GLAT - Learning scenarios

Holenko Dlab, Martina; Hoić-Božić, Nataša

Educational content / Obrazovni sadržaj

Publication status / Verzija rada: **Accepted version / Završna verzija rukopisa prihvaćena za objavljivanje (postprint)**

Publication year / Godina izdavanja: **2019**

Permanent link / Trajna poveznica: https://urn.nsk.hr/urn:nbn:hr:195:345721

Rights / Prava: Attribution-ShareAlike 4.0 International/Imenovanje-Dijeli pod istim uvjetima 4.0 međunarodna

Download date / Datum preuzimanja: **2024-12-27**

Sveučilište u Rijeci
Fakultet informatike i digitalnih tehnologija

Repository / Repozitorij:

Repository of the University of Rijeka, Faculty of Informatics and Digital Technologies - INFORI Repository

DIGITALNA KNJIŽNICA

DIGITALNI AKADEMSKI ARHIVI I REPOZITORIJI

Games for Learning Algorithmic Thinking

Learning Scenarios

Co-funded by the
Erasmus+ Programme
of the European Union

Group of Authors

Primary school junior grade teachers – participants of GLAT education

Mentoring of Learning Scenarios Development
For the *University of Rijeka, Faculty of Teacher Education*
Jasminka Mezak, Petra Pejić Papak

For the *Tallinn University, Centre for Educational Technology*
Mart Laanpere, James Sunney Quaicoe, Viktoria Humal

For the *Ss. Cyril and Methodius University in Skopje, Faculty of Computer Science and Engineering*
Ana Madevska Bogdanova, Katerina Zdravkova, Vladimir Trajkovik

For the *University of Ljubljana, Faculty of Education*
Jože Rugelj, Irena Nančovska Šerbec, Mateja Bevčič, Anja Luštek

For the *South-West University „Neofit Rilski", Faculty of Mathematics and Natural Sciences*
Daniela Tuparova, Kostadin Samardziev, Ivanichka Nestorova

Editors
Nataša Hoić-Božić (*University of Rijeka, Department of Informatics*)
Jasminka Mezak (*University of Rijeka, Faculty of Teacher Education*)
Martina Holenko Dlab (*University of Rijeka, Department of Informatics*)

English Language Proofreading
Lucia Načinović Prskalo (*University of Rijeka, Department of Informatics*)

Graphic Design and Digital Processing
Martina Holenko Dlab (*University of Rijeka, Department of Informatics*)

Contact
glat@inf.uniri.hr

Licence
This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.

Attribution should be given in the following way:
GLAT project, https://ec.europa.eu/programmes/erasmus-plus/projects/eplus-project-details/#project/2017-1-HR01-KA201-035362

Disclaimer
The sole responsibility for the content of this document lies with the authors. It does not necessarily reflect the opinion of the European Union.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Preface

The *Learning Scenarios* publication is one of the results of the project GLAT and includes materials prepared by the primary school junior grade teachers as part of the GLAT education. The aim of the education is to train teachers for developing algorithmic thinking among their students as preparation for later programming learning.

Learning scenarios are documents in which the teacher demonstrates how to carry out teaching activities in an innovative way, using modern pedagogical methods and appropriate digital content and tools. The main elements that any learning scenario should have are the description of activities, learning outcomes that will be realized with described activities, teaching methods and strategies and digital tools for achieving the learning outcomes. Learning scenario should be designed to motivate students, to bring them closer to the content and to link the content of a teaching subject to everyday life situations. Learning scenarios can be applied to each school subject as a part or whole lesson or more lessons.

When designing learning scenarios, in addition to the learning outcomes related to particular school subjects, the outcomes related to the development of algorithmic thinking should also be defined. While realizing those outcomes using appropriate methods and activities, the student is placed in the centre of the learning process and encouraged to research, think, conclude, and act.

The participants of GLAT education had to prepare a learning scenario after each of the three workshops: *Workshop 1: Game-Based Learning (GBL) and Unplugged Activities*, *Workshop 2: Problem Learning (PBL), Online Quizzes and Logic Tasks*, and *Workshop 3: Games and Tools for Programming*, in written form and graphic form using the LePlanner tool and apply it in the class with the students. Teachers were able to choose any subject and any topic within the subject for their class (from 1st through 4th grade).

Teachers started to work on the scenario during the workshops where they prepared the first versions. This was followed by a period of online mentoring by experts from the GLAT project team. The final versions of learning scenarios, modified according to the mentors' comments, were applied by the teachers in the classroom with their students.

In total, 62 learning scenarios were developed for primary school subjects: Croatian language, Mathematics, Science, Music culture, Fine arts, Physical and health education, and several are intended for integrated teaching. The scenarios are accompanied by additional materials, such as links to online content or worksheets for unplugged activities. Particularly interesting are the scenarios created in the *Workshop 3* with Scratch digital games and stories included, designed by the teachers in collaboration with their students. For those learning scenarios, game/story scripts are included as additional materials. Games that allow students to practice math or learn about healthy eating, seasons, cultural and historical monuments and many other topics are available at the GLAT Scratch studio.

All GLAT scenarios are, as examples of good practice, integral part of training materials prepared for the GLAT education, but can also be used independently as a stand-alone materials and ideas for teachers who would like to modernize their teaching. Part of the learning scenarios is also translated into English and presented in this publication.

Editors

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

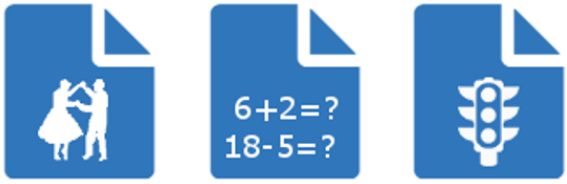
Contents:

Workshop 1: GBL and Unplugged Activities 5
Rhythmic and dance structures 6
Playing and revising about the traffic 13
Addition and subtraction to 20 23
Workshop 2: PBL, Online Quizzes and Logical Tasks 34
Addition to 5 35
Months of the year 40
Spatial orientation 45
Workshop 3: Games and Tools for Programming 48
Nutrition 49
The fruits of the seasons 54
Playing and calculating up to 20 62

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Workshop 1:
GBL and Unplugged Activities



The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 1: GBL and unplugged activities

Mate Verović

Learning Scenario Title	Rhythmic and dance structures / Folk dance selected from the native region
Course/ Grade	Physical Education 4th grade of primary school
Learning Outcomes	**Learning outcomes focused on general subjects:** • Develop nerve-muscular motion control with an emphasis on the development of coordination, flexibility and rhythm • Dance homeland folk dance „Crikvenički tanac“ • Identify the cultural heritage of their homeland **Learning outcomes focused on algorithmic thinking:** • Realize the repetitive parts of the dance • Link the melodic parts of a tune with specified parts of the dance • Convert the structural parts of the dance into a sequence of commands • Display the dance structures in the proper order using coded labels
Aim, Tasks and Short Description of Activities	Learn a few dance structures of Crikvenica's traditional dance by watching a YouTube video and using algorithmic thinking. Students will first listen to the music background by analysing melody and rhythm of the tune. Then the parts of the song will be labelled with the agreed marks. The following step is learning of the dance structures and finally labelling the entire dance performance with the agreed marks in a way that each dance structure is connected with the corresponding part of the music background. If there is time left, the students will create a new dance with different order of dance structures for the same music background with the help of coded characters. Students will be introduced to the term algorithm/loop as a series of commands that repeat a particular number of times.
Keywords	Loop, dance structure, repeat, rhythm, algorithm, command, folk dance
Correlation and Interdisciplinarity	Physical Education, Music, Informatics
Duration of Activities	60 minutes
Learning and Teaching Strategy and Methods	Active learning method, collaborative learning, problem solving, using dialog, watching and demonstration methods, solving worksheet, practical work, dance, dramatization
Teaching Forms	Frontal teaching Work in pairs Group work
Tools	-

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Resources/materials for the Teacher	Youtube, Canva, photos of the dance, ingredients and tools for preparing a sandwich	
Resources/materials for the Students	A4 paper sheet for introductory part, worksheets, felt pen, pencil	
Teaching summary	**Motivation-Introduction** The teacher demonstrates an already prepared sandwich, which consists of a bun in which the ingredients have been put according to the following order: a layer of cucumbers, a layer of cheese, a layer of ham, a layer of cheese, and a layer of tomatoes. The students are divided into four groups consisting of four members. Each group has to design an order of commands within 5 minutes so that the teacher/robot can make a sandwich identical to the demonstrated one (unsliced bun, cheese, ham, vegetables in one piece, which will require certain pre-activities in order to prepare the sandwich). Each group writes down a set of commands and one student from the group reads aloud the order of commands. The teacher/robot carries out the commands through dramatization, which leads to a more or less successful goal. The winner is the group that creates the most precise set of commands for making a sandwich. After the successfully competed task students are introduced to the term „algorithm“ as a series of commands leading to the solution. The students discover the meaning of the word „algorithm“ on a concrete example. They notice an organised conduction of a series of commands in order to achieve the goal. Moreover, they realise that some commands are repeated (cheese) – the term „loop“.	Duration 15 min
	Implementation A lesson of the dance structures of the traditional dance „Crikvenički tanac“ is announced. The students first listen to the music background of the dance from Youtube (0.08 – 2.30). They notice rhythmical-melodic recurring patterns (loops), and also the oscillation in the tempo. The first task is to recognize the pattern of the recurring change of the tempo. When the tempo is slower, the students have to slowly walk around the hall, and when the tempo quickens, the students jump. They notice that the two kinds of tempo are alternatively constantly repeated and are therefore labelled with the letter „B“ (quick part) and with the letter „P“ (a transition between the two quicker parts). With the repeated listening it can be noticed that each of the two tempos is repeated five times, usually one after the other starting with the „P“ part.	35 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	The students are divided into eight pairs followed by learning dance structures watching a video from Youtube. The teacher demonstrates and helps the students if needed. Students learn part by part of the dance in order as shown in the video. The dance consists of ten shorter parts, five quicker marked with the letter „B“ and five parts of a slower tempo marked with the letter „P“ during which six simpler dance structures alternate. The students immediately notice that some dance structures repeat. While rehearsing all six dance structures, they notice that three dance structures belong to the „P“ part, and three to the „B“ part. One pair of students demonstrates three dance structures from the „P“ part which are marked as „P1“, „P2“ and „P3“. The same is repeated with the „B“ part.	
	Reflection and evaluation The students work in existing pairs. Every pair gets worksheets, in which the labels of all six dance structures are stated and a small photo is put next to each structure as additional help in recognition. While watching the video from YouTube the students have to write down the exact order of dance structures/commands (algorithm) for the set dance. The students who conduct this activity faster get a task to create a new algorithm of commands with the existing labels („P1“, „P2“, „P3“, „B1“, „B2“, „B3“), for the same music background, and to demonstrate it through dance.	10 min
Annexes	Worksheet Photos of dance structures with labels	
Examples and game references	Video „Crikvenički tanci“ (0.08 – 2.30). Available online: https://www.youtube.com/watch?v=PPNbH1shbJI (30.7.2018) Photos of dance structures – https://www.google.hr/search?q=tradicijski+plesovi&hl=hr&source=lnms&tbm=isch&sa=X&ved=0ahUKEwjDn7G178TaAhXMDOwKHYzlApAQ_AUICigB&biw=1280&bih=650 (30.7.2018)	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

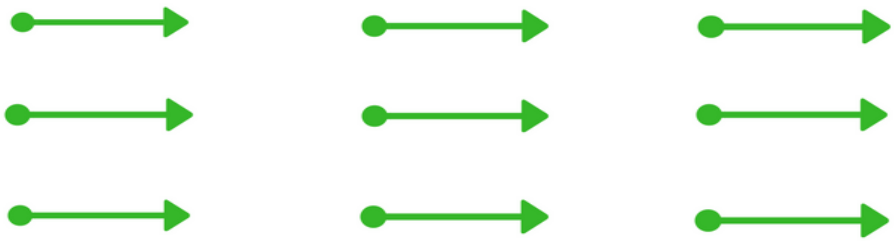
Co-funded by the Erasmus+ Programme of the European Union

Annex: Worksheet

„Crikvenički tanac“ dance

Task - Convert the structural parts of the dance into a sequence of commands using the given labels (P1, P2, P3, B1, B2, B3)

Algorithm – „Crikvenički tanac“ dance



The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Photos of dance structures with labels

FAST PART 1

B1

FAST PART 2

B2

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

FAST PART 3

B3

TRANSITION 1

P1

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

TRANSITION 2

P2

TRANSITION 3

P3

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 1: GBL and unplugged activities

Sonita Penavin

Learning Scenario Title	Playing and revising about the traffic
Course/Grade	Science, Homeroom class (topic "Personal and social development") 2nd grade of primary school
Learning Outcomes	**Learning outcomes focused on general subjects:** • Notice traffic signs for pedestrians • Distinguish, name and compare bus station, train station, airport and shipping port • Describe the importance of traffic connections in the homeland • Name the professions related to the traffic and means of transport • Connect knowledge about traffic signs, means of transport and behavior in traffic into a logical unit • Apply knowledge in everyday life situations • Review own traffic culture **Learning outcomes focused on algorithmic thinking:** • Use the if command • Find different, but the shortest solutions for achieving a certain goal (the shortest path in the game)
Aim, Tasks and Short Description of Activities	By playing the game according to the rules, students revise subject matter about traffic, means of transportation and traffic signs within the Science course. In the homeroom class, students learn about the decision concept, how to make a decision and about its consequences. In the game TRAFFIC, students will practice the application of the decision making model on examples by rolling a die, answering the questions, making decisions and accepting the responsibility. - - - - Students will use the if command to revise the subject matter, play the game according to the rules - answer all the questions and reach the goal as fast as possible.
Keywords	- means of transportation (train, bus, airplane and ship), traffic signs - decision, consequence, choice – – – - algorithm, command, a condition for making the decision, if command
Correlation and Interdisciplinarity	Mathematics, Homeroom class, Informatics
Duration of Activities	90 minutes

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning and Teaching Strategy and Methods	Game Based Learning Dialogical method Demonstration method Problem solving method	
Teaching Forms	Frontal teaching Individual work Group work (5 students)	
Tools	-	
Resources/materials for the Teacher	Sketchpad, Canva, Microsoft Word for preparing materials	
Resources/materials for the Students	Game rules, question cards, score table and game board. Die Pawns Pen (for game leader)	
Teaching summary	**Motivation-Introduction** Introductory conversation of the teacher and students about their way of arrival to and departure from school. The conversation include questions like: Do they come on foot, by car, by bus? What traffic signs do they see on the road? Do they always use the same route? Is there another way to go to school? Is a particular route longer or shorter? ...). Based on discussion about longer or shorter routes, we repeat the model of decision making and its consequences (the decision is what we have chosen). *Examples:* *If I use the long way I have to wake up early, otherwise, I can sleep longer.* *If it rains, will I wear rubber boots, or clothes sneakers? (WHY? - So that my legs don't get wet and I don't get cold).* – – – Repeat the concept DECISION -if-then-else (In everyday life we also make decisions. For example: **If** I get a good grade, **then** I can play games longer, or **else** I have to learn more.)	Duration 20 min
	Implementation **1st activity:** The teacher divides the students into groups of 5 students (4 players and game leader). Benches are moved and connected so that the students can sit in groups. With the help of two students, teacher demonstrates the rules and then distributes the working materials (question cards, score tables, dice and pawns). **2nd activity:** Playing the games (in groups of 5 students)	50 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

At the beginning of the game, each student roles a die. The student with the highest number becomes the game leader. The leader gets a paper where she/he writes the players' names and keeps the scores. During the game, she/he is in charge for reading the questions from the cards. She/he also writes "C" for every correct answer or "I" for every incorrect answer as well as how many times the player stopped on one of the numbered fields (by putting the mark X for each stopping).

The aim is to reach the end of the path on the game board by stepping on as few fields as possible.

The player who rolled the smallest number starts the game. The player sitting on her/his right side plays next. The game starting point is the picture of a traffic light ( ). Players move their pawns forward along the path by the number of fields indicated on the die. If the pawn ends on a field occupied by an opponent's pawn, the opponent's pawn is returned two fields backwards.

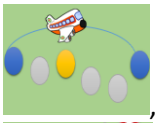
Explanations of specific fields:

or - Upon arrival in the fields with these traffic signs, the player has to roll an even number to continue the game. Otherwise, she/he pauses a round.

- By coming to this field, the player takes one of the question cards and answers the question. If she/he answers correctly, she/he can roll the die and move forward according to the number indicated on the die. If her/his answer is incorrect, she/he needs to remain in that field until the next roll.

or - Upon arrival in the fields with these traffic signs, the player moves her/his pawn backwards for the number of fields that represents the smallest multiplier of the number indicated on the die.

or - By coming to the fields with these traffic signs, the player can move forward for two fields, if she/he explains exactly their meaning. Otherwise, she/he remains in that field until the next roll.

 or - Upon arrival in these fields, the player has to decide whether to use a shortcut to reduce the number of

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	fields that he will step on or resume the game without using the shortcut. If the player decides to use the shortcut, he needs to take two cards and answer the questions correctly. Otherwise, he needs to take the longer path. A game winner is the one who has the most correct answers and first reaches the end of the path.	
	Reflection and evaluation Discuss with the students about the game using the following questions: How did you like it? Was it interesting, difficult, tense, ...? Do you have any new suggestions/ideas for the game? Do you like this method of subject matter revision? . . . What were the consequences of your decisions? Would you make different decisions and why? How did you like this group work? Did everyone respect given rules? Did you respect each other's opinions? . . . – – – Repeat the meaning of the concept DECISION Give few examples from everyday life (**If** I write my homework **then** I can play. **If** it rains **then** I have to wear an umbrella or **else** I'll get wet.)	20 min
Annexes	Game rules, question cards, score table and game board.	
Examples and game references	Proprietary game - TRAFFIC	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Game rules

Game rules

Three to seven players may play. Each player has one token.

The aim of the game is to revise the lessons about traffic from the subject of *Science* and to explain the concept DECISION.

At the beginning of the game, each student roles a die.

The student with the highest number becomes the game leader. The leader gets a paper where she/he writes the players' names and keeps the scores. During the game, she/he is in charge for reading the questions from the cards. She/he also writes "C" for every correct answer or "I" for every incorrect answer as well as how many times the player stopped on one of the numbered fields (by putting the mark X for each stopping).

The aim is to reach the end of the path on the game board by stepping on as few fields as possible.

The player who rolled the smallest number starts the game. The player sitting on his right side plays next.

The game starting point is the picture of a traffic light ( ).

Players move their pawns forward along the path by the number of fields indicated on the die. If the pawn ends on a field occupied by an opponent's pawn, the opponent's pawn is returned two fields backwards.

Explanations of specific fields:

or - Upon arrival in the fields with these traffic signs, the player has to roll an even number to continue the game. Otherwise, she/he pauses a round.

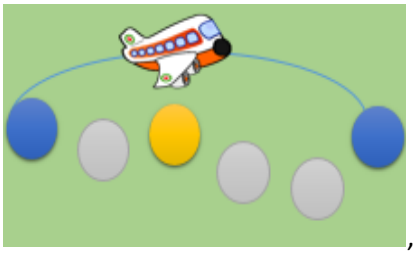
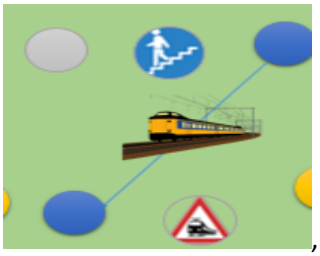
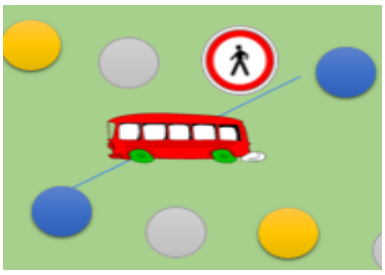
- By coming to this field, the player takes one of the question cards and answers the question. If she/he answers correctly, she/he can roll the die and move forward according to the number indicated on the die. If her/his answer is incorrect, she/he needs to remain in that field until the next roll.

or - Upon arrival in the fields with these traffic signs, the player moves her/his pawn backwards for the number of fields that represents the smallest multiplier of the number indicated on the die.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

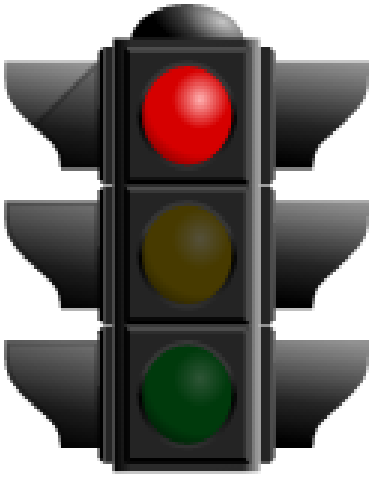
Co-funded by the Erasmus+ Programme of the European Union

or - By coming to the fields with these traffic signs, the player can move forward for two fields, if she/he explains exactly their meaning. Otherwise, she/he remains in that field until the next roll.

 , ,  ,
 or -

Upon arrival in these fields, the player has to decide whether to use a shortcut to reduce the number of fields that he will step on or resume the game without using the shortcut. If the player decides to use the shortcut, he needs to take two cards and answer the questions correctly. Otherwise, he needs to take the longer path.

A game winner is the one who has the most correct answers and first reaches the end of the path.



The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Question cards

What are the possible shapes of traffic signs?	Explain the difference between traffic lights for drivers and pedestrians.	What do the trains run on?
Which is the fastest vehicle?	What is the purpose of helmet and protectors while you are riding a bicycle?	Name three vehicles that drive on the road.
What do you call the place where we enter the train and come out of it?	How do you call the person who travels?	How do you call the person who drives a train?
What traffic signs did you notice next to your school?	Where will you check the time of departure and arrival of the bus?	What do we need to buy in order to travel?
What do traffic signs tell us?	Why do we need to know the meaning of the traffic signs?	Who checks the tickets on the bus?
Where can we check the time of departure and arrival of the bus at the bus station?	Does the railroad pass through your town?	Describe the difference between traveling by plane and traveling by car.

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Can you travel from your town by plane?	Which types of ships do you distinguish?	Specify rules of polite behavior when traveling by boat.
How should we behave when traveling by bus?	Compare the passenger and freight train. Explain the difference.	Where are the passengers waiting for the departure or arrival of the train?
Who checks the tickets and takes care of passengers during the journey?	When can passengers get into the plane?	Describe the process of passenger and luggage control at the airport?
What is your role in traffic?	Which traffic signs do you need to respect?	What do you call a place where ships dock?
Where do we buy tickets?	Who flies a plane?	Ships are sailing: a) in the air b) on the water c) on the road

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Score table

Score table

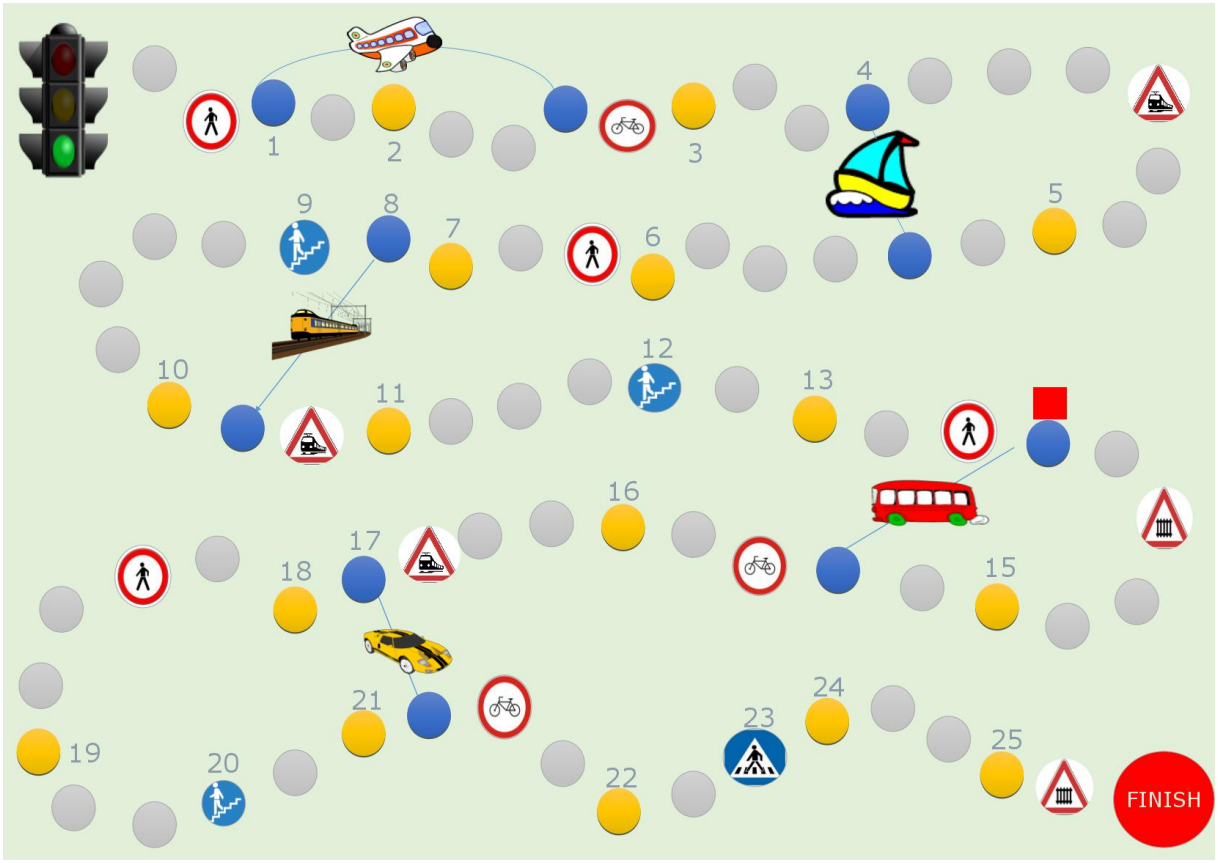
- The game leader should enter C or I for each answer and mark X for each stopping on numbered fields.

Player's name		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.
	Answer: C / I																									
	Stoppings: X																									
	Answer: C / I																									
	Stoppings: X																									
	Answer: C / I																									
	Stoppings: X																									
	Answer: C / I																									
	Stoppings: X																									
	Answer: C / I																									
	Stoppings: X																									

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Game board



The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 1: GBL and unplugged activities

Ana Cvitak

Learning Scenario Title	Addition and subtraction to 20 (repetition)
Course/Grade	Mathematics 1st grade of primary school
Learning Outcomes	**Learning outcomes focused on general subject:** • Demonstrate the procedure of adding numbers to 20 • Demonstrate the procedure of subtracting numbers to 20 • Developing speed in addition and subtraction • Compare and distinguish between correct and incorrect results **Learning outcomes focused on algorithmic thinking:** • Accept established, common rules of the game • Specify the steps for moving left-right, up-down • Explain the "algorithm" • Describe and give solutions for achieving a certain goal
Aim, Tasks and Short Description of Activities	In the Mathematics class, the students will repeat and practice the addition and subtraction to 20 by playing the game "Math memory", solving the maze worksheet, and playing bingo. By playing games with chosen rules, the students repeat the lessons from Mathematics (addition and subtraction to 20). Students will get acquainted with the concept of algorithm as a sequence of commands/rules that need to be performed to achieve the goals.
Keywords	Addition and subtraction to 20, left-right, up-down, algorithm, command
Correlation and Interdisciplinarity	Science (Orientation in space)
Duration of Activities	45 minutes
Learning and Teaching Strategy and Methods	Game Based Learning - game Dialogical method Demonstration method Problem solving method
Teaching Forms	Frontal teaching Pair work Individual work Group work (all students)
Tools	-

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Resources/materials for the Teacher	Canva, Microsoft Word for preparing materials	
Resources/materials for the Students	Maze, bingo cardboards, Math memory game, colored pencils	
Teaching summary	**Motivation-Introduction** Introductory conversation between teacher and students about Memory game and its rules, followed by giving the Math memory game cards to students. Students play the game in pairs. Teacher stresses out the importance of following the rules of the games. Teacher introduces the concept of "algorithm" and explains that it represents a sequence of commands or rules that need to be performed to achieve the task.	Duration 10 min
	Implementation **1st activity:** Solving the maze worksheet (individual work) The student's task is to help the boy find the right way to the ice cream. He/she has to paint the correct fields with a yellow pencil, and if he/she makes a mistake, he/she must return and start from the beginning. It is necessary to reach the goal as fast as possible in order to prevent ice cream melting. After all students finish the game, we check all together the exact path, this time using the terms left-right, up-down. **2nd activity:** Bingo (group work) Each student receives a cardboard with numbers. The teacher draws the paper with the task out of the bag (e.g. 12-6, the correct answer is 6). If the student has number 6 on the cardboard, it has to be colored in red. If there are more than one numbers 6 on the cardboard, only one number can be colored. The winner is the student who first colors all the fields.	25 min
	Reflection and evaluation Discuss with the students about the game and its rules and repeat the meaning of the term algorithm. Students are encouraged to imagine a task that can be represented by the algorithm and we come to the conclusion that the algorithms are all around us, even crossing of the road itself represents an algorithm. They all list common rules for crossing the road.	10 min
Annexes	Maze, Math memory game, bingo cardboards, bingo tasks	
Examples and game references	Proprietary memory, maze, and bingo games	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Maze

CILJ	19	3+16	3	17-14	17				
		16			10+7			18	
		7+12	19	19-10	10	19-9	19	3+16	
19		7				19		3	
7+11	8	16-9	16	6+10		18+2	18	12-9	
7		16		6		18		12	
19-12	19	14+2		18-12		11+7	7	18-6	
		14		18		11		18	
	13	19-3	19	14+3	17	17-12	5	5+13	8
				START					

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Math memory game

2	6	10	10-2
1+1	8	9+1	5-5
5	2+3	0	3+3

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Bingo cardboards

10		4			
6	5	17	18	13	6
			19		

10					
12	6	12	3	9	16
		5		17	

6	19				
	14	14	3	10	4
			5		18

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

12		1			
6	5	17	15	13	2
			19		

2					
5	6	7	3	1	16
		5		17	

2	19				
	14	1	3	10	11
			5		18

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

11		4			
2	5	17	18	1	6
			19		

2					
12	1	12	3	11	16
		5		17	

15	19				
	1	14	2	10	4
			5		18

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

10		4			
6	1	17	18	13	6
			19		

11					
12	6	12	3	9	16
		5		17	

6	19				
	14	14	3	11	4
			5		18

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

10		4			
1	5	17	18	2	6
			19		

10					
12	1	12	3	11	16
		5		17	

11	19				
	14	14	3	2	4
			5		18

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

11		4			
6	5	17	18	2	6
			19		

10					
12	6	12	3	9	16
		5		17	

6	19				
	14	14	3	10	4
			5		18

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Bingo tasks

17-10	13+4	17-8
16-10	17+2	17-11
13-7	11+8	8+4
12-6	7+12	5+7
11-5	9+7	8+6
19-16	16+3	7+7
18-13	13+6	19-7
19-14	8+10	19-3
17-13	14+4	8+5
20-10	16+1	9+9

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Workshop 2: PBL, Online Quizzes and Logical Tasks

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 2: PBL, online quizzes and logical tasks

Bojana Lanča

Learning Scenario Title	Addition to 5
Course/Grade	Mathematics 1st grade of primary school
Learning Outcomes	**General learning outcomes:** • Specify numbers 1 to 5 independently • Connect number and number words • Analyse and describe the image examples • Adopt a notation for the addition • Develop the abilities to compare, differentiate and conclude • Add up numbers to 5 **Specific learning outcomes oriented on algorithmic thinking:** • Search, find and extract relevant information • Distinguish elements by attributes • Compare and classify the numbers we add
Aim, Tasks and Short Description of Activities	AIM: learn to add up the numbers to 5 TASKS: • Cognitive: learn the meaning of the sign +; adopt a notation for adding numbers; understand the concept of arithmetic operation; understand the concept of adding numbers. • Psychomotor: write addition operations using mathematical signs; develop the ability to apply the acquired knowledge. • Affective: develop the capacity for independent work, accuracy, consistency and precision; develop and stimulate curiosity. SHORT DESCRIPTION OF ACTIVITIES: Repeat numbers up to 5 and compare them through short Learning Apps computer games. Using the Kahoot! quiz recognize the exact mathematical notation of tasks given in the mathematical story. Add and subtract numbers up to 5 through the short Learning Apps computer games. Explore the ways in which we can sum up multiple numbers in a way that the sum is equal to 5 (problem solving). Test the knowledge with the interactive Wizer worksheet.
Keywords	Numbers 1, 2, 3, 4, 5, addition, equality.
Correlation and Interdisciplinarity	Croatian language (Little Red Riding Hood), Science (Orientation in space).

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Duration of Activities	90 minutes	
Learning and Teaching Strategy and Methods	Dialogical method Demonstration method Method of writing Problem solving method Game Based Learning	
Teaching Forms	Frontal teaching Individual work Group work	
Tools	Kahoot! tools and Kahoot! quiz, Wizer, LearningApps.	
Resources/materials for the Teacher	Kahoot! tools, Wizer, LearningApps.	
Resources/materials for the Students	Kahoot! quiz, Wizer, LearningApps.	
Teaching summary	**IMPLEMENTATION OF ACTIVITIES** **1st activity: MOTIVATION - Two short computer games** Students will repeat numbers up to 5, count them and compare them. Example 1: Mathematical warming up (https://learningapps.org/display?v=p82852wi318) Example 2: Mathematical sequence (https://learningapps.org/display?v=p3k5fr3uk18) ANNOUNCEMENT OF OBJECTIVE: Announce that we will practice the addition of numbers to 5 **2nd activity: "Brainstorming!"** Using brainstorming method students give examples of using addition in everyday life. **3rd activity: "Kahoot!" Quiz** Through five questions from everyday life (supported by appropriate pictures) students need to find the correct numerical expression of mathematical word problems. QUESTION 1: There were three birds on the wire and two more landed on the wire. How many birds are now on the wire? a. 1 + 2 = 3 b. 2 +3 =4 c. 3 + 1 =4 d. 3 + 2 = 5 	Duration 10 min 7 min 15 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

QUESTION 2: There are three apples in the basket and one outside the basket. How many apples are there in total?

a. 1+ 3 = 5
b. 3 + 1 = 4
c. 2 + 1 = 3
d. 2 + 2 = 4

QUESTION 3: There is a pilot and three children in the plane. How many people are traveling by plane?

a. 2+ 2= 4
b. 3 +1 = 5
c. 4 +1 = 5
d. 1 + 3 = 4

QUESTION 4: Four cats are awake, and one is still sleeping. How many cats are there?

a. 4 + 1 = 5
b. 1 + 4 = 4
c. 2 + 3 = 5
d. 3 + 2 = 5

QUESTION 5: There are two pencils and two pens in the box. How many scribes are in the box?

a. 1 + 3 = 4
b. 4 +1 =5
c. 2 + 2 = 4
d. 3 + 1 = 4

4th activity „Let's add up to 5" — 20 min

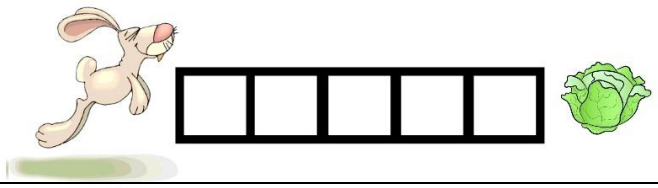
Using three games students practice the addition of numbers to 5.

Example 4: Color of the sum (https://learningapps.org/display?v=pj7trtsia18)
Example 5: Adding up to 5 (https://learningapps.org/display?v=pyopr4nyj18)
Example 6: Mathematical puzzle (https://learningapps.org/display?v=p4108eap318)

5th activity „Problem-based learning" — 20 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	The students work in groups to solve the following task: *Can we add various numbers to score 5? Explore.* *If YES, write down all possible solutions that you have found.* *If the answer is NO, explain why we cannot do this.* Students write down solutions on the paper. Representatives of the group present their solutions. The first group presents all the results. Other groups check whether they have found the same solutions. The other two groups present only solutions not presented by the firsts group of students and so on. The teacher checks the accuracy of the solutions and add additional solutions if necessary. The teacher declares the winners - the group that that found the most solutions. **6th activity "WIZER worksheet"** Students test their knowledge using Wizer worksheet. Example 7: https://app.wizer.me/learn/55YALZ **7th activity "A task that encourages algorithmic thinking"** The students should solve the following task: The rabbit wants the cabbage. The cabbage can be reached only by jumping two fields forward and one back. How many times a rabbit has to jump to reach the cabbage in the picture? 	10 min 8 min
Annexes	Learning scenario in LePlanner: https://beta.leplanner.net/#/scenario/5d728ae780a288cd3abb8783 Example 1 – Mathematical warming up: https://learningapps.org/display?v=p82852wi318 Example 2 – Mathematical sequence: https://learningapps.org/display?v=p3k5fr3uk18 Example 3 – Kahoot! Quiz: https://create.kahoot.it/details/zbrajanje-brojeva-do-5/9717c21c-8043-4f9e-879c-f8a1885f3bf2 Example 4 - Color of the sum: https://learningapps.org/display?v=pj7trtsia18 Example 5 – Adding up to 5: https://learningapps.org/display?v=pyopr4nyj18	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	Example 6 – Mathematical puzzle: https://learningapps.org/display?v=p4108eap318 Example 7 - Worksheet: https://app.wizer.me/learn/55YALZ
Examples and game references	Kahoot! https://kahoot.com/ (15.12.2018.) Learning Apps https://learningapps.org/(15.12.2018.) Wizer: https://app.wizer.me/ (15.12.2018.)

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 2: PBL, online quizzes and logical tasks

Melita Stambulić

Learning Scenario Title	Months of the year
Course/Grade	Science 2nd grade of primary school
Learning Outcomes	**General learning outcomes:** • Name months of the year • Determinate the order of months of the year • Explore the specific characteristics of each month of the year **Specific learning outcomes oriented on algorithmic thinking:** • Distinguish elements by attributes • Search, find and connect the month with its characteristic • Compare and classify months of the year
Aim, Tasks and Short Description of Activities	Aim is to revise and systematize the knowledge about the months of the year and to learn the importance of the months in everyday life. Students will revise the main concepts about months of the year by using quiz, memory game and word association game on computer. Problem-based learning will be used for exploring the specific characteristics of each month of the year (group work on a computer).
Keywords	Month, year, date
Correlation and Interdisciplinarity	Mathematics: numbers up to 100; roman numbers up to 100; ordinal numbers. Art class Science: seasons Informatics
Duration of Activities	45 minutes
Learning and Teaching Strategy and Methods	Game Based Learning Dialogical method Problem solving method Method of reading and working with text Method of writing
Teaching Forms	Frontal teaching Individual work Working in pairs Group work
Tools	Kahoot! tools and Kahoot! quiz, Match the Memory, Microsoft PowerPoint, Internet browser

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Resources/materials for the Teacher	Kahoot! tools, Match the Memory, Microsoft PowerPoint	
Resources/materials for the Students	Kahoot quiz, Match the Memory, Microsoft PowerPoint (association game), Internet browser	
Teaching Summary	**1. Motivation – introduction to the activity** **Talk about months of the year:** students choose favorite month of the year and argue their choice, mention what they know about this month (the reason for the name, to which season it belongs, holiday or event in that month) **Motivational game - association game** (playing in groups of three students)	Duration 10 min
	2. Main part of the activity Discussion for reviewing: year-month-number of days, names of months in the year, number of days in the month Revising and systematizing the knowledge about the months of the year. a) **Kahoot! quiz** QUESTION 1: We call the first month of the year: a. December b. March c. January d. August QUESTION 2: February has: a. 30 days b. 31 days c. 28 days d. 28 or 29 days QUESTION 3: The month in which autumn starts is: a. September b. October c. November d. December QUESTION 4: We celebrate the New Year in: a. December b. February c. November d. January QUESTION 5: The school year starts in: a. July	25 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	b. April c. September d. June QUESTION 6: The year ends in: a. January b. August c. October d. December b) **Memory game** (Match the Memory) – students play in pairs Match the month of the year with the date: January – 1.1. February – 28.2. March – 15.3. April – 20.4. May – 30.5. June – 25.6. July – 31.7. August – 15.8. September - 5.9. October - 8.10. November - 1.11. December - 31.12. c) **Problem based learning** Students are divided into groups of 3. Each group draws a paper with the name of one month of the year. The task is to enter the name into Internet search engine and to choose one of the pictures among the results. The students should explain their selection: why exactly this picture presents main characteristics of the month.	
	3. Reflection and evaluation Each student receives a "paper candle" on which has to write the date of his/her birthday. Students attach their candle to a picture of a large 12-layer cake. Layers are named according to the months of the year and a student attaches the candle to the layer with the name of the month in which he/she celebrates birthday. After attaching the candle, students are forming groups by month in which they celebrate birthday. The students repeat names of months in the year in correct order.	10 minutes

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	Discussion: In which month most/least students celebrate their birthday.	
Annexes	Learning scenario in LePlanner: https://beta.leplanner.net/#/scenario/5d72907980a288cd3abb87c1 Association game Kahoot! quiz: https://play.kahoot.it/#/k/d89977ac-f463-4a91-af3e-1eed202b0a09 Match the Memory game: https://matchthememory.com/mjeseciugodinimelita	
Examples and game references	Kahoot! https://kahoot.com/ (15.12.2018.) Match the memory https://matchthememory.com (15.12.2018.)	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Association game

A1	B1	C 1	D 1
A2	B2	C 2	D 2
A3	B3	C 3	D 3
A4	B4	C 4	D 4
COLUMN A	COLUMN B	COLUMN C	COLUMN D
FINAL SOLUTION			

CUTTING WOOD	SCHOOL STARTS	LINDEN BLOSSOMS	SPRING
WINTER BREAK	FIRST DAY OF AUTUMN	FIRST DAY OF SUMMER	EASTER
NEW YEAR'S DAY	PICKING APPLES, PLUMS	SCHOOL ENDS	FRUIT TREE BLOSSOMS
1ST MONTH	9TH MONTH	SUMMER BREAK	SPRING BREAK
JANUARY	SEPTEMBER	JUNE	APRIL
MONTHS OF THE YEAR			

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 2: PBL, online quizzes and logical tasks

Kristina Ujčić-Čučak

Learning Scenario Title	Spatial orientation
Course/ Grade	Science 3rd grade of primary school
Learning Outcomes	**General Learning Outcomes:** • Determine the cardinal and intermediate directions and know how to note them with abbreviations • Name the cardinal directions where sun rises and fall and therefore manage the orientation • Determine viewpoint and horizon, orientation by compass, sun or other signs on the ground • Manage the topographic map or town map • Distinguish the meaning of colour hues on the map **Specific Learning Outcomes oriented on Algorithmic Thinking:** • According to the adopted algorithm, create a map to find the hidden treasure
Aim, Tasks and Short Description of Activities	Aim: revise and systematize the processed teaching material (orientation in space) Tasks: a) Identify the viewpoint, the horizon, the plan, the map, to associate the image and the word, to write abbreviations of the cardinal and intermediate directions, to determine the cardinal points from the current position of the sun, to orient by the compass, to determine the meaning of colour on the map and to describe the relief, explain the legend on the map, manage the map and plan and find the hidden treasure, according to the algorithm create a treasure map. b) To practice spatial orientation, develop logical thinking, conclusion, memory c) To promote conscientiousness in work, to develop patience, persistence and tidiness in performing tasks, to develop Science. LIST OF ACTIVITIES 1. Memory game 2. Review with Kahoot 3. Spatial orientation – treasure map (group work) 4. Creating a map (work in pair) 5. Worksheet Wizer
Keywords	Cardinal and intermediate directions, viewpoint and horizon, town map, topographic map

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Correlation and Interdisciplinarity	Art class – colour hues	
Duration of Activities	90 minutes	
Learning and Teaching Strategy and Methods	Dialogical method Demonstration method Problem solving method Game Based learning	
Teaching Forms	Individual work, frontal teaching, work in pairs, group work	
Tools	Kahoot! tools and Kahoot! quiz, Wizer, Learning Apps, Match the memory	
Resources/materials for the Teacher	Kahoot! tools, Match the memory, Wizer, LearningApps for preparing quiz, memory game and interactive worksheets	
Resources/materials for the Students	Kahoot! quiz, Match the memory, Wizer, LearningApps for solving quiz, memory game and interactive worksheets on iPad	
Teaching Summary	**IMPLEMENTATION OF ACTIVITIES** **1. INTRODUCTORY PART** A game of Hangman (frontal work) Using the game, reach the keywords and topics of today's class (orientation). Repeat what it means to be oriented, ie. spatial orientation. **2. MAIN PART** **- Memory (individual work)** Visualize the basic concepts: viewpoint, horizon, map, plan. - **Kahoot quiz (individually solve the quiz, frontal analysis of tasks)** Revise the processed content. **- Spatial orientation (work in pairs)** Select the viewpoint. Determine the cardinal and intermediate directions on school playground using the Sun. Orient by the compass, follow the map with instructions, find the hidden treasure. Analysis and evaluation of activities. **- Making a treasure map (group work)**	5 min 5 min 15 min 20 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	According to the algorithm that followed, create a map that will lead the other group to the hidden object. **3. FINAL PART** **- Wizer worksheet** Solve worksheet for self-assessment. Set homework - determine the cardinal and intermediate directions in your bedroom / living room. Draw the map of that room.	30 min 10 min 5 min
Annexes	Learning scenario in LePlanner: https://beta.leplanner.net/#/scenario/5d7281a480a288cd3abb876e GAME OF HANGMAN https://learningapps.org/display?v=pxbx2d8o518 STAPLE https://matchthememory.com/orijentacijakika TREASURE HUNT https://learningapps.org/display?v=p05tz96fn18 Kahoot! https://create.kahoot.it/create#/edit/0196a25f-66c4-4973-8712-13bdcfeafdc6/done Wizer https://app.wizer.me/learn/OY2KVJ	
Examples and game references	Learning Apps https://learningapps.org (15.12.2018.) Match the memory https://matchthememory.com (15.12.2018.) Kahoot! https://create.kahoot.it (15.12.2018.) Wizer https://app.wizer.me (15.12.2018.)	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Workshop 3: Games and Tools for Programming

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 3: Games and tools for programming

Tašana Bobanović

Learning Scenario Title	Nutrition
Course/ Grade	Science 2nd grade of elementary school
Learning Outcomes	**General learning outcomes:** • List the foods important to our health • Name the daily meals • Explain the relationship of diverse and regular diet with health • Describe decent behaviour at the table • Use the cutlery properly **Specific learning outcomes oriented on algorithmic thinking:** • Identify and apply basic programming concepts when designing a game in Scratch (algorithm, sequence, condition, loop, variable) • Identify different as well as the shortest solution to achieve a specific goal and recognize • Solve simple logic tasks
Aim, Tasks and Short Description of Activities	Students will visit food market and observe groceries that can be bought there. Students will learn about food that should be regular in the diet, the names of the main meals, and how to behave at the table during the meal. They will design a computer game for identifying healthy foods.
Keywords	Nutrition, groceries, meals, game
Correlation and Interdisciplinarity	Croatian, Art, Informatics
Duration of Activities	5 school hours (5x45 minutes)
Learning and Teaching Strategy and Methods	Oral presentation Dialogical method Problem solving method Method of reading and working with text Method of writing Game Based Learning
Teaching Forms	Frontal teaching Individual work Group work
Tools	Internet browser, Scratch

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Resources/materials for the Teacher	Photos, chalk and board, textbook, Internet browser, Scratch	
Resources/materials for the Students	Prepared materials, notebook, textbook, Internet browser, Scratch	
Teaching Summary	Motivation-Introduction The teacher will show food drawings to the students. They will classify shown foods into two groups: foods that should be regular in the diet and foods that should be eaten moderately or avoided. The teacher will show the drawings in the particular order: three types of food that should be regular in the diet, and one that we should eat moderately or avoided. Students will have to determine by themselves why the teacher is showing the foods in this order.	Duration 15 min
	Implementation 1. A few days before the activity, the teacher and students will visit the town food market. Students will receive the research question: What can we do at the market? They will carefully look at all the part of the market, indoor and outdoor, and observe groceries that can be bought at the market. Students will keep their own notes to solve the following tasks: a) Observe the parts of the market and list them. b) List the groceries that can be purchased outdoors. c) List the groceries that can be purchased in the first pavilion. d) List the groceries that can be purchased in the second pavilion. e) List the groceries that can be purchased in the third pavilion. f) Draw the space of the market place. 2. After motivation, I will ask the students to remember what they saw at the town food market. Everything they remember will be written on a whiteboard. The areas of the market will be connected to the groceries. Student will use the textbook and with the help of teacher sort out the words related to proper nutrition. With these words students will construct sentences. For example: • Proper nutrition is important for health. • Proper nutrition should include a variety of foods. • Oily, salty and sweet foods should be eaten moderately. • Food is needed to grow and maintain health. Then, the main meals and how people should behave at the table will be discussed.	60 min 15 min 30 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	3. The teacher will guide students through the process of designing a digital story with game elements. First, the teacher will show several games created in Scratch: https://scratch.mit.edu/projects/281378543/ https://scratch.mit.edu/projects/281460031/ https://scratch.mit.edu/projects/281418234/ Then, the teacher will announce that the student will design a game with several logical mini-games. The student will choose the main character and the part of the market where the mini-games will be played. Students should also design the flow of the game and agree on the scoring method as well as the prize for the player who achieves the goal of the game.	60 min
	Reflection and evaluation After university students create the game in Scratch, the students will play and discuss whether they like the game.	45 min
Annexes	Learning scenario in LePlanner: https://beta.leplanner.net/#/scenario/5d71e0bd80a288cd3abb86ad Story/game scenario	
Examples and Game References	Developed Scratch game – Let's eat healthy!: https://scratch.mit.edu/projects/325739167/ (30.7.2019.) Scratch – A story about cleanliness and health: https://scratch.mit.edu/projects/281378543/ (30.7.2019.) Scratch game – Red clocks: https://scratch.mit.edu/projects/281460031/ (30.7.2019.) Scratch game – Live and inanimate nature: https://scratch.mit.edu/projects/281418234/ (30.7.2019.)	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Game/story scenario

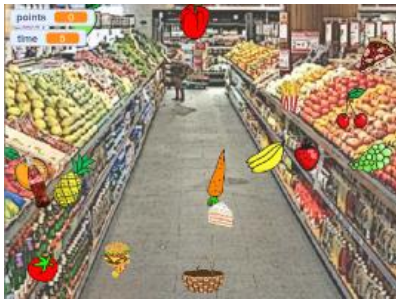
Title of the game	Let's eat healthy!
Type	Scratch story with game elements
Course/ Grade	Science 2nd grade of elementary school
Learning outcomes	• Get to know the groceries that are important to our health • Explain the relationship of diverse and regular diet with health • Play a simple game • Choose the right solution • Solve simple logic tasks • Recognize basic programming concepts
Goal of the game	The goal of the game is to follow the instructions. With the help of instructions, students will solve tasks and learn about healthy eating.
Characters and their roles	**Tašana** (main character) Tašana is a little girl who appears throughout the game. Tašana gives different instructions during the game. Based on these instructions, the student accomplishes tasks in order to adopt new content and reach the goal, the end of the game. **Grandma Sandra** (supporting character) Grandma is a character who appears in the game to give directions. Grandmother represents a worker at the market. Tašana arrives to her food stall to pick healthy groceries.
Description of the game flow	Pressing the *s* key starts the game. Tašana first calls a player (a student) to help her buy healthy foods. Tašana comes to the market where grandmother appears and gives directions for the first mini-game. The game is started by clicking the key *1*. The player should use left and right keys to move and collect 20 healthy groceries in the basket. The player has 30 seconds to collect groceries. If the player does not collect enough healthy groceries, the game starts over. The next game is started using the key *2*. The player should lead Tašana through the maze to find cereals. After successfully passing the maze, the girl goes home. On her way, she comes across a wall. To see the next task, the player should press key *3*. The task is to arrange the words of a phrase related to healthy diet in the correct order. The player should also write the name of the meal shown on the photo. If the player answers correctly, Tašana is ready for lunch. Key 4 starts the final mini-game where the player should set the table.
List of scenes / backgrounds	1. Home 2. Market (market1, market2, market3, market4, market5) 3. Street 4. Wall 5. Kitchen 6. Breakfast 7. Table (table1, table2)

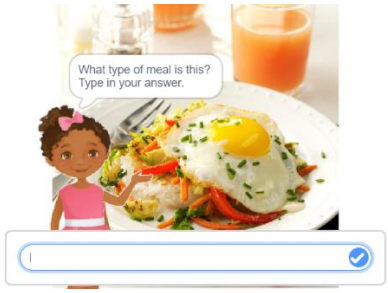
The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	8. Set the table 9. Final
Logical mini-games within the story	**1. Collect healthy groceries** The player moves left and right using the arrows on the keyboard to collect healthy groceries to the basket. The player should avoid unhealthy foods. **2. The maze** Using the arrows on the keyboard (up, down, left, right) the player moves through the maze and avoids obstacles and unhealthy foods to reach the cereals. **3. The wall** The player should arrange the words of a phrase *Healthy food – healthy life!* in the correct order. **4. Setting the table** There is a spoon, fork, knife and dessert spoon on the table. The player's task is to properly set the table for lunch.
End of the game	After the player completes all the tasks, the game ends. To play again, the player should press *s* key.

Screenshots from the game





The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 3: Games and tools for programming

Mate Verović

Learning Scenario Title	The fruits of the seasons
Course/Grade	Science 1st grade of primary school
Learning Outcomes	**General learning outcomes:** • Recognize the characteristics of particular seasons. • Explore the specifics of the seasons and seasonal fruits. • Design a game for repeating the aforementioned contents (distinguish the seasons by observation, describe the weather conditions of all seasons, associate appropriate clothes with specific seasons, identify and name seasonal fruits and vegetables according to seasons). **Specific Learning outcomes oriented to algorithmic thinking:** • Search, find, and extract relevant information. • Summarize and extract elements by attributes. • Compare and classify seasons and fruits. • Identify and apply basic programming concepts when designing a game in Scratch (algorithm, series of commands, condition, loop, variable).
Aim, Tasks and Short Description of Activities	Repeat and practice recognizing and distinguishing the characteristics of the seasons. Promote healthy eating habits. For each season, examine seasonal fruits specific to our climate. Create a thematic poster with fruits for each season. Participate in the design of a story (scenes, flow, logical tasks) that will encourage the identification of specific characteristics of each season. Play the game and evaluate the whole process.
Keywords	seasons, autumn, winter, spring, summer, characteristics, seasonal fruits, healthy eating, algorithm of commands, game
Correlation and Interdisciplinarity	Croatian Language, Art, Informatics, Mathematics
Duration of Activities	During May 2019 (230 min)
Learning and Teaching Strategy and Methods	Active learning method, collaborative learning, problem solving, dialog method, viewing method, demonstration method, research method of learning, computer games
Teaching Forms	Individual, frontal, group work, work in pairs

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

<table>
<tr><td>Tools</td><td colspan="2">Scratch, Internet browser</td></tr>
<tr><td>Resources/materials for teachers</td><td colspan="2">Scratch, Internet browser, examples of computer games in Scratch</td></tr>
<tr><td>Resources/materials for students)</td><td colspan="2">Scratch, Internet Browser, posters, felt-tip pens, tempera, coloured thread/wool, activity captions, photos of smileys</td></tr>
<tr><td>Teaching summary</td><td>MOTIVATION
Game of association.
<table>
<tr><td>SNOW</td><td>CHANGEABLE</td><td>FRUIT</td><td>HOT</td></tr>
<tr><td>ICE</td><td>SWALLOW</td><td>FOG</td><td>HOLIDAYS</td></tr>
<tr><td>COLD</td><td>PRIMROSE</td><td>RAIN</td><td>BREAK</td></tr>
<tr><td>CHRISTMAS</td><td>EASTER</td><td>PICKING GRAPE</td><td>SUN</td></tr>
<tr><td>WINTER</td><td>SPRING</td><td>AUTUMN</td><td>SUMMER</td></tr>
<tr><td colspan="4">SEASONS</td></tr>
</table>
Students watch an animated video “Four Seasons” on Youtube
https://www.youtube.com/watch?v=n52naW_VXBo&t=5s
Short commenting on the video.

Students solve the puzzles:
No paint, no brush, but trees shine in colours! (autumn)
No teeth, no hands, but it bites! (winter)
Two housewives each year cover the table: one with a green tablecloth, the other with a white tablecloth. (spring and winter)
The sun is hot; everyone is running in the shade! (summer)

Teacher asks the following questions:
Do you know that there are parts of the planet where the season is always the same?
What do you think, what problem do people who live there have?
What kind of clothes and shoes do they need?
Do they have enough food?
Do they grow fruits and vegetables?</td><td>Duration

20 min</td></tr>
</table>

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	Have you heard of refugees and migrants? There are people who leave their homes and go with their families to other parts of the world because the soil has dried up and vegetables and fruits cannot be grown. Where people are hungry, wars often break out, which is another reason why they leave their homes. Many people and children have gone through our country in recent years in search of a better life. Some of them stayed here with us. One boy/girl came from Africa and stayed in Croatia. He/she comes from a place where there is a shortage of water and food and it is constantly very hot. He/she wants to know what life is like here. He/she heard that 4 seasons alternate during the year, and that various fruits and vegetables grow here. He/she is interested in the specificities of each season and their fruits. He/she wants to stay healthy by eating only seasonal fruits. Would you like to help him/her describe what the seasons look like in our country and what fruits and vegetables are ripening in them?	
	Implementation ACTIVITY 1 (research assignment) Project assignment (division and definition of assignments for group work: 6 students in a group, 4 groups, each group gets a specific part of a project assignment). The specificities of the seasons and their seasonal fruits will be explored partly at school, with the supervision of the teacher, but mostly at home with the supervision of the family members. *1. group:* AUTUMN – characteristics and seasonal fruits *2. group:* WINTER – characteristics and seasonal fruits *3. group:* SPRING – characteristics and seasonal fruits *4. group:* SUMMER – characteristics and seasonal fruits Also, each group will determine the gender and the name of the child from the story who will be helped with this research. ACTIVITY 2 Together with the students, I check the correctness of the collected data. Each group makes their own poster with the theme of the given season and its seasonal fruits that they have explored.	45 min 30 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	ACTIVITY 3 Two students from each group briefly present the poster, in the way that they mention the main characteristics of the season and list several seasonal fruits. During the presentation, one of the students addresses the named character from the story who is played by another student. ACTIVITY 4 Do you think your character remembers everything you showed him/her from the poster? What do you think about making him/her a computer game that will help him/her to remember faster and better everything you showed him/her and said to him/her, and at the same time have fun? I show the examples of similar computer games: https://scratch.mit.edu/projects/3028073/ https://scratch.mit.edu/projects/96101619/ Students in groups should, for their season: 1. Design the scene according to the season. 2. Choose which outfit the main character could wear. 2. Describe the game/event within the given season. 3. Define the moves of the main character. 3. Come up with what he is doing, saying. 4. Describe the main character's tasks. 5. Define the way the points are collected. 6. Determine the ultimate goal of the game. 7. Determine when the game is over. The teacher gives a possible example. E.g. SUMMER - evident summer scene (beach, sea...) The main character should be dressed according to the season in the background, with the summer clothes that are offered among clothes for all four seasons, at a given time. If the main character is dressed properly, he/she can start collecting fruits/points typical of summertime (fruits typical of other times are also offered). If the main character fails to dress properly within the given time, the further course of the game cannot be accessed and it is returned to the beginning. For example, in the summer, the main character will need to be dressed in a swimsuit in order to enter the sea/lake and collect fruits while swimming. The fruits that appear are always the same, and they need to be recognized and picked up, but only those associated with the	15 min 45 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	season/background/scene in which the main character currently is, otherwise the points are deducted. There can be 12 fruits, three of which will belong to each season (e.g. watermelon, apricot, melon, pumpkin, pomegranate, olive, lemon, orange, kiwi, cherry, radish, young onion...) When finished with designing, each group presents their answers to those present. ACTIVITY 5 In this activity, the students, with the help of the teacher, define and write down the final sequence of the game with all the details, tasks, conditions… Also, by voting, they decide how many points will bear the right and wrong choice of fruits. They also decide how many points will be needed to move to the next level/next season and at what time. Finally, they agree on which goal/final outcome will be chosen from the 4 proposed. ACTIVITY 6 The game is created by university students in collaboration with the 6th grade student and the teacher, and students are involved in the creation process by thinking through and suggesting possible solutions. The teacher and the senior student encourage students to cooperate. The students then play the game and determine its name by voting.	20 min 45 min
	Reflection on the performed activity (evaluation) (Reflection and evaluation) 6 signs (side by side) are placed on the panel, i.e. 6 names of the completed stages which the students participated in: 1. Research work 2. Creating a thematic poster 3. Presentation of the poster, i.e. conversation with the main character 4. Designing a game 5. Participation in the making of the game 6. Playing the computer game Under each sign, there are three smileys, one smiling, the other serious and the third dissatisfied. Each student will get approximately 2 m of thread or thin coloured wool. The evaluation is done in such a way that each thread/wool will	10 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	be marked with one smiley face. The wool/thread is wrapped around the pin once and continues to "travel" to the next smiley face. The amount of wool/thread on certain smileys will clearly reflect the students' opinion on the activities carried out.	
Annexes	Learning scenario in LePlanner: https://beta.leplanner.net/#/scenario/5d6e4aa080a288cd3abb8640 Story/game scenario	
Examples and game references	Developed Scratch game – Seasons: https://scratch.mit.edu/projects/326888540/ (30.7.2019.) 4 Seasons: https://www.youtube.com/watch?v=n52naW_VXBo&t=5s (30.7.2019.) Scratch game – Stegocrunch: https://scratch.mit.edu/projects/3028073/ (30.7.2019.) Scratch game – Fruit Adventures: Part 1: https://scratch.mit.edu/projects/96101619/ (30.7.2019.)	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Game/story scenario

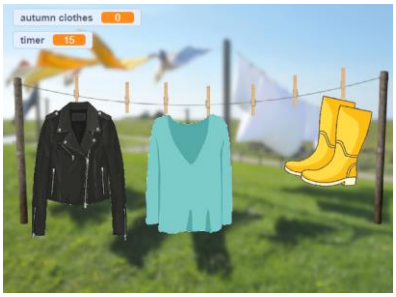
Title of the game	Seasons
Type	Scratch story with game elements
Course/Grade	Science: Seasons / Health 1st grade of primary school
Learning outcomes	**Learning outcomes focused on general subjects** • Recognize the seasonal fruits of particular seasons • Associate appropriate clothes with specific seasons **Learning outcomes focused on algorithmic thinking** • Search, find, and extract relevant information
Goal of the game	Dress the main character in season-appropriate clothing to eventually harvest the fruits characteristic of that season.
Characters and their role	Mia – the main character Family (mom, dad, 2 sisters, 1 brother) - supporting characters
Description of the game flow	The main character introduces the player into the story. Little girl Mia comes from Africa to Croatia in search of a better life. The goal is to teach Mia all about the seasons specific to the Croatian climate. For each season, it is necessary to first dress appropriately Mia, which is also a condition for continuing the game. Successful dressing is followed by the second part of the game, in which fruits specific to a particular season are collected. In that way the main character goes through all four seasons. By collecting the correct fruit, the player wins 1 point, while by making the wrong choice, he loses 1 point. Accordingly, by collecting seasonal fruits in all seasons, the player can collect a total of 36 points, out of which a minimum of 20 points is required for successful completion of the game.
List of scenes/backgrounds	1. Park - an introduction to the game 2. Africa 3. Summer - Dubrovnik, beach, sea 4. Laundry rope - choose summer clothes 5. Sailboat 6. Summer - beach - selection of summer fruits 7. Tree (displaying 4 seasons) - entry of the season following the summer 8. Autumn – forest 9. Laundry rope - choose autumn clothes 10. Autumn - forest - selection of autumn fruits 11. Tree (displaying 4 seasons) - entry of the season following the autumn 12. Winter - mountains, snow, cottage 13. Laundry rope - choose winter clothes 14. Winter – selection of winter fruits 15. Tree (displaying 4 seasons) - entry of the season following the winter 16. Spring – Meadow

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	17. Laundry rope - choose spring clothes 18. Spring – selection of spring fruits 19. Promenade - end, display of points won, arrival of Mia's family
Logical mini-games within the story	Recognizing the characteristics of the seasons. **The first part of the game for each season:** Choosing the right clothes for the main character according to the current season. Condition to continue the game - collecting points. Minimum required for each season: • Summer: 4 points • Autumn: 3 points • Winter: 4 points • Spring: 3 points **The second part of the game for each season:** Collecting fruits specific for specified season. By collecting fruits, a maximum of 9 points can be collected in each season.
End of the game	If all four levels are successfully played and the minimum number of points (20 points) is collected, we get to know the whole family of the main character. If the player does not collect enough points, Mia instructs him/her to repeat the game from the beginning.

Screenshots from the game



The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Learning Scenario

Workshop 3: Games and tools for programming

Blaženka Bajić

Learning Scenario Title	Playing and calculating up to 20
Course/Grade	Mathematics 1st grade of primary school
Learning Outcomes	**Learning outcomes focused on general subject:** • Add numbers up to 20 • Subtract numbers up to 20 • Write down the calculus with a mathematical notation • Name the members in computational operations • Apply the commutative property **Learning outcomes focused on algorithmic thinking:** • Recognize the possibility of using the micro: bit for game • Identify and apply basic programming concepts when designing a game in Scratch (algorithm, sequence, condition, loop, variable)
Aim, Tasks and Short Description of Activities	Apply the computational actions of summing and subtracting up to 20 in the research learning to design the numerical expressions and word-given tasks. Design and write down a computer game to practice adding and subtracting numbers up to 20.
Keywords	Addition and subtraction to 20, addends, sum, changing the order of the addends in a sum.
Correlation and Interdisciplinarity	Music – Elements of musical creativity: Tone painting Croatian language – Linguistic expression: Asking questions and giving answers Art – Flat design painting: Color - color names, basic and derived colors, color tones. Mathematics – Shapes in Space, Numbers 11 to 20 Science – Spatial orientation
Duration of Activities	90 minutes, during May
Learning and Teaching Strategy and Methods	Dialogue method Oral presentation method Method of reading and working on the text Demonstration method Writing method Game based method Problem solving method
Teaching Forms	Frontal teaching Individual work Pair work Group work (four students in a group)

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Tools	micro:bit, Scratch, Internet browser, You Tube	
Resources/materials for the Teacher	Scratch, Internet browser, game examples in Scratch, You Tube	
Resources/materials for the Students	micro bit game, Scratch	
Teaching summary	*Motivation-Introduction* In the motivation part, students work in pairs to play a game of computing with the micro: bit Each member of the pair plays with a programmed micro: bit to display numbers from 1 to 10. By shaking the micro bit, the first member of the pair gets a certain number. Another member of the pair is given another number by the same procedure. The values obtained should be shown as a calculation action and their total value should be calculated. After calculating their common value, students should also apply the commutative property of the sum. The guided conversation follows: How did you feel while you were using micro:bit? What did the micro:bit remind you of? In which social game could it be applied? How often do you play games? What are your favorite games? Who makes the games? The introduction of the activity based on a fairy tale. Listening to the audio fairy tale "Sleeping Beauty" https://www.youtube.com/watch?v=9MIsZBhsQtA OBJECTIVE ANNOUNCEMENT: Today you will be the creators of a computer game.	Duration 30 min
	Implementation Research Question: How could we add a little math to a fairy tale? What would the main character do, how would he/she get to Sleeping Beauty? Which way would he/she go? What would he/she do on his/her way? (Students cite examples) Now let's look at one example of a game in Scratch: https://scratch.mit.edu/projects/270953940/ The subsequent part is group work with a goal to design computational tasks in a set of numbers up to 20. The students are divided into four groups of four students each. Group 1 has a task to design 5 numerical expressions with addition and subtraction up to 10. Group 2 has a task to design 5 numerical expressions with addition and subtraction up to 20.	30 min

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

	Group 3 has a task to design 5 word-given tasks in a set of numbers up to 20 with addition. Group 4 has a task to design 5 word-given tasks in a set of numbers up to 20 with subtraction.	
	Reflection and evaluation - playing the designed game - satisfaction questionnaire for the conducted activity	30 min
Annexes	Learning scenario in LePlanner: https://beta.leplanner.net/#/scenario/5d727c6b80a288cd3abb871e Satisfaction questionnaire Story/game scenario	
Examples and game references	Developed Scratch game – Computational Castle https://scratch.mit.edu/projects/326503995/ (30.7.2019.) Sleeping Beauty - Audio Tale (in Croatian): https://www.youtube.com/watch?v=9MIsZBhsQtA (30.8.2019.) Scratch – Story/game Snow White: https://scratch.mit.edu/projects/270953940/ (30.7.2019.)	

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Annex: Satisfaction questionnaire

1. HOW DID I FEEL IN TODAY'S MATHEMATICS?

POOR GOOD EXCELLENT

2. HOW DID YOU LIKE WORKING IN THE GROUP?

POOR GOOD EXCELLENT

3. HOW DO YOU LIKE WORKING WITH COMPUTERS?

DON'T LIKE LIKE IT GREAT

The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

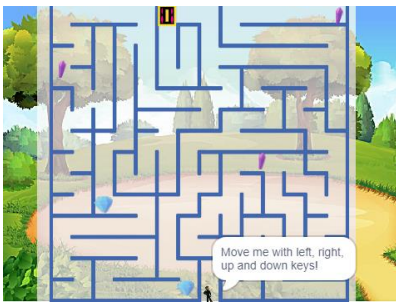
Annex: Game/story scenario

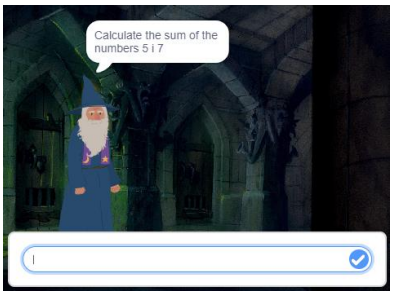
Title of the game	Computational Castle
Type	Scratch story with game elements
Course/ Grade	Mathematics - Adding and subtracting numbers up to 20 1st grade of primary school
Learning outcomes	• Independently sum and subtract numbers from 1 to 10 (1st level) • Independently sum and subtract numbers up to 20 (2nd level) • Independently solve simple word problems (3rd level)
Goal of the game	Solve tasks of addition and subtraction of numbers up to 20.
Characters and their roles	The king's vassal, the supporting character: the proclaimer Young Prince, the main character: solves the tasks King, the supporting character: golden key bearer Fairy, the supporting character: gives the instructions Princess, the supporting character: happily get out of the castle.
Description of the game flow	The king's vassal makes a proclamation promising to give the princess to the one who comes to the golden key. If the young Prince correctly solves the tasks, he will get a golden key that unlocks the castle door and meet the princess, otherwise he becomes a dog and returns to the beginning of the game.
List of scenes / backgrounds	1. The king's vassal make a proclamation - a settlement with a square 2. Road to the castle with hidden tasks 3. Castle on the hill 4. The interior of the castle Note: Scene for inaccurate solutions - turning Prince into a dog
Logical mini-games within the story	**1. task:** Prince has to collect a certain number of apples or watermelons. Number is set with numerical expressions of addition or subtraction. Each correct answer is one point. To pass the level player must collect 10 points. **2. task:** The maze - Prince moves around the maze and collects 5 diamonds. When Prince reaches the diamond, he must correctly answer the calculus to collect it. Prince exits the maze trough the yellow door which opens only if all diamonds are collected. **3. task:** The King asks the final question. If Prince answers correctly, he will get the princess, otherwise the King turns him into a dog and you lose the game.
End of the game	The game ends when Prince gets the golden key to unlock the castle and meet the princess.

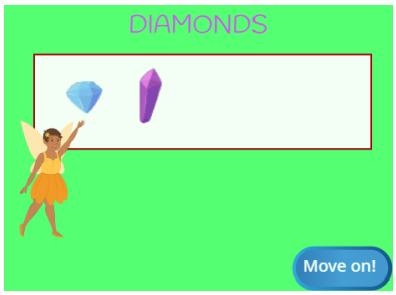
The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union

Screenshots from the game







The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union.

Co-funded by the Erasmus+ Programme of the European Union