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PONTAL: Preventing NEETs status through active learning

Intellectual output 2:

A set of courses based on the "action learning" method – VIRTUAL REALITY / AUGMENTED REALITY

Content:

Introduction

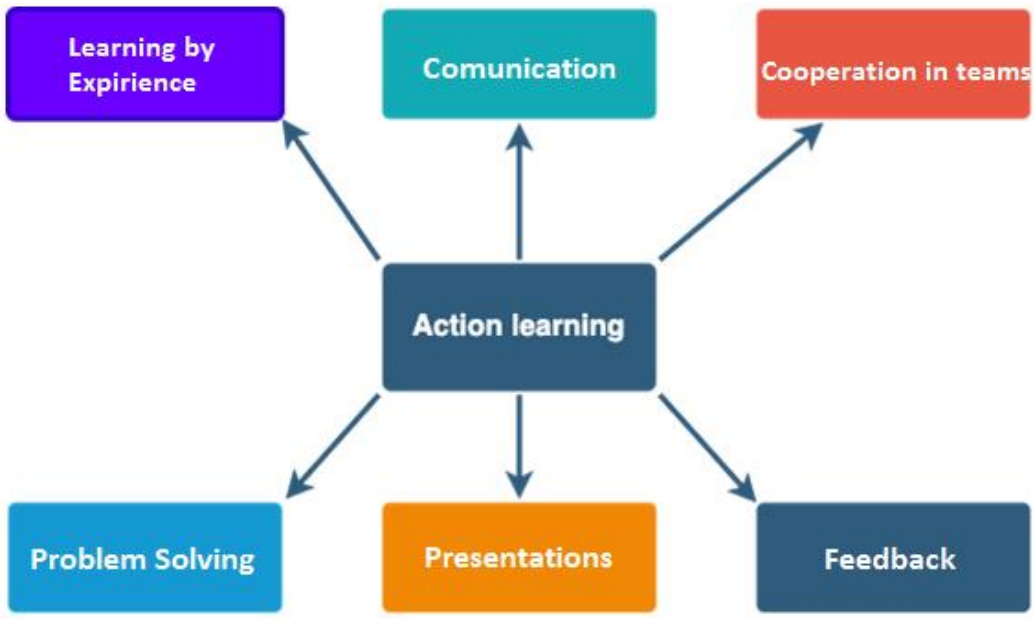
This material was created as a tool to support technical education involving Action learning and virtual reality.

Aim of the course:

After completing the course, participants will gain the ability to work independently and in groups on various real-life examples that will be developed in a virtual environment in **CoSpaces Edu** and other tools for effective work in VR and AR with an overlap into the real world and the use of 3D technologies (3D printer, 3D scanner).

Action learning:[1]

Picture 1: Action learning



Action Learning is a process for developing creative thinking to solve complex problems of individuals, groups of people and corporations. It involves taking steps to solve a problem and consequently evaluating the effectiveness of those steps. In other words, one tries to learn

[1] Source: https://www.tcbs.cz/cs/action-learning/

from solving real problems. Later on, we can formulate a new, more effective solution to the problem and put that solution into practice.

Building teams and transforming organisations is being promoted as one of the most effective and cost-effective tools for problem solving, developing managment and leadership skills. The great potential of Action Learning lies in the simultaneous achievement of all the described objectives.

This is an effective approach to development at all levels (e.g. individual or organisational). It is considered particularly well suited to team approaches to problem solving, effective learning, and to assist in team building within lessons, groups and organisations.

Action Learning uses cyclical learning. The acquisition of new experiences (ACTION) is followed by the need to look closely and think carefully about them (EXPLORATION). This is followed by forming general conclusions based on previous experience and comparing them with theory (LEARNING). The next step is a practical test (APPLICATION). It naturally leads to gaining new experiences, reviewing them.

Benefits of Action learning approach:

- by using this method, participants learn from the consequences of their own actions, find their own solutions and reach their own conclusions,
- students learn by experience and are thus able to remember much more
- they develop imagination, creativity and social communication,
- students learn to overcome obstacles individually and in groups,
- feedback and reflection are important,
- motivates learners and set a goal, showing, how to achieve it,
- competition has a positive effect on the method, it motivates learners to perform better,
- combines play and education,
- acqusition of key competences.

Picture 2: Actiopn learning vs academic education

ACTION LEARNING	ACADEMIC EDUCATION
Asks questions. Students are searching for answers with lectors.	Asks questions. Answers are given by teachers.
Students are working in teams.	Students are searching for answers individually.
Develops creativity and forces to think in a broader context.	Supports the context-sensitive perception of reality.
Experience and knowledge can be practically and very quickly applied in practice.	Knowledge needs to be verified over a long period of time, repeatedly, and then only practically used. The opportunity for this does not always arise.
The aim is the student's ability to apply the acquired knowledge in solving real situations with measurable benefits.	The aim is to pass a test demonstrating the ability to repeat the theory.
The result is the student's understanding of the context, "I taught them".	The result is the student's completion of a written, oral or other formal examination.

History of the Action learning:

The spiritual father and pioneer of the Action Learning method is the world-renowned english manager and university professor Reginald William Revans (1907-2003). In the 1950s, he came up with the revolutionary idea that a successful organisation must be constantly learned. R.W.Revans found that people learn much more easily, quickly and permanently by sharing their mistakes. Much more than by absorbing theoretical knowledge. He developed and promoted the method called the Action learning troughout his life.

Virtual and augmented reality

History[2]

As early as the 18th century, several artists attempted to create panoramas, i.e. wide angle views that were intended to transport the observer to a very distant place virtually. This can be considered as the beginning of virtual reality. Some artists also placed their paintings on the inside of the cylinder for an even more powerful experience. In the 19th century, the first stereoscopes and stereoscopic photographs began to appear. In the following years, the concept of augmented reality and the "Character marker" occured. This device was introduced by L. Frank Baum in his illustrated novel. Altought, previously very abstract matter and now a real technology that helps us understand the functioning of some of the more challenging things/technologies.

[2] Source: VR in building practice (Ondřej Pilný and colleagues)

VR/AR usage:

Nowadays, VR is used for education, staff training, virtual tours of different places, or meeting people in a virtual world. In education, VR can be used as a supplement to understand more difficult topics in the classroom for better visualization and imagination. A concrete example can be used in primary school geography classes, where by simply putting on the glasses, student can be transported to any place on the planet, or walk through the solar system.

The training of staff shows results during the testing of VR technology. Experiential learning is especially strong in workplace safety training and the employee experiences exactly how they can get hurt at work and what to look out for afterwards.

The AR is an ideal choice for the training, especially with the Merge Cube. For example, by using augmented reality and the cube, the student can hold a planet or the moon. It's actually a technology that has a huge overlap into the real world.

The future?

A great inspiration for everyone in the field of VR/AR can be the book and film of the same name Ready Player One by author Ernest Cline, in which is possible to see the potential of these technologies. In this piece of work, author describes the absorption of the real world by the artificial, virtual one. People try to spend more time in the virtual world than in the real one.

VR/AR:

VR - Virtual reality - Total immersion and movement in a virtual environment. Various headsets are used to provide VR tours, gaming and more.

AR - Augmented reality – Display of virtual elements/objects with an overlap into the real world.

Selecting a learning application: CoSpaces Edu

Educational app with unlimited potential aimed at creating VR and AR tours on any device (browser on PC, tablet, mobile phone) with the possibility of simple and more complex programming. Once created, the tour can be viewed on a mobile phone with a simple headset (cardboard) or e.g. VR glasses Oculus Quest II.

In CoSpace Edu, you can easily create custom content focused on any topic. All types of virtual reality are available - 360° tours, 3D tours and tours for the Magic Merge Cube (CoSpace Edu add-on). The

advantage of CoSpace Edu is the possibility of real-time collaboration in the groups. Likewise, the teacher can monitor the work of individuals and groups in real time and intervene in the tour if necessary.

Simply drag and drop 3D objects, photos, songs, spoken word, gifts and more into the environment. The creation is very simple and can be done in no time by anyone. It is up to the creater to decide how complex content is inserted and programmed into the tour.

1) Introduction to VR, AR and CoSpaces Edu!

Plan of the lecture: https://edu.cospaces.io/SVK-QNH
Educational level: primary school
Subject: technical education, ICT, modern technologies
Format: individually **Duration**: 120 minutes

Main points:

- What is virtual reality?
- What is the difference between AR and VR?
- What is the difference between 360° and 3D tour in CoSpaces Edu?
- The basic controls of CoSpaces Edu!

Introduction and lesson objectives:

The aim of the lesson is to introduce participants to the concepts of virtual and augmented reality. All students will try out the basic operations of the CoSpace Edu application on all types of devices, i. e computer, tablet and mobile phone. The Oculus Quest 2 headset or similar will be used for the virtual demonstrations.

To start working in virtual reality, students will try out mutual movement in simple simulations and tours, created in CoSpaces Edu. We will show them the differences between a 360° tour, a 3D tour and partly, the possibility of creating a tour on a magic Merge Cube.

Tools:

- mobile phones/tablets,
- virtual glasses,
- computers,
- internet.

Instructions for teachers:

1. Introducing the differences between AR and VR to learners. Emphasis is on an illustration. Learners try out the different technologies themselves.

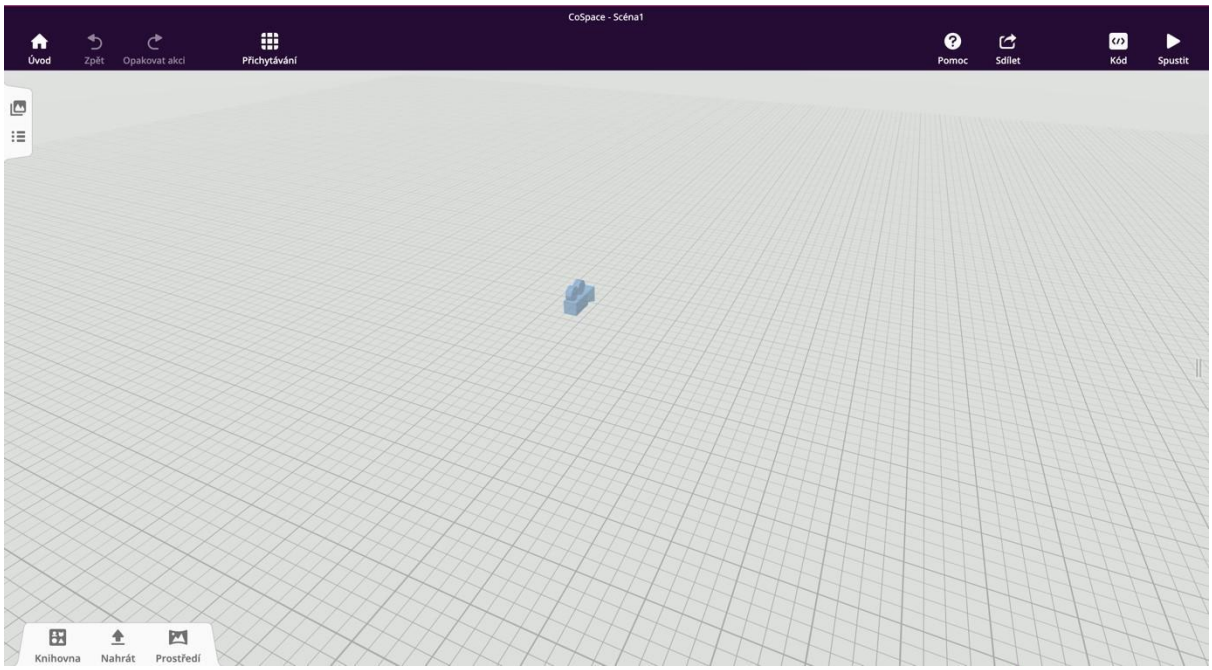
2. Demonstration of several finished tours/simulations created in CoSpace Edu.
3. A collective insight into the control of CoSpace Edu on a computer. Consequently, on a tablet and mobile phone. Allowing a minimum of 20 minutes for learners to try out the basic functions. Demonstrating the opportunity to develop creativity with appropriate programming in the CoBlocks environment.
4. Creating the first self-guided tour. Possibility of using the "All about me" template, in which the creator inserts information about himself. The content is not essential. Learners try to create the virtual tour themselves.
5. Viewing the first self-created tour in the VR headset.
6. Introducing several other virtual reality applications. Warp, Unity, etc...games, other applications…
7. At the end, the teacher will invite learners to think about the use of virtual reality, its benefits, why to use it. Future perspectives.

During the creation of the first tour, the teacher does not intervene directly, but only guide them and possibly help the learners or answer questions. The creation of the content itself is up to them.

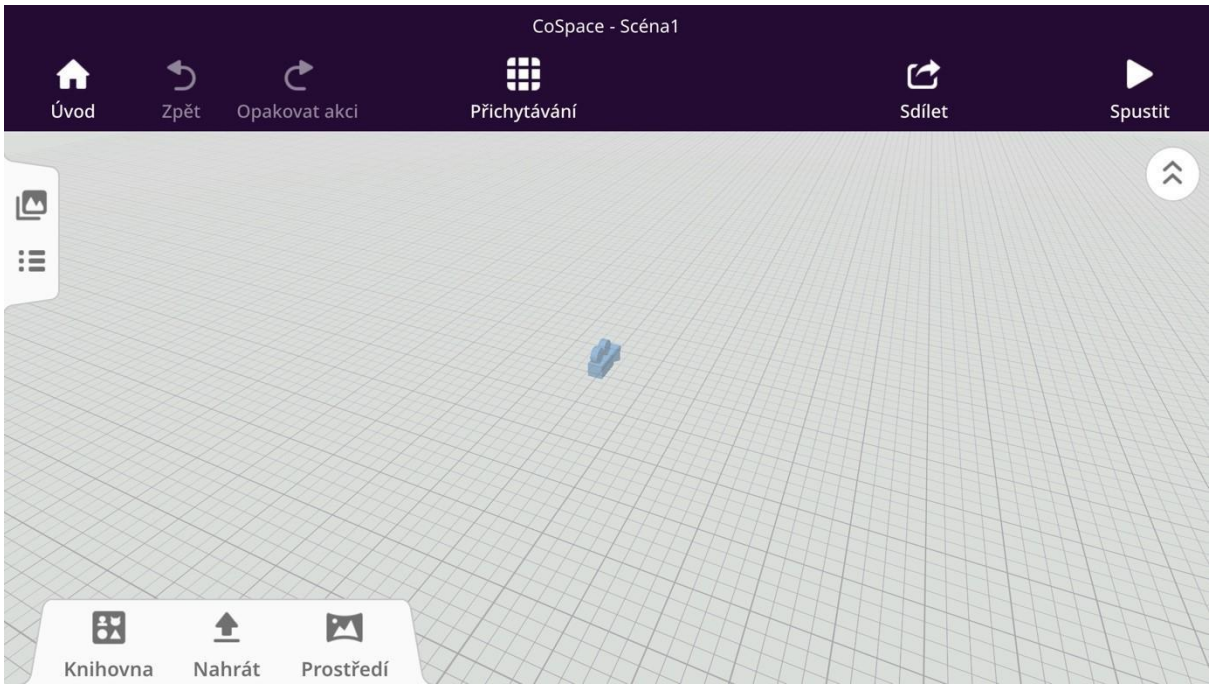
Lesson output:

Learners will take away basic knowledge about virtual reality technology after the lesson. They will experience for themselves the differences between VR (virtual reality) and AR (augmented reality). They will be able to work independently with the basic interface of CoSpace Edu on a computer, tablet or mobile phone. Among other things, they will experience what might be their first contact with a virtual headset, in which they will be able to see their first own creation in VR.

Picture 3: Environment of CoSpaces Edu - PC



Picture 4: Environment of CoSpaces Edu – mobile phone



2) Design of the script and first 360° tour in CoSpaces Edu

Plan of the lecture: https://edu.cospaces.io/TAK-YVZ
Educational level: primary school
Subject: technical education, ICT, modern technologies
Format: individually
Duration: 120 minutes

Main points:

- Project thinking, the creation of the script, work layout,
- Creating virtual tour content, working with the script,
- Data collection and data evaluation in relation to the use in the virtual tour,
- Ways to obtain 360° photography,
- Installation of Google Chrome extension to get 360° images,
- Work with mobile phone and google street view application,
- Usage of acquired data to create your own 360° tour,
- presenting your own tour in front of other students, justifying your choice of data.

Introduction and lesson objectives:

The aim of the lesson is to introduce participants to the thinking processes involved in creating their own content. All students will be tasked with choosing their own site for which they will create a virtual tour in which they will guide all other learners. They will think about the content beforehand and get data for the tour. Later on, we move on to the actual creation of the tour in CoSpace Edu.

Tools:

- mobile phones/tablets,
- virtual glasses (headset) Oculus Quest II,
- computers,
- internet,
- paper script,
- writting utensil.

Procedure:

The participant selects the location for which the tour will be created. It can be any state with a choice of several locations, or a place of residence. The choice is up to the individual student. In the next steps, student will design the content of the tour on the attached paper script, which should include a list of the objects to be inserted. At the same time, there will be a requirement to write at least one piece of information about the chosen place in a minimum of 200 words in the tour. The ideal option is to insert a 3D character for which the student speaks a spoken word. This will serve as a virtual guide to the selected place.

Instructions for teachers:

1. Demonstration of a simple 360° tour for an introduction. Showing how such a tour can be used.
2. Assigning a task, motivating learners to reward the best tour. The reward will be 10 minutes of playing a game of their choice. Evaluation will take place at the end of the lesson. The winner of the competition will play the game at the next meeting. Winner will receive a voucher to play the game with his/her own name on it.
3. After the introduction, the teacher will not interfere too much in the course of the lesson, only to give direction. Teacher will let the creativity and ideas of each student flow freely.
4. After designing the location and a simple script, the teacher moves on the explanation of how to get 360° images. He will demonstrate at least 3 ways that anyone can get a given photo.
    a. Pano fetch - install the Google Chrome extension
    b. Street view – mobile app for 360° photography
    c. Downloading from internet portals
5. During the actual conversation about 360° images, the trainer will take the students to the textual content and then speak it directly into CoSpaces Edu.
6. The creation of the tour itself - the teacher only directs the pupils, is always on hand with advice, does not interfere in any way. He leaves the creativity and creation of the tour free.
7. At least 25 minutes before the end of the meeting, it will prompt students to generate a link to share and view the tours in virtual glasses.
8. After the display, it is necessary to let the students correct any shortcomings they notice before presenting their creations to the rest of the group.
9. Presenting: the student will wear a headset on his/her head and share the content on a screen/screen. It is necessary that he/she describes why he/she chose his/her particular location, what sources he/she used for the creation, what are the 3D objects used in the tour, etc.
10. After the presentation of the works, the winner will be evaluated and awarded a prize (a paper voucher to play the game for 10 minutes in VR at the next session). The

evaluation will take place in any way the teacher decides. E.g. anonymous voting using slips of paper, show of hands and counting, or use of a mobile app for voting.

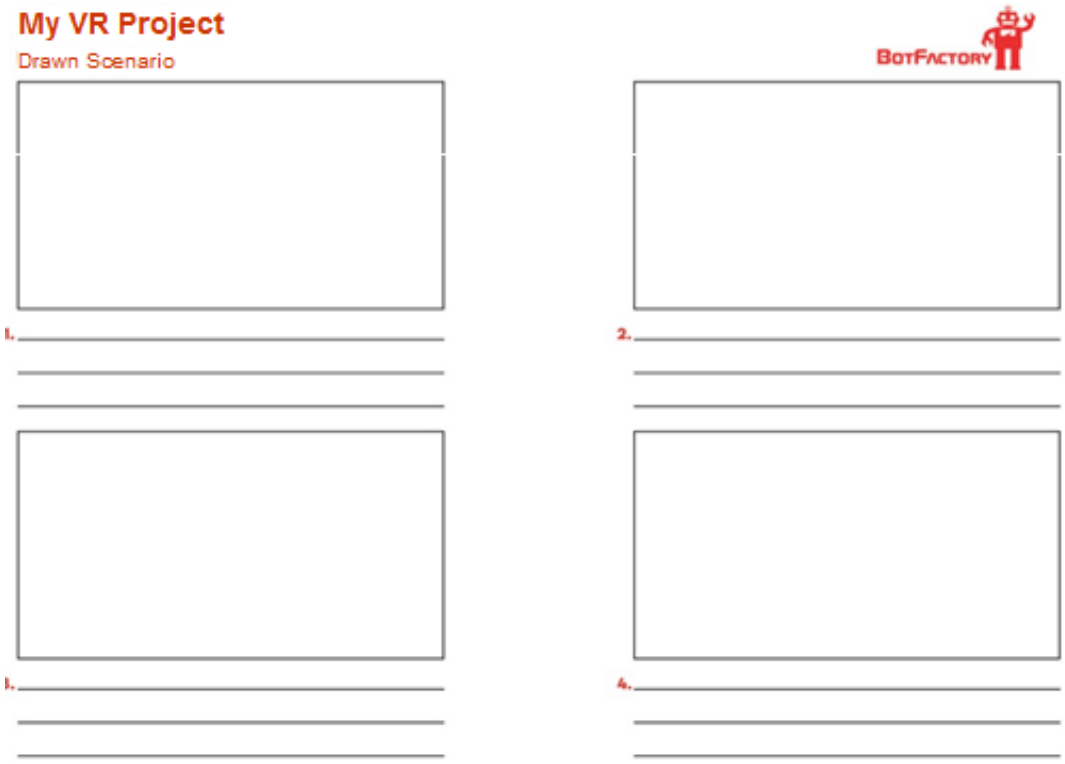
11. Feedback from inspections, own suggestions for improvements and repairs.

It is important to motivate learners as much as possible at the beginning of the lesson to reward the best tour with a virtual reality game. It is advisable to show what the game will be (video demonstration only).

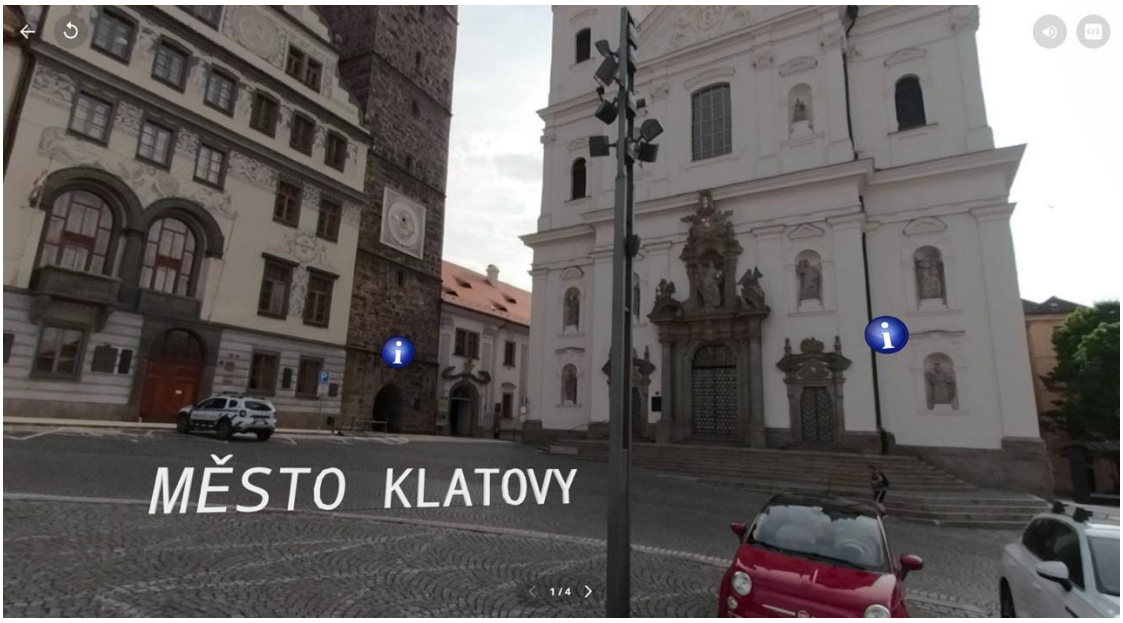
Lesson output:

Learners are able to independently invent, evaluate and use retrieved data. They are able to work with the Google Chrome extension and know several ways to obtain 360° photos. They will also acquire the basic ability to present their creations to others in a group. Mutual motivation within the group and a battle to win a prize.

Picture 5: Paper script

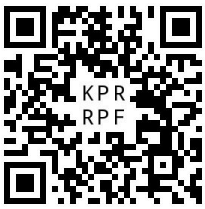


Picture 6: Preview of 360° tour – city of Klatovy, Czechia



3) Creation of 3D tour - ZOO

Plan of the lecture: https://edu.cospaces.io/KPR-RPF
Educational level: primary school
Subject: technical education, ICT, modern technologies
Format: individually / in the group
Duration: 120 minutes



Main points:

- Working with the template in CoSpace Edu
- Layout the work into the paper script
- Designing your own ZOO, inserting 3D objects into the template environment
- Searching relevant data about individual animals (3D objects) on the internet (using resources),
- First steps in CoBlocks programming

Introduction and lesson objectives:

In this lesson, the participant will learn how to insert a large number of 3D objects into a pre-made template in CoSpace Edu. Together we will touch and introduce the first steps in CoBlocks programming, allowing the participant to set up custom interactions for each 3D model in the tour.

Tools:

- mobile phones/tablets,
- virtual glasses (headset) Oculus Quest II,
- computers,
- internet, · paper script,
- writting utensil.

Procedure:

The participant first designs content of the tour on a paper script. After reflection, participant searches for relevant information about the individual animals (3D objects). The participant then incorporates the information into the tour as appropriately as possible. Student learns how to insert soundtracks, as well as finding individual sounds on the internet or record his/her own sound, as close as possible to the sound of the animal.

Instructions for teachers:

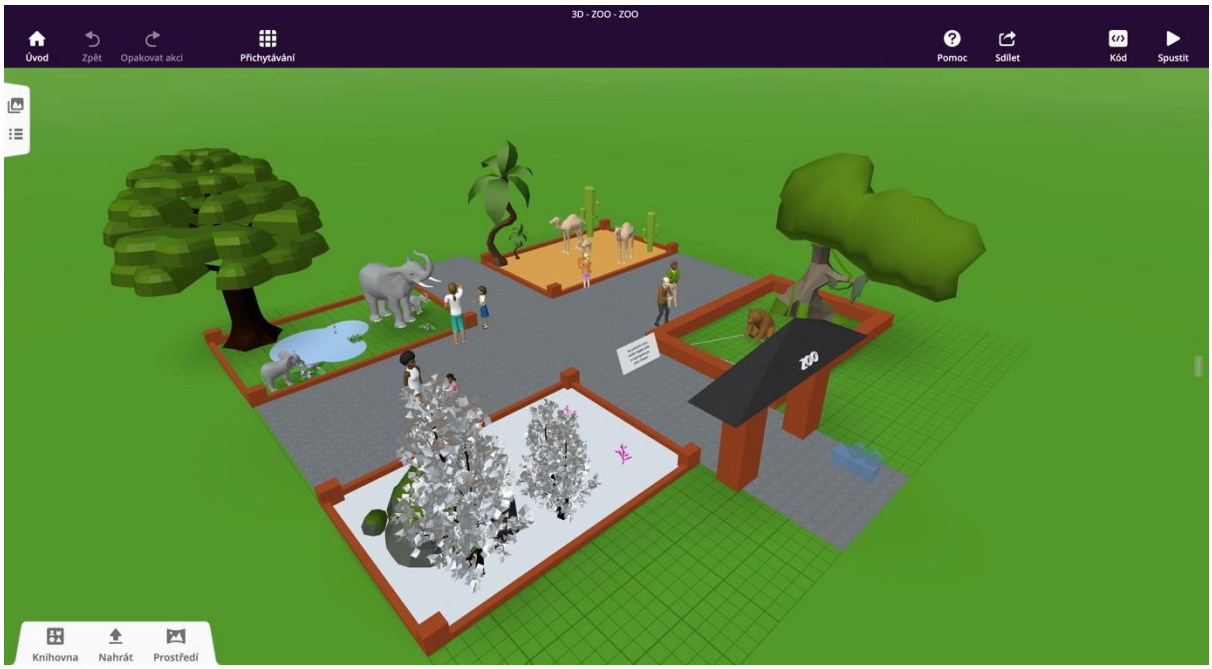
1. Explanation of the work with the template and the objectives of the lesson.

2. Providing good examples of already completed 3D tours.
3. Learn the first basics of programming in CoSpace Edu
4. Examples of block programming. Benefits of programming and programming thinking.
5. Assignment to students. Pair work can also be offered if students wish. Students in pairs have to allocate the roles – leave it all up to them, do not interfere. Intervene only in extreme cases (one of the students is not working at all, has no work).
6. Application of a voucher to play a virtual reality game for 10 minutes.
7. Incorporating the creation of a ZOO directly into the primary school curriculum (8th year)
8. In the middle of the lesson, the teacher should mention the possibility of inserting a virtual guide into the tour. Of course, other characters can be inserted into the virtual tour. Point out the virtual tour. How easy they are to create. Leave it up to the creativity of the students.
9. If students insert a virtual guide, it will serve as a speaker in front of the others.
10. If the students do not insert virtual guide, they have to present their work. If students work in pairs, they must present both (one speaker per group is not enough).
11. Presentation: students in pairs have to defend the choice of animals inserted in the tour and also what resourcesare used to create and what 3D objects in the tour etc.
12. After the presentation of the works, the winner will be evaluated and awarded a prize (a paper voucher to play the game for 10 minutes in VR at the next meeting). The evaluation will take place in any way the teacher decides. E.g. anonymous voting using slips of paper, show of hands and counting, or use of a mobile app for voting.
13. Tours feedback, own suggestions for improvements and repairs. Classroom discussion.

Lesson output:

Students are able to work independently or in pairs with the 3D tour template in CoSpace Edu. They know the basics of object-oriented programming CoBlocks. They can record sounds and spoken word and use them in an application. Searching for relevant data on the internet is not a problem for students. They gain experience in sorting information and critical thinking.

Picture 7: 3D tour ZOO



Pircture 8: Demonstration of CoBlocks programming in CoSpace Edu

4) 3D technology

Educational level: primary school
Subject: technical education, ICT, modern technologies
Format: individually
Duration: 120 minutes

Main points:

- 3D scanning (mobile phone, handheld scanner, desktop scanner),
- The concept of photogrammetry
- 3D model (online CAD - Tinkercad),
- 3D print (materials for 3D print, print technology, benefits of 3D print),
- Interconnection of 3D technology and VR/AR.

Introduction and lesson objectives:

In this lesson, students will learn about basic types of scanners and compare their benefits. They will try 3D modelling in a simple program that works in a browser with an internet connection. In it, they will create their own 3D model, which they will use to create a virtual tour, thus connecting the 3D and virtual worlds.

Tools:

- mobile phones/tablets,
- virtual glasses (headset) Oculus Quest II,
- computers,
- 3D scanners,
- internet,
- 3D printer.

Instructions for teachers:

1. At the beginning of the lesson, the teacher will start by reflecting on the acquisition of some real 3D objects. He asks the pupils if they know if it would be possible to obtain them in some simple and quick way. He tries to guide the pupils to the technology of 3D scanning.

2. After the introduction, the teacher moves on to a quick introduction of the different types of scanners. He will point out the use of a mobile phone or camera as a 3D scanner.
3. Students will scan each other using handheld Sense scanners. They will work with the created avatars in the CoSpaces Edu app in the virtual world.
4. Scanning with the Sense scanner:

- 3D scanner Sense is suitable for scanning larger objects where we do not need completely accurate details. It also records scanned objects in the same colours thanks to the scanning camera. It is lightweight and easy to carry. When connected to the portable computer, it can also be used for outdoor scanning of cars or other large parts and objects. With this scanner, it moves around a static objects.

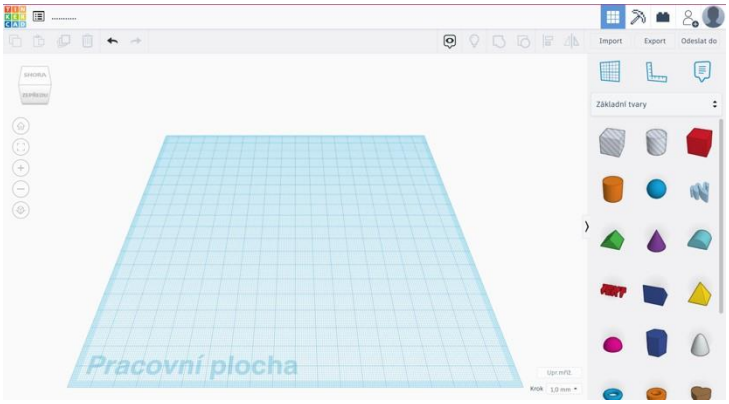
5. For scanning with mobile phones, the teacher will have students search for apps independently in the mobile app store. The pupils will be asked to select the most suitable app according to the given parameters. They can also download multiple apps and simply test and compare them.
6. The teacher will give at students command 3D printed objects on a 3D printer – these are ideal for 3D scanning. Students will learn about 3D printing and the possibilities of printing.
7. 3D printing – the teacher will introduce the students to 3D printing. It will start with a theoretical introduction and the possibilities of printing materials and setting parameters for 3D printing.
8. From 3D scanning and 3D printing, the teacher will take the topic for further obtaining 3D models in a different way. Moving towards 3D modelling and online databases with 3D models.
9. 3D modelling - the teacher will briefly introduce the simple 3D CAD TINKERCAD, which is an easy way to create 3D objects.
10. Students will independently create a 3D model according to their own imagination in Tinkercad. They will use the model they create later in CoSpace Edu to create a tour.

Lesson output:

Student is able to explain what 3D scanning is used for and when it is appropriate to use it. Learner can design and model a simple 3D object, which he/she can further work with in his/her own virtual tours.

Picture 10: Sense handheld scanner

Picture 9: Tinkercad Environment



Picture 12: 3D scanning via mobile phone

Picture 11: Examples of 3D printers

5) Work with Merge Cube[3]

Plan of the lecture: https://edu.cospaces.io/ENG-FKJ

Educational level: primary school
Subject: technical education, ICT, modern technologies
Format: individually **Duration:** 120 minutes

Main points:

- Augmented reality (AR),
- Manual dexterity – cutting and gluing the Merge Cube,
- Working with the magic Merge Cube,
- Creating a tour for Merge Cube – different forms (on the cube/in the cube),
- The benefits of AR and the use of the magic cube.

Introduction and lesson objectives :

At the beginning of the lesson, students review basic manual work. First, they cut out the unfolded cube net according to the template. They then fold the cut-out according to the pattern and glue it together. They will create a fully functional educational model of the Magic Merge Cube, which they will work with in this and future lessons. The output of the lesson should be a set of multiple viewings for the Merge Cube.

Tools:

- mobile phones/tablets,
- virtual glasses,
- computers,
- templates for creating Merge Cube,
- glue,
- scissors.

Instructions for teachers:

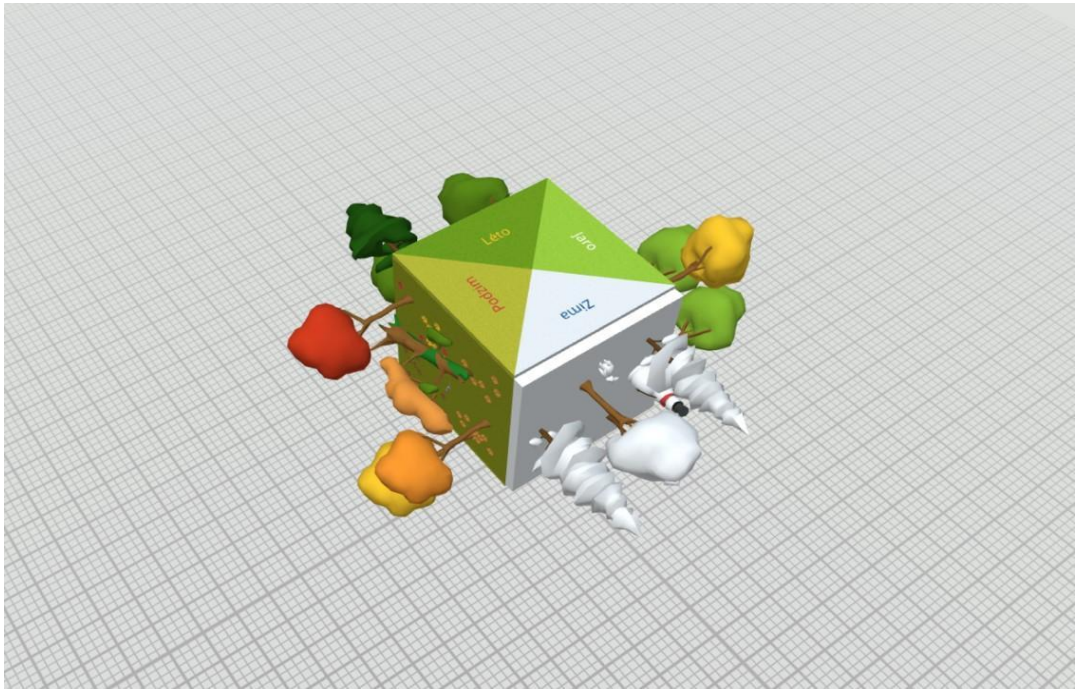
1. At the beginning of the lesson, the teacher will give a very short explanation about augmented reality. He will mention the advantages of using it compared to VR and guide the pupils through activation questions to come to their own conclusions about the benefits of AR (augmented reality).

[3] Template for creating your own Merge Cube is included in the attachments.

2. Next, the teacher assigns independent work to the students. They cut out a cube grid according to the template and then glue it together to form a Merge Cube.
3. Once the cubes are complete, all students will move to the Object viewer app, which can be downloaded from the play store or appstore, where there are finished models to display on the Merge Cube. The teacher will have students freely walk through the app for at least 10 minutes independently.
4. Inserting your own models into the Object viewer.
5. Introduction to 3D online database (thingiverse) - task assignment: Download any freely available model, then insert it into the application. The object appears in AR on the Merge Cube.
6. After completing the first task, students move to CoSpaces Edu. They will use the Merge Cube template "All about me". The teacher gives them a job and lets them work freely in the app environment.
7. After the "All about me" tour, there will be short presentations between the pupils. We will learn new information about the other pupils. The teacher gives a short evaluation of each of the tours.
8. After the presentation of the works, the winner will be evaluated and awarded a prize (a paper voucher to play the game for 10 minutes in VR at the next meeting). E.g. anonymous voting using slips of paper, show of hands and counting, or use of a mobile app for voting.
9. At the end of the lesson, the teacher will introduce another 3D online database of objects and how to work with them. This will serve as an introduction to 3D technologies.

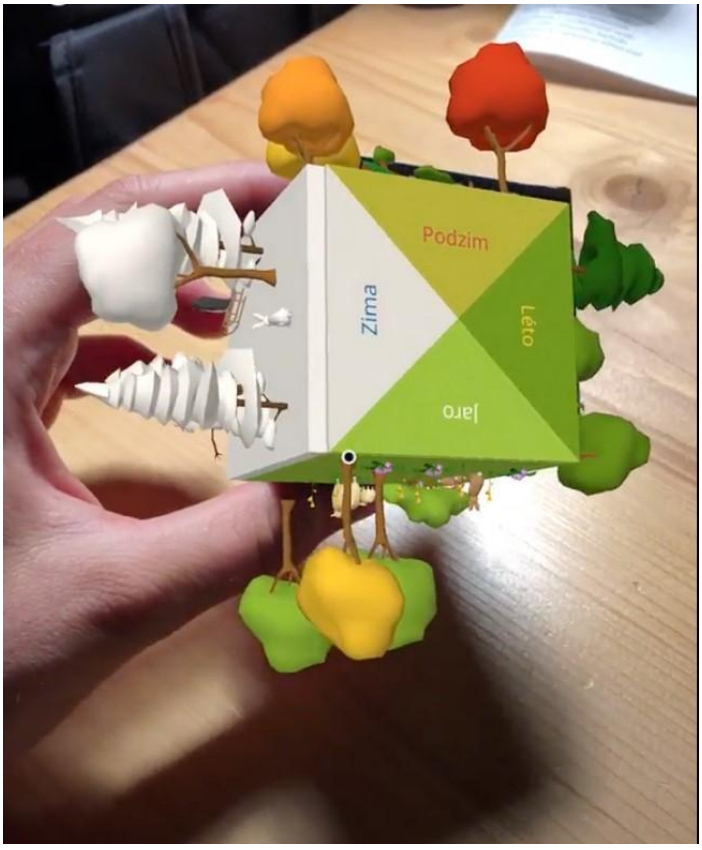
Lesson output:

The learner has basic manual dexterity and is able to apply it to the given task. All students can work independently in Object viewer and CoSpaces Edu using the magic cube Merge Cube. The output of the lesson should be a tour incorporated into the Merge Cube template "All about me" in which the learner incorporates information about themselves, adds a photo and more…



Picture 13: Demonstration of the tour creation process on the Merge Cube

Picture 14: Display in AR on the Merge Cube



6) Creation of the Maze – group work

Plan of the lecture: https://edu.cospaces.io/FWG-NVD
Educational level: primary school
Subject: technical education, ICT, modern technologies
Format: in the group **Duration**: 120 minutes

Main points:

- using a 3D modelling to create a tour base in CoSpace Edu
- group work, cooperation,
- programming through the use of CoBlocks.

Introduction and lesson objectives:

The aim of the lesson is to create a fully automated maze for which will students prepare a base in tinkercad and insert it into the CoSpace Edu environment. They will then insert an avatar (animal/character) into the prepared tour, which will ten be programmed to be able to navigate through the maze independently when triggered.

Tools:

- mobile phones/tablets,
- virtual glasses (headset) Oculus Quest II,
- computers,
- internet,
- paper script,
- writting utensil,

Procedure:

In tinkercad, students create a base and export it to .stl or .obj format. This object is then inserted into CoSpaces Edu. In CoSpaces Edu, they will work in the CoBlocks object-oriented programming environment. They will set up the environment so that the avatar walks through the maze on its own. Students can also create a second scene, where the avatar will be navigated using controls. It will then be up to the participant to solve the maze.

Instructions for teachers:

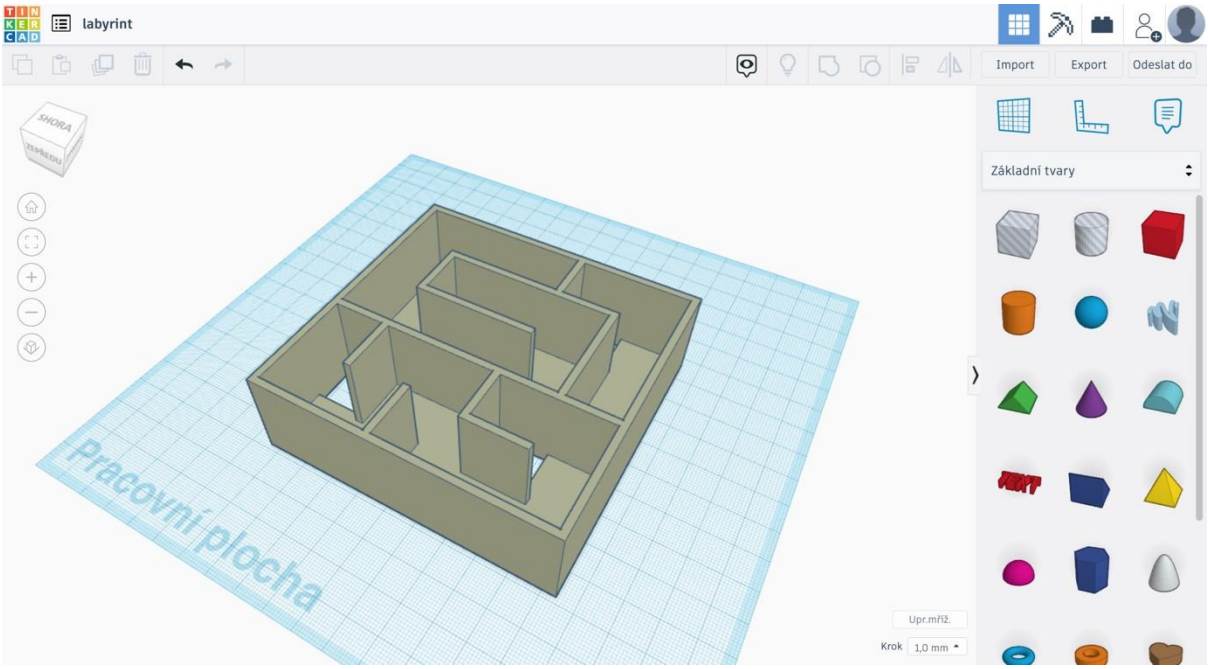
1. At the beggining of the lesson, teacher introduces the objectives tat the students should achieve. He/she mentions and motivates them to work as much as possible with 3D models and their use in the virtual environment.

2. After the introduction, he leaves the work to the students. They will work on preparing a 3D object in Tinkercad.
3. Teacher does not work for the students, solely offers a helping hand. He tries to make them come to the goal in their own way, because there is not only one possible way to the goal, but many.
4. Throughout, teacher encourages students to actively participate and to work in groups hepling each other, where appropriate.
5. In the next part of the lesson, students will test out CoBlocks programming.
6. After the experience of the previous lesson, they should manage to work on their own.
7. At the end of the lesson, students will present their individual tours and joint evaluation. The teacher will highlight at least one aspect of each tour in the evaluation.

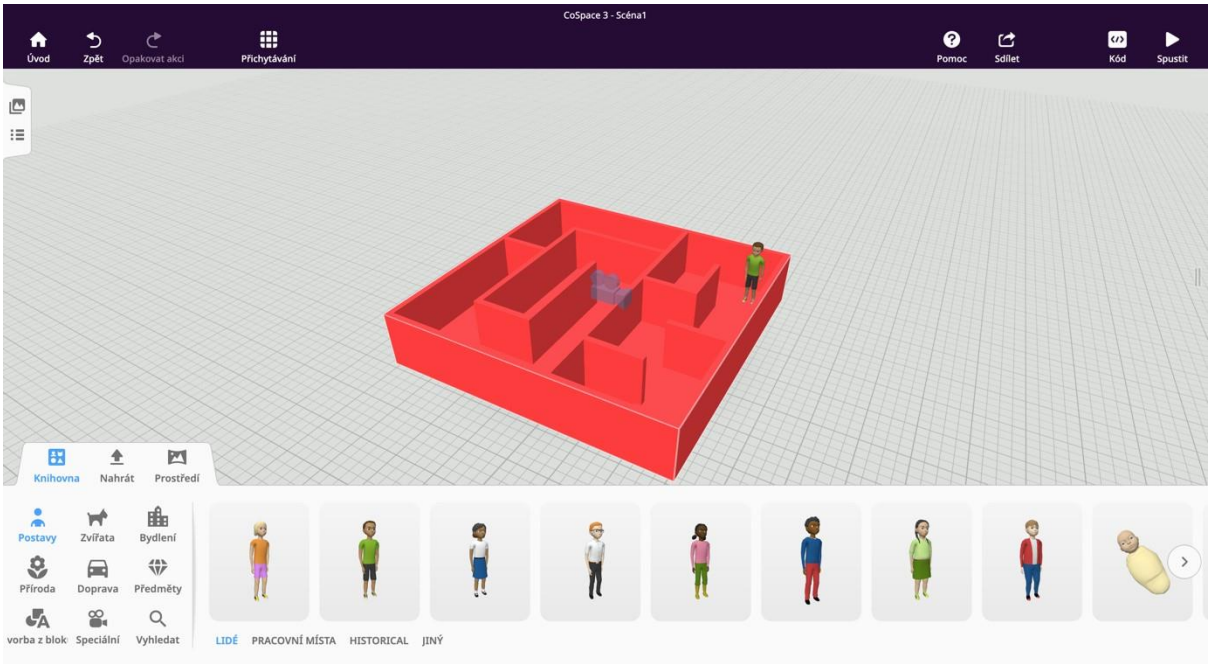
Lesson output:

The student can independently create a 3D object in a simple CAD program. Learner can save the 3D model n the correct format and work with it in CoSpace Edu. Students have no problem with the advanced CoBlocks programming.

Picture 16: Creting 3D obejct in Tinkercad



Picture 15 : Inserting 3D object into CoSpaces Edu



7) Creation of buildings in your virtual world

Plan of the lecture: https://edu.cospaces.io/XWC-EYK
Educational level: primary school
Subject: technical education, ICT, modern technologies, house design, design
Format: individually / in the group **Duration**: 120 minutes

Main points:

- usage of building blocks in CoSpaces Edu,
- creation of virtual world in a group,
- project thinking,
- development of creativity.

Introduction and lesson objectives:

Students will create their own virtual world by using the work blocks. The output should be their own house, subsuming basic equipment.

Tools:

- mobile phones/tablets,
- virtual glasses (headset) Oculus Quest II,
- computers,
- internet,
- paper script,
- writting utensil.

Instructions for teachers:

1. At the beginnig of the lesson, the teacher introduces the objectives of the lesson. Point out the possibility of creating building or other structures from building blocks in CoSpace Edu.
2. Teacher will show basic methods (procedures) how to create blocks efficiently.
3. In the introduction, teacher mentions the use of 3D objects in the library.
4. Teacher proposes that the learners build entire city together, in which individuals will have their own housing. The city will be created by combining particular houses.
5. All the while is teacher available for students.
6. Teacher encourages the learners to work in groups and leaves the division up to them, but supervising the activity of all participants.
7. The theme of building a house can be combined with eco-living and included in the theme of sustainability and the use of renewable energy sources.

Lesson output:

The student is able to design and build his own house or other building and insert basic equipment. The learner is able to work independently on a PC in CoSpaces Edu using more advanced features to produce a high quality output in the form of a building.

Picture 17: Demonstration of the creation from building blocks in CoSpaces Edu

8) Creation of an advanced tour – the end of the course

Educational level: primary school
Subject: technical education, ICT, modern technologies
Format: individually / in the group
Duration: 120 minutes

Main points:

- Connecting all the acquired knowledge and skills in the field of 3D technology and virtual reality.
- Creating a summary tour that highlights all the issues already discussed.
- Finally, virtual reality gaming.

Introduction and lesson objectives:

The goal is to create a tour that summarizes the content of the entire course. The tour should show what the learner takes away from the course. The main idea of this lesson is to create a timeline after each session and recall the content. However, the concept of the assignment for this lesson is entirely up to the pupils and it is up to them what form of tour they choose

The form of the tour can be any, but it must meet the following parameters:

a. Created in CoSPaces Edu,
b. Must include all topics from the course,
c. At least 20 programming steps must be used in CoBlocks.

Tools:

- mobile phones/tablets,
- virtual glasses (headset) Oculus Quest II,
- computers,
- internet,
- paper script,
- writting utensil.

Instructions for teachers:

1. At the beginnig of the lesson, the teacher sets a simple task. *"Create a tour that summarizes the entire course."*
2. After the assignment, it leaves all the work to the students and only intervenes when the students are inactive or not engaged in creating the tour.
3. Students will have 45 minutes to complete the tour.
4. Students can work independently or in groups. It is up to them which form they choose.
5. The final part of the class will include presentations of individual tours.
6. There will also be a full evaluation of the course and the knowledge that participants take away from the course.

Lesson output:

The output should be a comprehensive tour that summarises all the knowledge and skills acquired.

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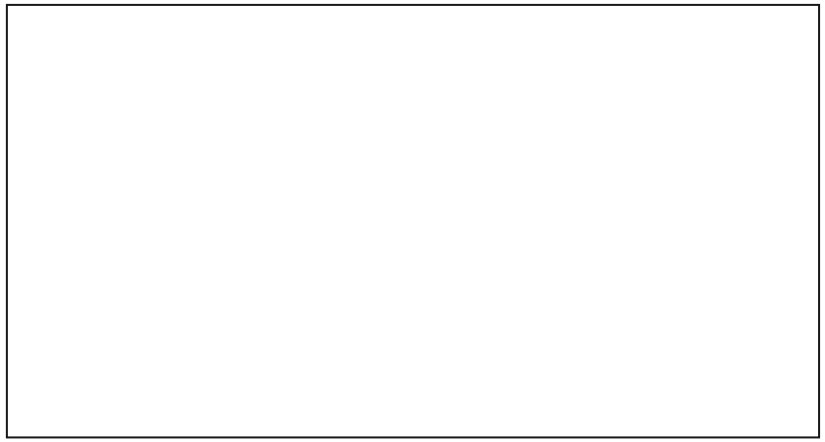

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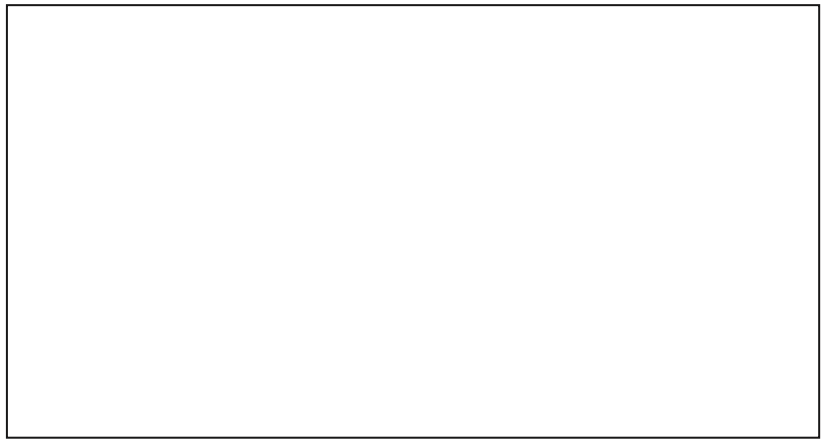

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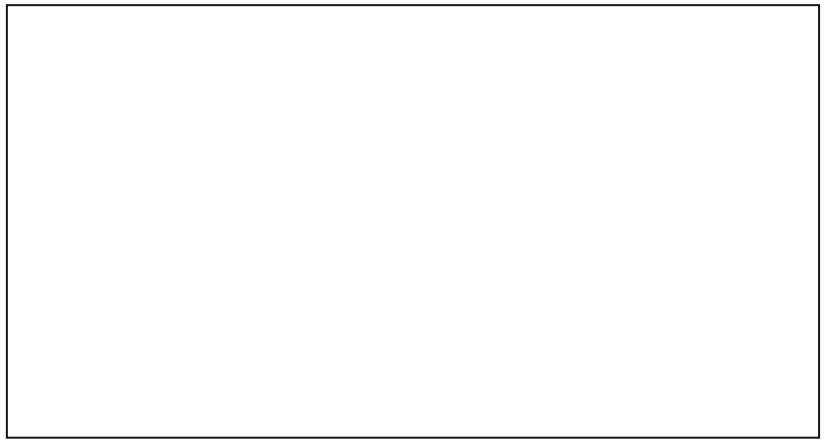

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