Development of algorithmic thinking using digital storytelling

Since the 3rd GLAT workshop "Games and tools for programming", teachers from the focus group have developed learning scenarios that include digital storytelling.

Digital storytelling is a process of telling stories by integrating multimedia elements (images, sound, text, animation) using digital tools. By engaging in the process of designing and creating digital stories, students can develop algorithmic thinking skills as well as many other skills such as research, organization, digital literacy, and problem solving skills.

The teachers have developed initial ideas for interactive digital stories related to topics from various school subjects. With the help of their students, they described the setting of the story and decided on names and appearances of characters (playing characters and characters who guide the player through the game and give instructions and feedback). After exploring the topic and gathering necessary information, they designed game elements that enable the player to develop algorithmic thinking skills (e.g., challenges like labyrinths, brainteasers, sorting games, and puzzles). The students were also included in defining scenes, the sequence of events, and logical conditions for directing the flow of the game.

In the process of designing interactive stories with game elements, students had the chance to develop their algorithmic thinking skills and learn basic programming concepts:

- **sequence** – students arrange the elements in the chronological order in which they will appear in the story
- **data** – students define which data need to be stored (e.g. player's name, collected points, remaining time, etc.)
- **condition** – students direct the story flow, define how the player will collect points, define the end of the game, etc.
- **loop** – students define challenges for the player, decide how many attempts the player will have to finish the game, etc.
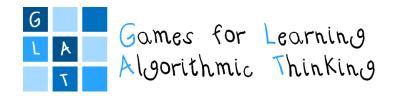
Visual programming language Scratch has been chosen for creating designed digital stories because it offers a library with numerous sprites (characters), backgrounds, and sounds. The participants of the GLAT workshops were junior grade teachers and non-informatics teachers who did not have enough knowledge and skills to independently code in Scratch. Therefore, in the preparation of the stories with game elements university students - future teachers of informatics, helped the teachers. They programmed the stories according to the instructions provided by the teachers and their students.

The following table shows outstanding stories that were created during this very successful collaboration.

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www.facebook.com/glatproject

glat@inf.uniri.hr

Name with link	Subject and grade	Story	Game elements	Preview
Seasons	Science 1st grade	A girl named Mia moved from Africa to Croatia and wants to learn about the seasons.	Choose appropriate clothes, seasonal food, and write the names of the seasons.	
Choose healthy!	Science 2nd grade	A girl named Tašana goes to the market to buy healthy food for a meal.	Collect healthy food, write the names of the main meals, and put the cutlery next to the plate.	
Cultural heritage	Science 4th grade	A boy named Joseph was abducted by aliens who want to learn about the Croatian cultural heritage.	Mark the Croatian counties where UNESCO sights are located, collect pictures of the intangible cultural heritage.	
Calculation castle	Mathematics 1st grade	To win the princess' hand, young prince must find the golden key and free the princess from the castle.	Collect a number of items (according to given numerical expression), solve word problems.	
Hlapić plays with words	Croatian language 3rd grade	To find his lost friends in a castle, a boy named Hlapić needs to recognize different word classes (nouns, verbs, adjectives).	Sort words, to find a certain word class in a sentence, collect words of a given class.	

Teachers combined the activity of designing the digital story with other activities in line with Inquiry Based Learning, which was one of the topics of the 3rd workshop, and developed learning scenarios for various school subjects. Most of the learning scenarios were for the *Science* course and the other scenarios were for *Mathematics* and *Croatian language*. The teachers implemented the designed scenarios in the classroom with their students who really enjoyed playing the game they had designed together.

All the stories can be found in the GLAT Scratch studio: https://scratch.mit.edu/studios/7387159/.