps build their reputation, expand their network of contacts, and inspire future collaborations and creative endeavours.
6. **Promotion of Openness and Sharing**: The Scratch platform promotes the principles of openness, sharing, and remixing. Collaborative animation projects exemplify these principles by encouraging participants to share their work openly, allow others to remix and build upon their creations, and contribute to the collective pool of resources available to the Scratch community.

This culture of openness and sharing fosters a supportive and inclusive learning environment where everyone can contribute and benefit from the collective knowledge and creativity of the community.



4. Conclusions

Overall, the goal of training on this topic is to leverage Scratch programming as a tool to enhance mathematical learning, promote computational thinking, foster creativity, improve digital literacy, and increase student engagement and motivation in mathematics education. By combining mathematics with Scratch programming, educators aim to provide students with a dynamic and interactive learning experience that not only strengthens their mathematical skills but also equips them with valuable computational and problem-solving abilities for the future.

The latest version of this Best Practice Guide is available to download at https://moon.aeva.eu/

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