# GOOD PRACTICE GUIDE
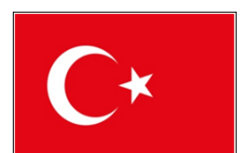
# GAME-BASED EDUCATION OR HOW TO MAKE LEARNING EASIER

# - GAMES -

No. 2017-1-AT01-KA219-035048

01.11.2017-28.02.2020

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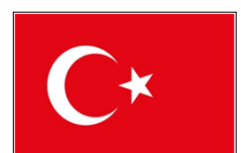
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# CONTENT

# DESCRIPTION OF THE PROJECT

The essence of the Montessori educational system is the interaction of pupils with specialized, hands-on teaching materials. In different words, learning is viewed as a continuous process that comes best by interacting with materials and not by listening to someone's talk. There are several possible ways to realize interaction with materials.

For example, it is possible to set up a laboratory where each pupil will be able to perform some sort of laboratory exercises (or experiments) to get to know various aspects of matter.

Economic restrictions do not make it possible to have all sorts of laboratories for all pupils in any particular school. However, it is possible to use computers and to set up some sort of virtual laboratories instead. In fact, such virtual laboratories can be seen as a sub-case of the Game and Learning approach, the latest trend in education, which is in line with the Montessori principles.

Concisely, this approach advocates the use of video games in education. Thus, a virtual laboratory can be saw as a role-playing game where players assume the role of, say, doctors and/or patients. Then pupils may learn the basics of the cardiovascular system by playing such a game. Naturally, one can develop video games for any field of study.

Games are fun but what makes them enjoyable is the built-in learning process. As James Paul Gee put it "[a]t a deeper level, however, challenge and learning are a large part of what makes good video games motivating and entertaining. Humans actually enjoy learning, though sometimes in school you would not know it." (Good Video Games and Good Learning, Phi Kappa Phi Forum, Vol. 85, No 2, pp. 33-37, 2005). Video games often offer an effective, interactive experience that motivates and actively engage pupils in the learning process. Typically, game-based learning applications can draw us into virtual environments that look and feel familiar and relevant. It seems this is motivational because we can quickly see and understand the connection between the learning experience and our real-life work. However, one can say that this connection between learning experience and real-life does not come automatically (there is lot of scientific evidence for that that educators are often needed to bridge this gap).

Another important aspect of this kind of learning is the fact that learners can make mistakes in a risk-free setting and through experimentation, pupils actively learn and practice the right way to do things. This keeps them highly engaged in practicing behaviors and thought processes that they can easily transfer from a simulated environment to real life. Gee concludes that these

characteristics of games allow "players [to] feel a real sense of agency and control and a real sense of ownership over what they are doing. Such ownership is rare in school."

Game-based learning has a number of advantages when compared to traditional training. In addition, well-designed games allow learning experiences that are not possible otherwise.

This project does not aimed to just show that games are beneficial for the educational process. Our goal was twofold. First, we aimed to show how games could enhance the learning process. Briefly, we planned to explain how video games could be use to enhance learning for various disciplines. Second and most important, we planned to teach pupils and teachers how to create and implement their own simple video games.

Today, varied kinds of learning processes were employ in classrooms and game-based education is such a process. In particular, games have contributed chiefly towards the interactive experience of the learner. In addition, in a game the learner is occupied from start to finish of the session unlike regular classroom sessions. Since all computer systems have a browser and today all browsers support HTML5 and JavaScript, we concluded that the ideal tools for this project are HTML5 and JavaScript.

The project had two phases. In the first phase, pupils and teachers learnt the basics of game-based education as well as the basics of web programming with HTML5 and JavaScript. Then, in the second phase, all teams designed and implemented their simple game.

The games was tested and assessed locally by a team of pupils and "globally" by all participants. Thus, each partner formed two teams: the core team, which designed and implemented the simple game and which consist of about 10 people, and the testing team, which locally evaluated a game and which consists of about 30 people. All games were upload on the web page of the project and all material produced are available from the project's web site.

Based on this it was extremely important to understand how different cultures perceive fun in learning. This helped us to better understand how to prepare games that can be used in many and different cultures. At the same time, it was interesting to see how certain approaches have different effects to groups of pupils with different cultural background.

Target groups: pupils, teachers, and parents (whatever improves the quality of education should concern them).

# PROJECT COORDINATOR
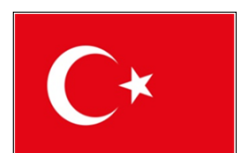
✓ **BUNDESHANDELSAKADEMIE LAA**, Laa an der Thaya, Austria

# PARTENERS

✓ **2nd GYMNASIUM OF XANTHI**, Xanthi, Greece
✓ **ALYTAUS PROFESINIO RENGIMO CENTRAS**, Alytus, Lithuania
✓ **SECONDARY SPECIAL SCHOOL NO. 2**, Bucharest, Romania
✓ **AHMET ÇUHADAROĞLU ORTAOKULU**, Istanbul, Turkey

# PROJECT OBJECTIVES

➢ Training of students and teachers in basic web programming using HTML5 and Java Script;

➢ Designing by the students, with the help of the teachers, of some simple educational video games;

➢ Implementation of video educational games created in the learning process.
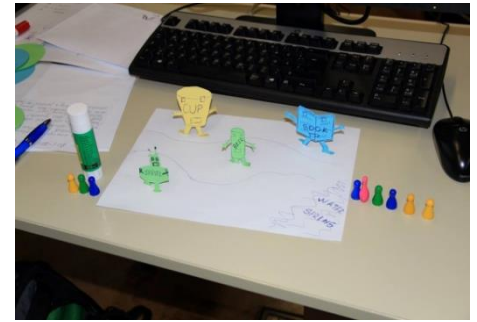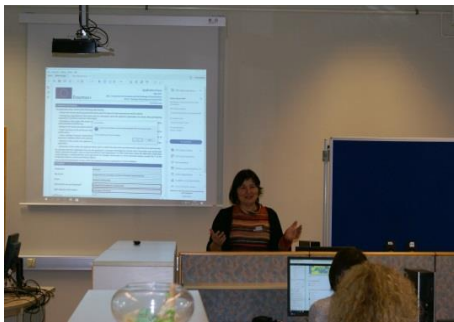
# LEARNING/TEACHING/TRAINING EVENT
## – Short term joint staff training events –

- 29th January – 2nd February 2018
- BUNDESHANDELSAKADEMIE, Laa an der Thaya, Austria



# LEARNING/TEACHING/TRAINING EVENT
## – Short-term exchange of group of pupils –

- 14th –18th May 2018
- SECONDARY SPECIAL SCHOOL NO. 2, Bucharest, Romania





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## LEARNING/TEACHING/TRAINING EVENT
### – Short-term exchange of group of pupils –

➢ 8th –12th October 2018
➢ 2nd GYMNASIUM OF XANTHI, Xanthi, Greece
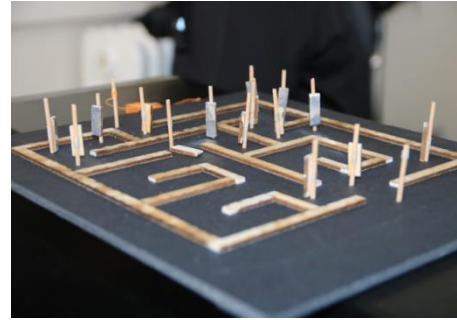





## LEARNING/TEACHING/TRAINING EVENT
### – Short-term exchange of group of pupils –

➢ 17th – 21st December 2018
➢ BUNDESHANDELSAKADEMIE, Laa an der Thaya, Austria
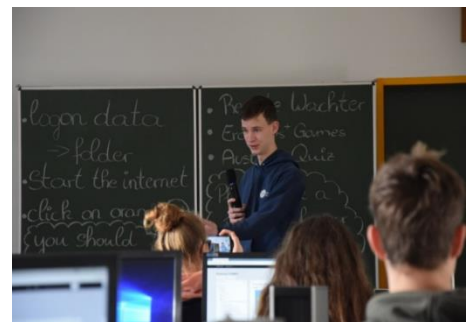






**GAme-based-education or how to Make lEarning eaSier - GAMES, no. 2017-1-AT01-KA219-035048_6**

## LEARNING/TEACHING/TRAINING EVENT
### – Short-term exchange of group of pupils –
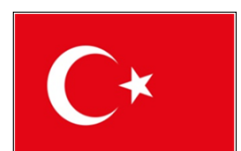
- ➢ 7th –11th October 2019
- ➢ ALYTAUS PROFESINIO RENGIMO CENTRAS, Alytus, Lithuania



## TRANSNATIONAL PROJECT MEETING

- ➢ 17th –19th December 2019
- ➢ AHMET ÇUHADAROĞLU ORTAOKULU, Istanbul, Turkey





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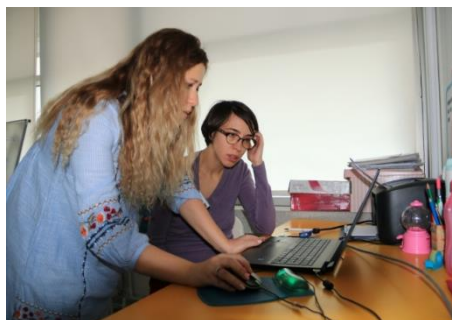
# PROJECT RESULTS



- **PROJECT'S LOGO**

- **PROJECT WEB PAGE**   **www.edu-games.eu**

- **MOODLE COURSE WITH GAMING ELEMENTS**

- **EDUCATIONAL VIDEO GAMES**

- **QUESTIONNAIRES AND INTERVIEWS FOR COLLECTING DATA AND EVALUATION**

- **BOOK**

- **GOOD PRACTICE GUIDE**

- **ERASMUS+ CORNER**

- **DISSEMINATION ACTIVITIES**
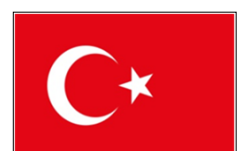
# THE POTENTIAL OF DESIGNING GAMES FOR LEARNING PROCESSES

Prof. Mag. Dr. SONJA GABRIEL
Media education and media didactics
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When it comes to learning, the potential of digital games is often seen in enhancing problem solving skills as games basically are a collection of artificially constructed challenges which need to be solved by taking decisions or actions by the players. Moreover, games provide a safe space to try out causes and effects of actions and processes without having to fear any real world consequences (Gee, 2005). Although learners are also active when playing a digital game (compared to watching a film or reading a text), they need to integrate even more skills when designing their own games. The reason is that they need to learn details about game-design like narrative elements, character and world design, reward system and so on (Perry & DeMaria 2009). Beside learning about game-elements, learners need to work in teams, apply different idea-generating methods as well as being able to let go of ideas. There is even another challenge added if the task is to design games whose primary purpose is beyond mere entertainment (Michael & Chen, 2005). If a game should convey meaning or teach about a topic, game-designers need to dive deep into the contents they want to integrate. Gaming fluencies (Kafai & Peppler 2012) should be an objective of constructivist teaching as learners do not only get familiar with game design but also engage in creative, critical and technical aspects of digital media.

Game design is seen as advantageous by advocates of this teaching method because it can enhance creativity as students need to think of new worlds, characters and rules. Making a game usually is a collaborative task and furthers technological skills. Moreover, games are described as a collection of artificial obstacles – which have to be thought of and solved by game designers. Studies have also shown that content-related learning takes place in the context of game-making activities (Kafai & Burke, 2016). Using game design as a constructionist learning environment (cf. Kafai, 1994) has often been researched from the pupils' and students' point of view and their learning progress. However, there have also been studies looking at pupils and pre-service teachers to find out about the potential of teaching and learning by creating a virtual game learning environment for others (cf. Kafai et al. 1998; Ruggiero & Green, 2017). Especially when it comes

to teaching MINT-subjects or software engineering, this approach has been widely used (cf. Claypool & Claypool, 2005, Shemran et al., 2017). The advantages sought for when using a game-design approach are the many skills learners need for designing a digital game as for example problem-solving and programming skills (VanEck, 2006). Designing digital games has, however, also been used for teaching about games as a cultural medium (Buckingham & Burn, 2007) or to enhance media literacy (Costa et al., 2018) or to make girls more interested in computer programming (Flanagan, 2006). Compared to digital game-based learning, the creation of games is not that widespread. A reason might be that designing digital games provides some barriers as for example the lack of special knowledge in creating games, the high resources regarding hardware and software that are required and finally, the high amount of time that is needed to produce a working digital game.

So why should teachers use game-design as a teaching method? Basically, you can say that game design means active work with media and thus enhances media literacy of students. Before designing their own games, students also need to be able to "read" existing games and to identify elements of a game, find out about what works and what does not work – especially when it comes to rules and reward systems. Moreover, production processes need to be understood – there are certain steps to be taken to come from an idea to a finished product. Designing a game also enhances creativity – students can realize their own ideas, they need to care for grphics, sound, animation as well as texts, design and coding. Digital games are therefore often designed in teams – which means there is another potential of game design. Teamwork needs communication and collaboration as well as project management and being able to give and get feedback. Looking at this long list of skills that can be taught by designing digital games, it becomes obvious that they should be part of every curriculum.

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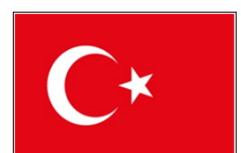
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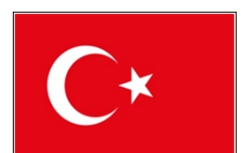
# GAMIFICATION AND GAME DESIGN

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J.L. Plass, B.D. Homer and C.K. Kinzer (2015) reviewed reports and studies on youth's consumption of digital games and found that 99% of boys and 94% of girls playing digital games (Lenhart et al., 2008). In 2008 youth spend approximately 7 to 10 hr per week playing digital games (Lenhart et al., 2008) and more recent estimates are putting this number higher. Although there are gender differences in the amount of time boys and girls play (Homer et al., 2012), and in the types of games boys and girls prefer (Lenhart et al., 2015), studies have not found significant gender differences in learning or motivational outcomes in educational games (Papastergiou, 2009). Given the level of engagement that games generate for a broad range of individuals, and considering the kinds of individual and social activities they can offer, James Paul Gee (2003) argues that video games are an ideal medium for learning.

When talking about playing and learning we have to take in consideration that the design process of games for learning involves balancing the need to cover the subject matter with the desire to prioritize game play (Plass, Perlin, & Nordlinger, 2010). This perspective helps us to make the distinction between play, game-based learning and gamification.

- Play is the essential activity in games and it is a critical element in human development.

- Game-based learning is a type of game play with defined learning outcomes (Shaffer, Halverson, Squire, & Gee, 2005). In this context, a game is "a system in which players engage in an artificial conflict, defined by rules that results in a quantifiable outcome" (Salen & Zimmerman, 2004, p. 80).

- Gamification involves the use of game elements, such as incentive systems, to motivate players to engage in a task they otherwise would not find attractive.

Many important concepts, for game based learning, are related to different theoretical foundations: cognitive, affective, motivational, and sociocultural. Depending upon the intention and design of the learning game some become more important than others.

Psychologists have long acknowledged the importance of play in cognitive development and learning. Piaget (1962), described play as being integral to, and evolving with, children's stages of cognitive development. Vygotsky (1978), also characterized play as being a "leading factor" in

children's development and thought that a vital role of play is to create a zone of proximal development for the child. In Vygotsky's words, play allows the child to achieve "beyond his average age, above his daily behavior; in play it is as though he were a head taller" (p. 103).

Loftus and Loftus (1983), in one of the first books on the psychology of video games (with strong foundations in the behaviorist theories) focused on players' motivations, exploring what makes video games "fun". These statements can be applied to all types of well designed games, including the digital games

**Games as Pedagogical Devices**

Games are adaptable and flexible so they can suit a variety of learning settings, environments and disciplines. They complement well traditional teaching strategies and add a layer of interactivity to the learning process (Boyle, 2011). They can enliven teaching topics and are effective for dealing with problem solving and key concepts. They can be used as tools in the classroom to provide more energetic learning activities in which the pupil is actively involved and he's learning styles are stimulated trough visual, verbal, kinetic, etc. instructions and logical keys.

Video Games encourage creative behaviour and divergent thought (Fuszard, 2001) and enhance pupils' self-confidence and "they can reduce the gap between quicker and slower learners" (Fuscard, 2001).

Some of the most important arguments for using GBL and video games as part of it are: motivation, player engagement, adaptativity, graceful failure.

The Gamification concept includes the motivational elements important for the creation of educational video games.

**What is Gamification?**

❖ According to Merriam Webster Dictionary "Gamification" is: the process of adding games or game-like elements to something (such as a task) to encourage participation.

❖ From an educational point of view, Gamification means the application of game-thinking, game mechanics (game elements and game principles) and game aesthetics in a non-game context in order to motivate actions valuable for the pupil in the learning process.

❖ From a psychological point of view, Gamification represents the use of the motivational techniques effective in games to improve user engagement, learning, physical exercise and more.

**Types of gamification**

❖ Structural – the application of game elements to immerse a learner throughout the content with no alteration or changes to it (K. Kapp, 2013).

❖ Content – the application of game elements, game mechanics and game thinking to make the content more game like by adding story like context and challenges.

Both types of Gamification are meant to motivate the learner and to keep him engaged in the learning process.

**Specifications of Gamification**

| Approach | Gamification |
|---|---|
| **Content Rework** | **Instruction design required for making content more learning friendly** |
| **Re-Usability** | **The design can be used for any kind of training** |
| **Cost of development** | **Easy on the pocket** |
| **Time of development** | **Relatively easy to develop, quicker to apply** |
| **Best used for** | **Driving engagement through the learning process** |

**http://www.learntech.in/types-of-gamification-games-vs-gamification/**

### Game Mechanics

❖ Game mechanics are rules or methods designed for immersion providing this way an engaging game play.

❖ Gamification is built upon game mechanics that are proven to motivate and engage users.

❖ Any combination of game mechanics can be effective in creating a fun and useful activity.

**Some key game mechanics**

| Victory condition mechanics | Gaming condition mechanics |
|---|---|
| ▶ Goals | ▶ Turns |
| ▶ Quest | ▶ Action points |
| ▶ Loss avoidance | ▶ Game modes |
| ▶ Piece elimination | ▶ Capture / Eliminate |
| ▶ Puzzle solving | ▶ Catch-up |
| ▶ Races | ▶ Dice |
| ▶ Structure building | ▶ Movement |
| ▶ Territory control | ▶ Resource management |
| ▶ Victory points | ▶ Risk and reward |
| ▶ Team coordination | ▶ Role-playing |

### What is Programming?

Programming is the mental activity by which we express the solution to a given (mathematical) problem in some programming language. The difficult part is to solve the problem with specific tools. Programming is not something you learn by following a recipe or a method. Programming is both a craft and a science. It is a craft (or art!) because there are no rules of thumb that one can follow to solve a problem. Intuition plays a very important when solving a problem.

The implementation of a solution requires the knowledge of common techniques and practicers.

**Steps Involved in Programming**

1. Defining the problem.
2. Outlining and structuring the solution.
3. Selecting solution methods.
4. Coding.
5. Debugging.
6. Testing and verifying.
7. Documenting.
8. Maintaining the program.

**What is a Programming Language?**

A formalism or formal notion used to instruct a computer to perform a computational task that is an abstract, mathematical in a sense, task.

**Characteristics of Programming Languages or How computational tasks are described?**

- By a sequence of commands? The language is imperative.
- By objects and their interactions? The language is object-oriented.
- By functions and their composition? The language is functional.
- By a set of sentences in logical form? Then it is a logic programming language
- Specifying a programming language means to: describe its syntax and its semantics.
- Syntax: the way we arrange "linguistic" elements in a program.
- Semantics: the computational effect of each structure.

**Some popular programming languages**

- ✓ Old languages: FORTRAN, COBOL, PL/1, Algol68, BASIC, LISP, Pascal.
- ✓ Timeless languages: C, C++, Ada, Prolog, SML.
- ✓ Modern languages: Java, JavaScript, Perl, Python, Ruby, C#, Haskell.

**Guidelines for educational video game design**

When educational video games are developed, psychological techniques should be used to enable people to trigger their cognitive potential and to increase their implication in the learning process. In order to achieve this we have to keep in mind some essential theories, which support accessibility and generalization of information.

For accessibility we can use Gardner's Multiple Intelligences Theory. This theory states that Intelligence is not a unitary and indivisible concept but a set of abilities or capabilities that can be trained. The idea is that individuals possess a blend of various intelligences, and should not be restricted to just one modality of learning. The types of intelligences generally consist of the following: Logical-Mathematical, Musical, Linguistic, Interpersonal, Spatial, Bodily-Kinesthetic, and Intrapersonal.

For generalization we can use Sidman's theories about "Equivalent Relationship" ("Stimulus Equivalence" mechanism). This theory concludes that if relationships between stimuli (Reflexivity, Symmetry, Transitivity) are trained then new relations that have been hidden can be obtained implicitly.

Learning styles refer to theories that take into account the differences between individuals and how they approach learning. These classify persons according to the way they process and acquire new information and give guidelines about defining, categorizing and assessing the styles of learning. There are three types of learners:

### Visual learners
• Prefer using images, pictures, colors, and maps to organize information and communicate with others.
• Remember what was read or seen in a presentation.
• Think in pictures, use "scenes" to describe.
• Associate color with information.
• Remember faces, but not names.
• Like written reports better than verbal ones.

### Auditory learners
• Must hear things to have the best chance of learning.
• Remember what was heard in a lecture or presentation.
• Talk while writing.
• Are sophisticated speakers.
• Remember information by listening, and therefore get the most out of lectures.

### Kinesthetic learners
• Learn best through a hands-on approach.
• Want to move all the time, to be busy and well-coordinated.
• Are "doers", not big "talkers".
• Like to take things apart, put them back together to learn how things work.
• Need concrete experiences to act as learning aides.

### Gamer types and motivations
1. The Explorer – defined by a focus on exploring and a drive to discover the unknown, seeks to understand how the game world works;

2. The Socializer – defined by a focus on socializing and a drive to develop a network of friends and contacts, seeks to develop social interaction skills;

3. The Achiever – defined by a focus on attending status and achieving present goals quickly, seeks to rank up and advance to higher levels of game play;

4. The Killer – defined by a focus on winning, and direct competition, seeks to impose themselves skill wise on others.

By combining this knowledge in designing educational video games we can enhance different abilities. Using stronger intelligences to improve weaker once while solving tasks allow the mobilization of a subset of abilities associated to others. It is important to stimulate the strong intelligences and to use them as supporting tools for the development and also for the personalization of learning based on the child's profile.

Some points to take into account while designing educational video games:

1. To identify the player's profile, his/her limitations and cognitive capabilities in order to choose the best interaction mechanisms.

2. To structure and adapt the didactic objectives to the player's characteristic.

3. The educational contents should be introduced into the game structure in a hidden way.

4. To evaluate the positive aspects that the game offers, without forgetting the negative ones (eg. game fixation or inappropriate conducts of the child).

5. The game must offer feedback for each action. This feedback is focused on the cognitive need which the child must train.

6. Errors should be corrected without causing frustration (sadness or discouragement).

7. To use a main character or hero, who acts as a guide in the learning process and game.

8. The learning process should be in rise, based on multi-levels or missions where the level of difficulty increases gradually. At each level the cognitive weakness should decrease.

9. To give rewards for correct actions: animations, songs, videos, points.

10. The mechanism to carry out an action in the game should have the same structure as the mechanism that would be used to solve it in the real world.

**Some characteristics of a curriculum based on video games**

The features of video games, and the re-examination of some basic educational premises have provided a list of characteristics for a game based curriculum that can be also used for special education:

➢ it should require increasing response rates and accommodate wide performance possibilities.

➢ it should provide immediate feedback through a variety of options.

➢ it should provide rewards for quick and correct responses by higher scores and/or extended playing time.

➢ it should see errors as opportunities to improve rather than indicators of failure.

➢ it should use positive reinforcement to motivate pupils to want to perform and consequently.

➢ it should value proficient performance which recognizes that mastery is based on both accuracy and speed.

The concern of this kind of curriculum is directed to maximizing the odds that a pupil will be able to perform with ease and confidence, retain the skill, utilize it to build more complex performance, and transfer it into real life.

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# GAME BASED LEARNING AND GAMIFICATION

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Games are very important for learning and James Paul Gee has proved this in his book "What Video Games Have to Teach Us about Learning and Literacy." Gee stated that games, and particularly video games, require the players to learn and think in ways at which they are not adept. He further states that games provide a life enhancing experience for learners and they also revolutionize the routinized ways of learning through combining learning and play.

Learning through games (game-based learning) is a very important and necessary educational tool, especially for young learners, or special need learners, but not only.

Game based learning (GBL) is a type of game play that has defined learning outcomes. Generally, game based learning is designed to balance subject matter with gameplay and the ability of the player to retain and apply said subject matter to the real world.

Game based learning describes an approach to teaching, where students explore relevant aspect of games in a learning context designed by teachers. Teachers and students collaborate in order to add depth and perspective to the experience of playing the game.

Good game-based learning applications can draw us into virtual environments that look and feel familiar and relevant. Within an effective game-based learning environment, we work toward a goal, choosing actions and experiencing the consequences of those actions along the way. We make mistakes in a risk-free setting, and through experimentation, we actively learn and practice the right way to do things.

Gamification is a different type of learning experience. Gamification takes game elements (such as points, badges, leaderboards, competition, achievements) and applies them to a non-game setting. It has the potential to turn routine, mundane tasks into refreshing, motivating experiences.

So, what educational games are?

✓ a special case of gamification applied in education and lifelong learning. Usually includes the integration of educational models, educational content, gaming concepts and high-tech digital visualization and interaction in a single package.

✓ a game designed to aid in learning about specific subjects, in expanding concepts, in stimulating growth, in understanding a historical event or a culture, in developing a skill while playing;

Photo credit: https://www.educatorstechnology.com/

✓ are those intentionally designed for the purpose of education, or those entertainment games that have incidental or educational values. Educational games are designed to help people understand concepts, learn domain knowledge, and develop problem solving skills as they play games.

✓ are defined as not having entertainment, enjoyment or fun as their primary purpose.

Playing educational games, student engagement is:

✓ Emotional: involves interest, boredom, happiness, anxiety, and other affective states, the sense of belonging and values.

✓ Behavioral: involves persistence, effort, attention, participation, and involvement.

✓ Cognitive: effortful tasks with purposiveness and strategy use, making cognitive investment in learning, and engaging in metacognition and self-regulated learning.

✓ Involvement: refers to the degree of attention, interest, curiosity, motivation and passion students show, as well as the effort and time they invest and the persistence and resilience they demonstrate towards their goals.

Laura Devaney said that as educational gaming moves from a future technology to a practice found in more and more classrooms, educators are recognizing game-based learning's potential to engage students and help them prepare for future learning.

Mia MacMeekin stated there are 6 steps for adding gamification and instructional design in classroom:

1. Identify the learning outcomes (use verbs and make them measurable): motor skills; cognitive skills, intellectual skills, verbal information, attitude.

2. Choose a big idea/theme/challenge: in order to accomplish, students has to master all the learning outcomes

3. Storyboard the game: choose a learning activity, design phases, and present the learning activity design.

4. Design learning activities: what the teacher will do and what the student will do.

5. Build teams. Games can be played individually or in teams:

- form mixed ability groups (age, gender, achievement);

- help groups bond into teams (choose an avatar, a flag, get to know each other, listen, participate);

- tinker with struggling groups (teach active listening, give them a way out, ask if help needed);

- encourage intrinsic motivation, create a reason to win, give bonus point for unity.

6. Apply game dynamics:

- players

- levels

- reward

-competition

- challenges
- permission to fail.

What are the advantages of using games in the classroom?

-   Improved recall and retention
-   Development of problem-solving skills
-   Instant feed-back

Characteristics of effective classroom games:
- Ease of use
- Engagement
- Customization
- Purpose

With classroom games, students gain valuable computer literacy and social skills, retain more of the content you teach them, and come to class excited to learn.



Photo credit: https://www.gamified.uk/ Andrzej Marczewski

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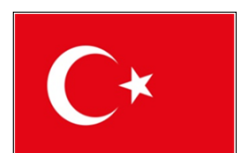
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# SCHOOL TOUR

# -GAME ANALYZE-

https://edu.cospaces.io/Universe/Space/0AiOqspLftS0dtx6

1. What materials (equipment) do you need to play? PC, Internet

2. Players

- How many? 1

- Any roles?  Player

- Any special knowledge? No

- Any age limit? No

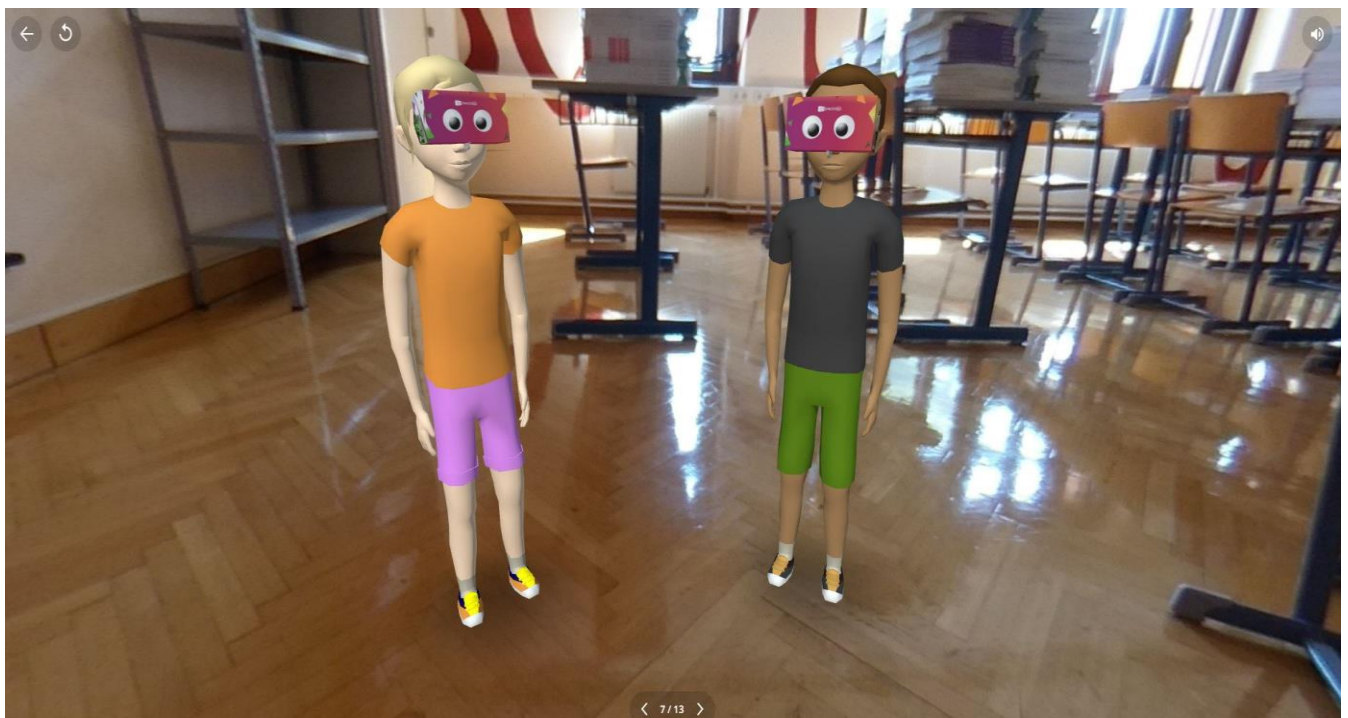3. What is the challenge (aim) of the game?  To take a tour through our school.

4.   What are the objectives of the game? To welcome the player at our school.

5.   What are the required actions for playing the game? Choose a direction to go.

6.   What are the rules of the game? Choose direction.

7.   What creates challenge in this game? To answer questions.

8.   What makes this game fun? To answer questions correctly and to learn more about our school.

9.   What abilities can it train/form? IT skills.

10.  Can we consider it an educational game and why? To learn IT skills.

# SCHOOL STORY

## -GAME ANALYZE-

http://www.solic.at/games/SchoolStory/

1. What materials (equipment) do you need to play? Internet, PC

2. Players

- How many? 1

- Any roles? No, player, schoolmate.

- Any special knowledge? How to control PC.

- Any age limit? 12+

3. What is the challenge (aim) of the game? To find a happy end.
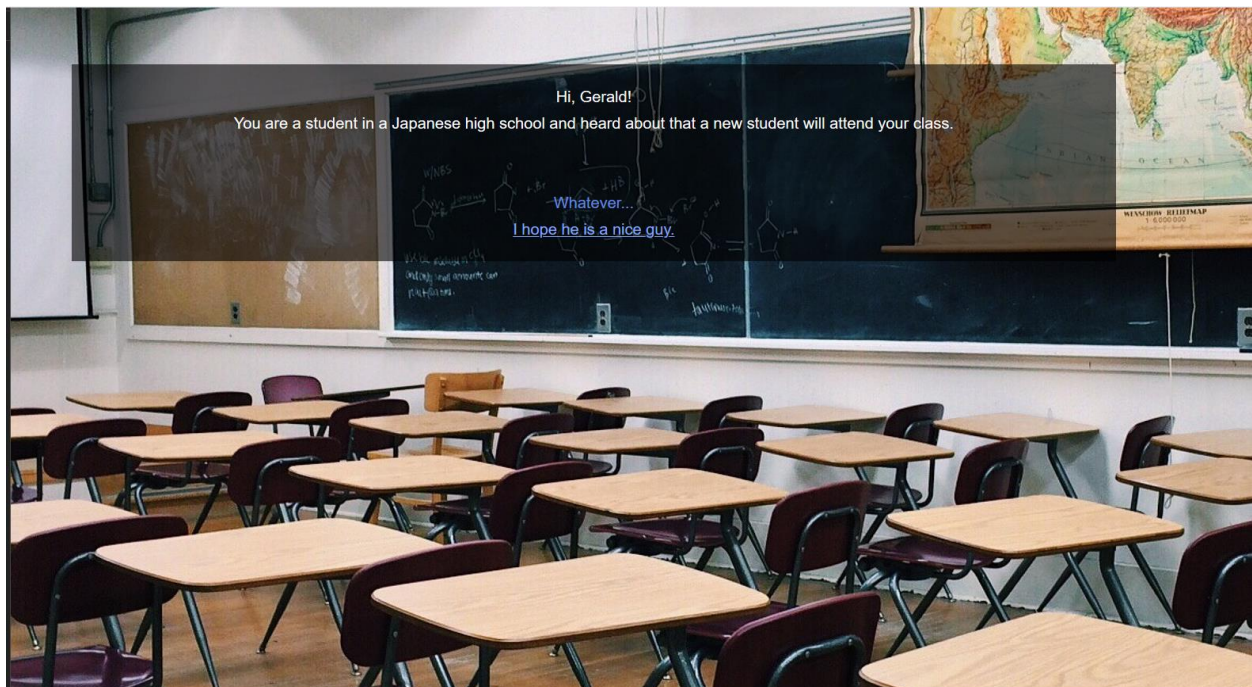
4. What are the objectives of the game? To improve social skills.

5. What are the required actions for playing the game? To select one of the offered reactions.

6. What are the rules of the game? Depending on your selection you bring to a different end.

7. What creates challenge in this game? To make the right decision to bring the story to a happy end.

8. What makes this game fun? Not knowing the next situation and if it is possible to bring it to a happy end.

9. What abilities can it train/form? Emphatic, social skills.

10. Can we consider it an educational game and why? Yes, because it trains empathy and social skills.
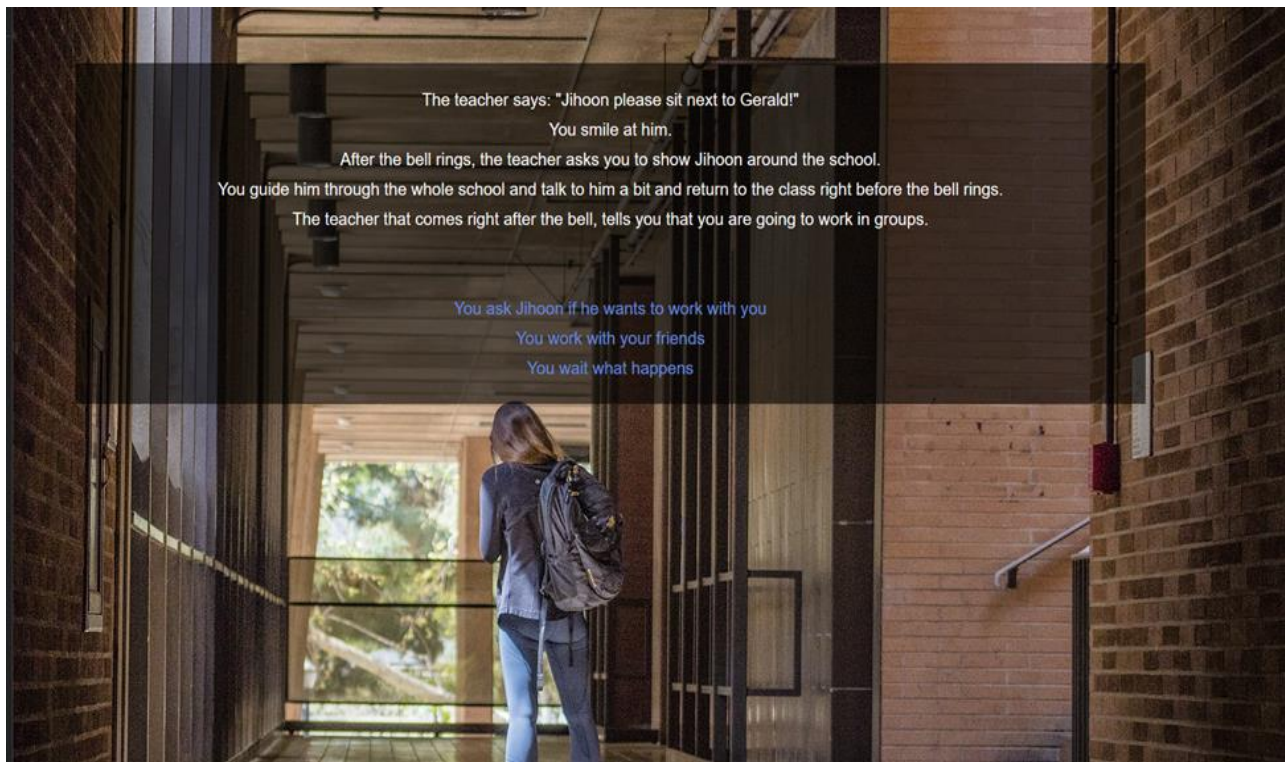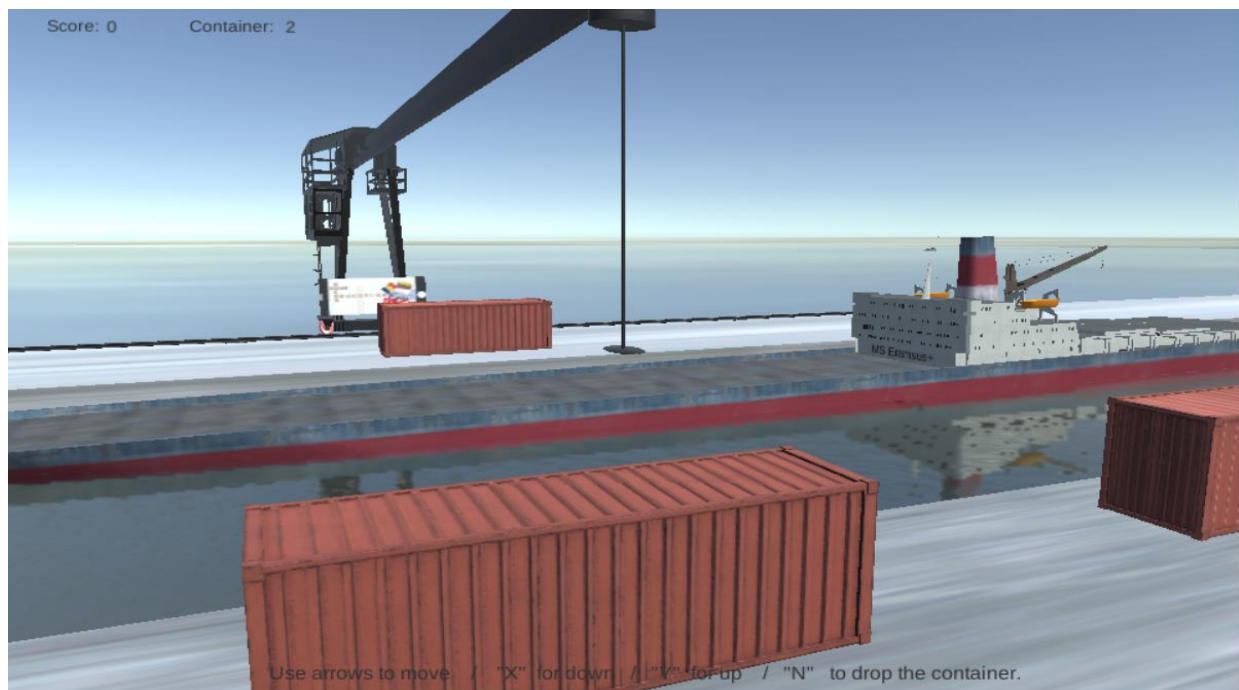
**SHIP**

**-GAME ANALYZE-**

http://www.solic.at/games/Ship/

1. What materials (equipment) do you need to play? Internet, PC.

2. Players

- How many? 1

- Any roles? Player works as a crane operator.

- Any special knowledge? How to control PC, little bit of physics, knowledge about transport.

- Any age limit? No, depends on the questions added.

3. What is the challenge (aim) of the game? To put all (6) containers on one ship.
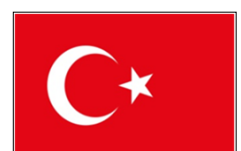
4. What are the objectives of the game? To make students aware of transport risks and to answer all the questions correctly.

5. What are the required actions for playing the game? To move container from the que to the ship and to answer questions in a risky situation.

6. What are the rules of the game? To bring the containers carefully to the ship because if they are wrong placed, the ship is sinking.

7. What creates challenge in this game? To be careful with the containers. Wrong control can damage all.

8. What makes this game fun? To tackle the challenge and be successful and to experience 3D situations.

9. What abilities can it train/form? Orientation, controlled movements, physics and knowledge about the topic

10. Can we consider it an educational game and why? Yes, because it trains basic skills of physics, and it is the use of new technology and knowledge about transport.
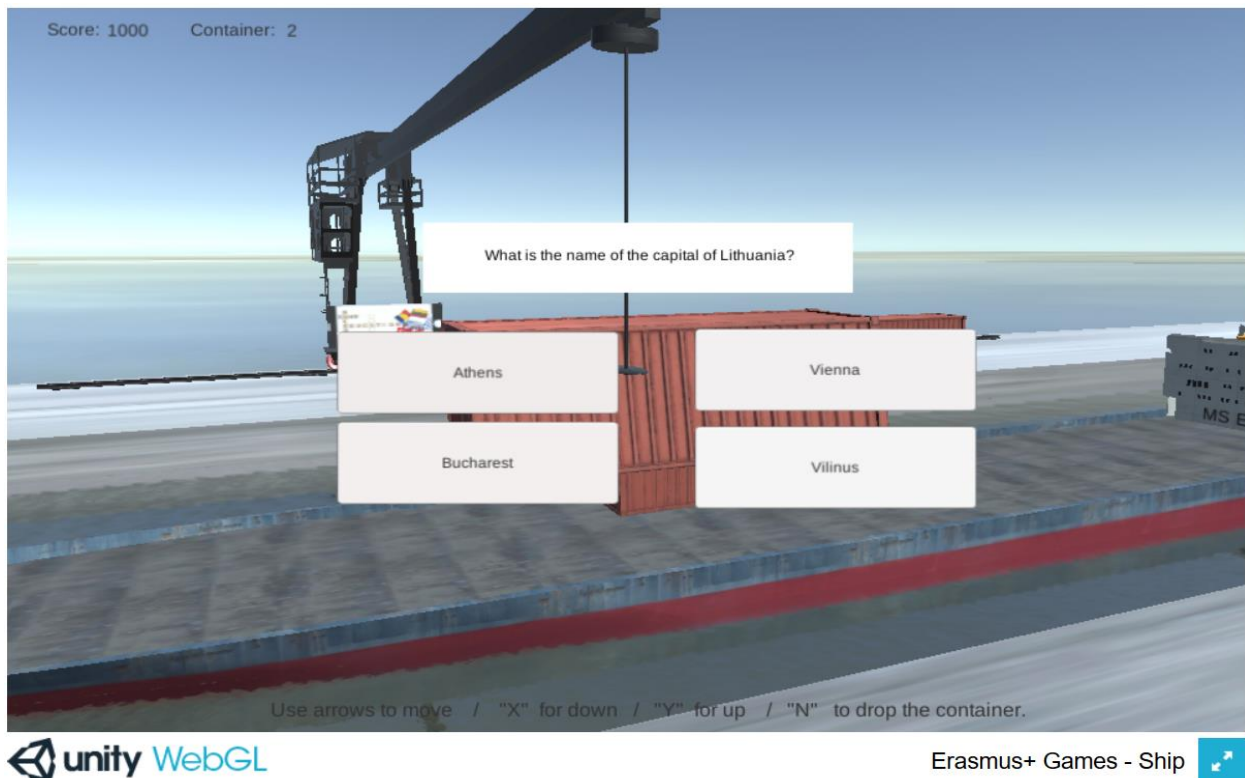
# GHOST

# -GAME ANALYZE-

http://www.solic.at/games/Ghost/
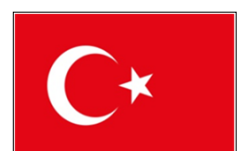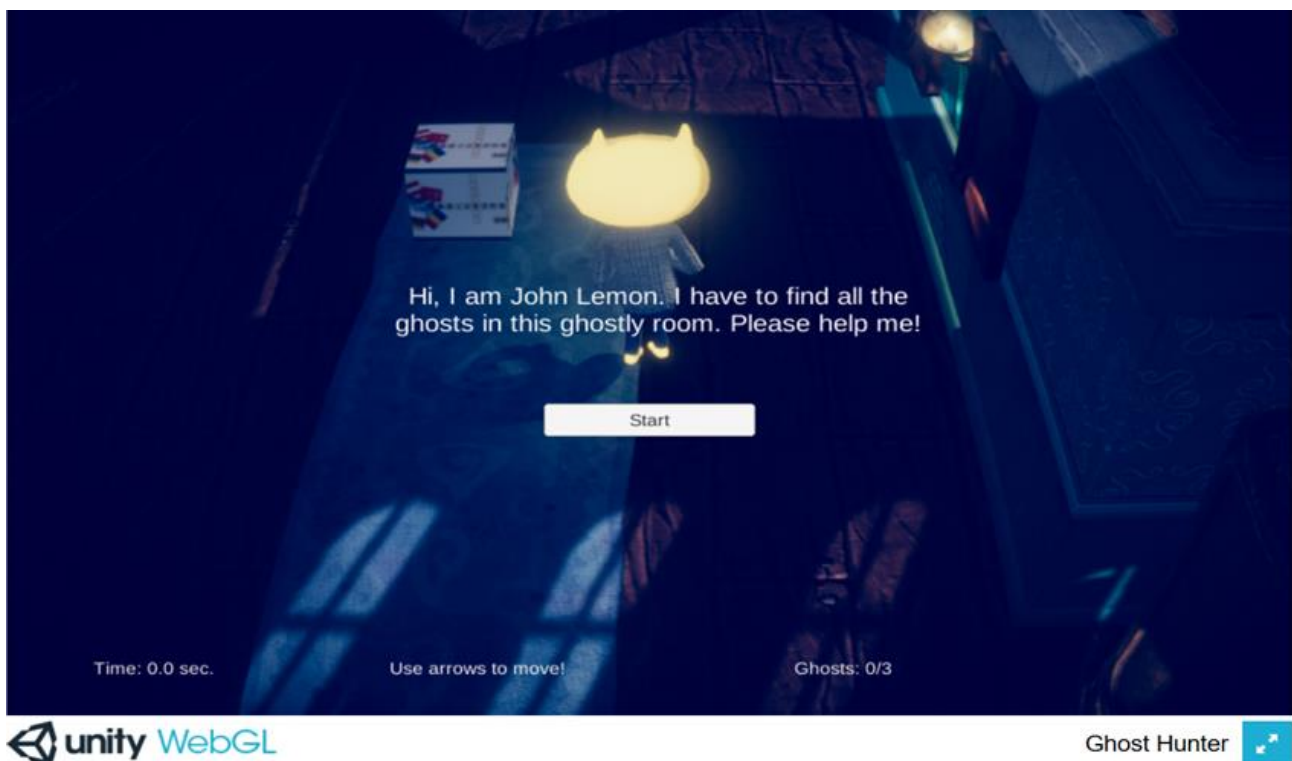
1. What materials (equipment) do you need to play? Internet, PC

2. Players

- How many? 1

- Any roles? No, player

- Any special knowledge? How to control PC/mobile phone, "1x1"

- Any age limit? No

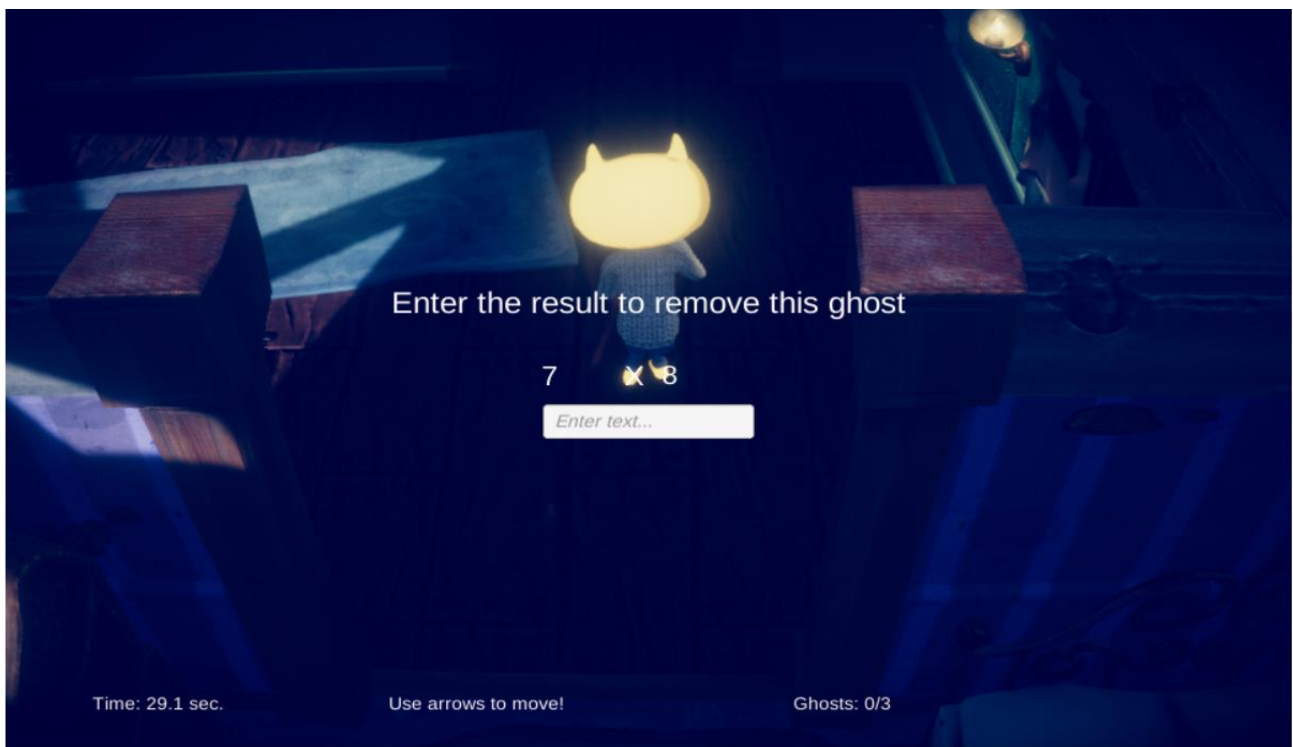3. What is the challenge (aim) of the game? To escape from all the ghosts.

4. What are the objectives of the game? To train multiplication.

5. What are the required actions for playing the game? To escape and to calculate in a short time

6. What are the rules of the game? To escape from three ghosts and to calculate correctly.

7. What creates challenge in this game? To be very quick.

8. What makes this game fun? To be in an attractive room with ghosts.

9. What abilities can it train/form? Orientation and multiplication.

10.    Can we consider it an educational game and why? Yes, because it trains basic skills of multiplication and it's the use of new technology.



Enter the result to remove this ghost

7    X 8

*Enter text...*

Time: 29.1 sec.    Use arrows to move!    Ghosts: 0/3

unity WebGL    Ghost Hunter

# CRYPTO GAME

# -GAME ANALYZE-

"Crypto Game" is a game all about cryptography. You (the player) are trapped in a dark house full of ciphers. In order to escape, and win the game, the player should solve all of the ciphers that are incorporated in the game. Through these puzzles, players can surprisingly learn how to use more advanced computer programs, they can enhance their ability to solve problems and they can even develop cooperation skills.

**Players**

Although the player can be controlled by only one person, the game can be played cooperatively. For instance, in a group of four, one person can be the "Main Controller", the one that takes control of the player. Another person can be tasked with researching into possible solutions/ciphers. Finally the two lasting players can coordinate all the clues that they have collected and help with deciphering. Thus you have a fully capable team ready to finish the game.

**Age limit**

Another point worth mentioning is the age limit. We firmly believe that, it all depends on the player's knowledge. This is due to the complexity of some of its ciphers. Consequently the game can be completed by players of all ages.
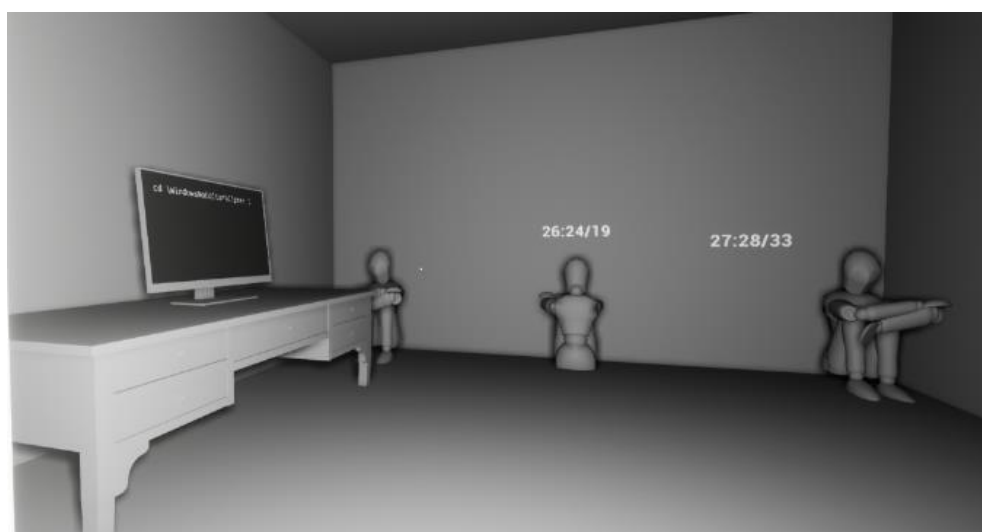
### How to play

The game uses the typical WASD navigational configuration (as it was established in the 90s and it's still being used in modern FPS games).
It has two supplementary keys "F" and "E". The "F" key is used to turn on and off flashlight that accompanies the player in order to make clues easier to see. The other key "E" is used to interact with the keypad that is placed behind the starting location of the player.

### The challenge and entertainment

To begin with, the game doesn't have much colour, happy music, and merry environment. Thus the player is stuck in a house with sounds (such as a giggle, and the excruciating 19Hz infrasound frequency) but these are all factors made to make the player feel a subtle uneasiness in order to keep the player distracted from the game. Therefore the player can develop their concentration skills. Furthermore the fun a player can experience, in this instance, can be "born" through their motivation and perseverance to complete the game. As a result they can gain knowledge, and develop basic skills through such an exceptionally onerous game.

### Equipment

At present and whilst creating it the game is only available for computers due to its demanding nature but it can be played on the majority of medium-end computers. We would also recommend the use of paper and pencil due to the almost compulsory organization.

In conclusion the game can be played by anyone as long as they are willing to dig deeper into the subject of cryptography and due to its complexity and distraction factor it is necessary to work in a team. As a result it teaches players to cooperate, stay concentrated, and develop their problem solving finesse.
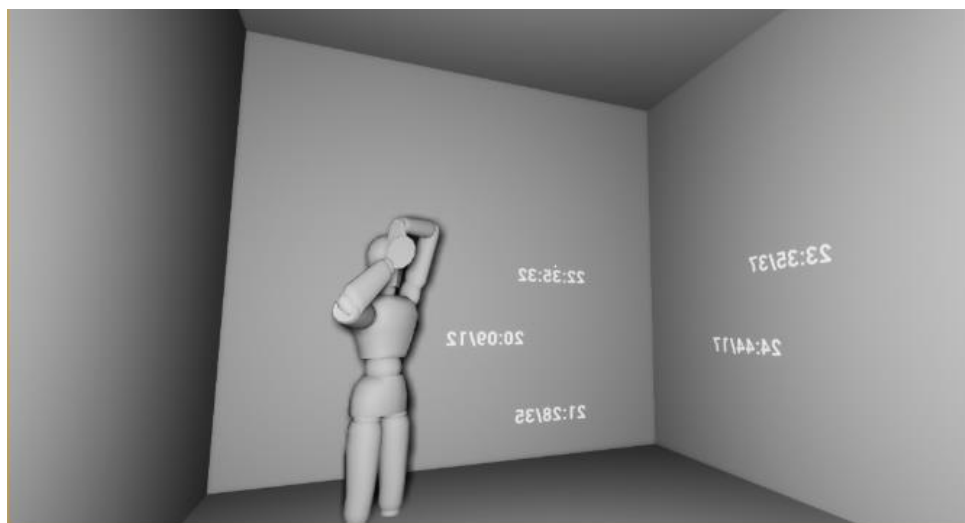
# PIRATES LOOKING FOR TREASURE

# -GAME ANALYZE-

"Pirates looking for treasure" is digital game for Mathematics lessons for students of 11-12 grades. With the help of this game, students will revise the basic concepts and rules of mathematics. Students can play this game both in the classroom and at home. During the game, they will develop their calculation, quick orientation and mathematical skills.

**What is the activity?**

"Pirates looking for treasure" consists of the main mathematic sections. Students have to choose the mathematic topic and to start playing the game. They have to navigate the ship and collect the marked chests with treasure solving five tasks of the chosen topic within the limited time. Then, they can move to the next level where they find more complicated tasks. The problem is that is not very easy to collect the chests. Students have to think logically how to sail across the sea and collect the chests. While sailing, they must avoid the dangers of the sea - mines that can explode the ship if they do not solve the given mathematical task correctly, and rocks can wreck the ship.
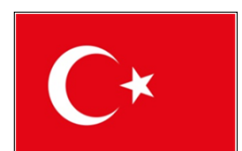
### How does it work?

The purpose of the game "Pirates looking for treasure" is to collect 5 marked chests. Before starting the game you have to choose the math topic. You have to navigate the ship and avoid hidden mines in the sea. If you stop on the mine you have to solve the math task correctly if you want to survive. If you failed to answer during the given time your ship will explode. There are rocks in the sea which can wreck your ship. The more points you will win the better mark you can get.

### What equipment is needed for playing?

It is needed the Internet connection for playing games. You can play games in the computer laboratory or in an ordinary classroom, but you need to have laptops or tablets or you can play it using the Smart board.

### What about the players?

"Pirates looking for treasure" is beneficial mathematics learning tool that help students not only improve their mathematical knowledge but also to prepare for the national exam. It can be played by a single player and can be played by all students in the classroom, competing against each other trying to be and remain a leader.

This game are for the age of 17-18, because the mathematical rules, concepts and tasks are provided from the textbooks of senior classes.
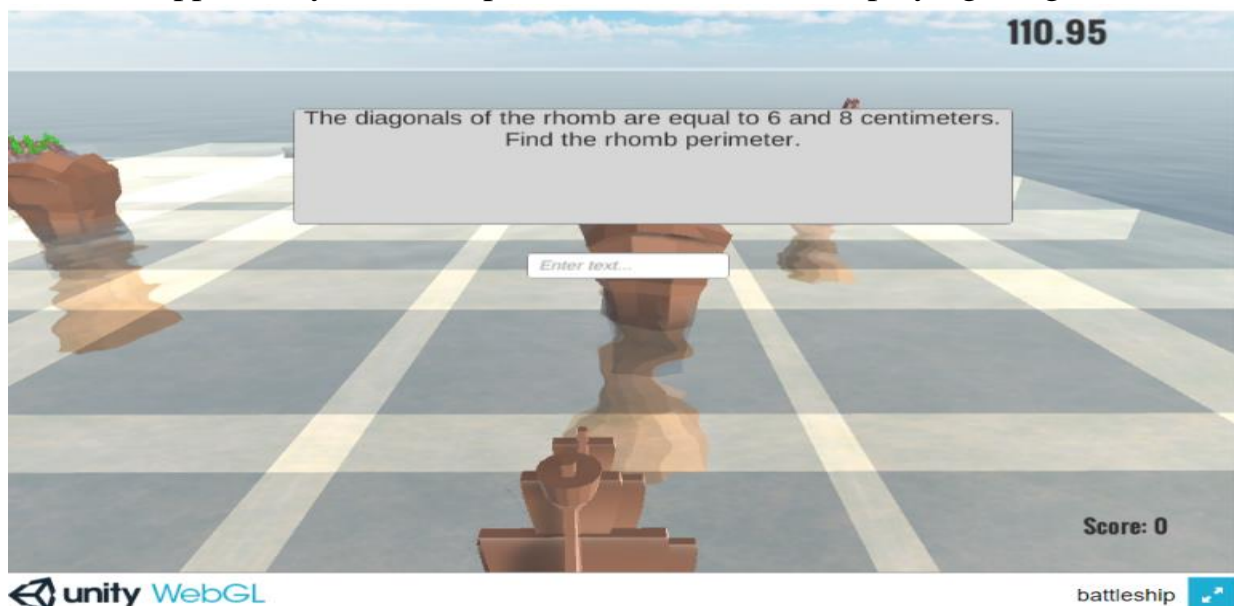
**What makes the game challenging and fun?**

"Pirates looking for treasure" is fast and interesting three-dimensional mathematical game that make math even more interesting and easier to study for students. Successfully to navigate across the sea and collect all the chests (solve all the mathematical tasks you have been given) is challenging and more interesting game that help players improve their mathematics skills.

This game improve the teaching process in the classroom, and is great tool for stimulating students and motivating them to learn mathematics. It has been tested that by playing this game, pupils become more active and acquire better critical and logical thinking skills, pay pupils' attention and improve memory, quick orientation and mathematical knowledge. This are the main challenges of the game:

- Teach how to use manuals.
- Develop logical and critical thinking and help solve problems.
- Require the good hand and eye coordination and improve the spatial skills.
- Teach/learn to carry out several actions at once.
- Teach quick thinking and making a quick decision and the situation analysis.
- Promote accuracy.
- Develop math skills.
- Improve memory and concentration.
- Encourage to take risks.

We are considering of improving our game in the future. If the student chooses the wrong answer, he or she will receive a tutorial how to solve the problem and have the opportunity to catch up with his/her classmates playing the game.
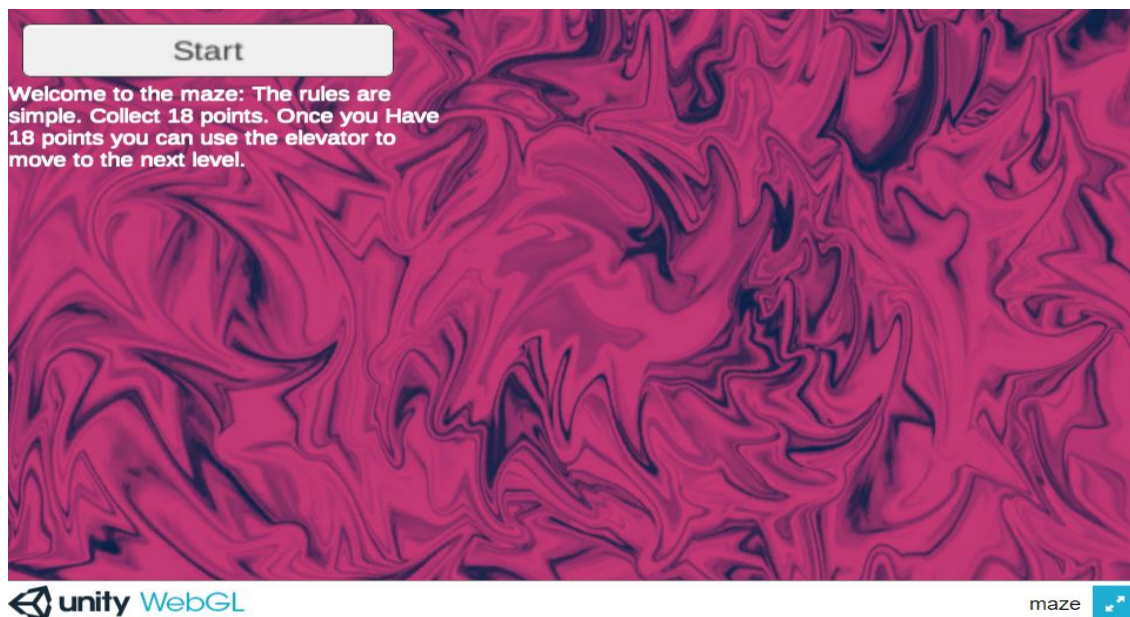
# THE MAZE

# -GAME ANALYZE-

http://mokinys4.aprc.lt/

"The maze" is digital games for Mathematics lessons for students of 11-12 grades. With the help of this game, students will revise the basic concepts and rules of mathematics. Students can play this games both in the classroom and at home. During the game they will develop their calculation, quick orientation and mathematical skills.

**What is the activity?**

"The maze" consists of the basic mathematics tasks for students of 11-12 grades. During the game students can travel through the 3D image maze. While travelling they collect points (18 points) looking for the boxes with the mathematical tasks. Travelling through the maze, students will be challenged to find exactly 18 boxes and provide 18 correct answers. Only then, they will be able to travel to the next level and overcome another maze with more tasks.

**How does it work?**

The rules of the game "The Maze" is very simple. You have to collect 18 points solving math tasks. When you have 18 points you can travel to the next more complicated level.



Start

Welcome to the maze: The rules are simple. Collect 18 points. Once you Have 18 points you can use the elevator to move to the next level.

unity WebGL                                    maze

**What equipment is needed for playing?**

It is needed the Internet connection for playing game. You can play game in the computer laboratory or in an ordinary classroom, but you need to have laptops or tablets or you can play it using the Smart board.
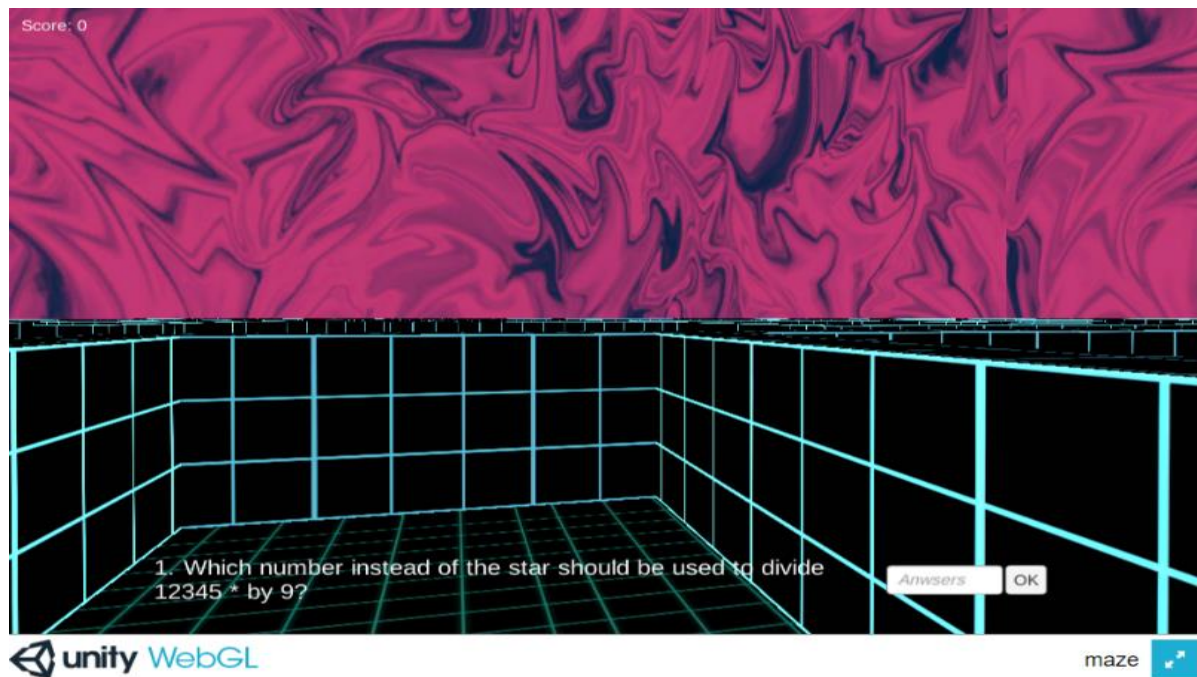
**What about the players?**

"The maze" is beneficial mathematics learning tools that help students not only improve their mathematical knowledge but also to prepare for the national exam. It can be played by a single player and can be played by all students in the classroom, competing against each other trying to be and remain a leader.

This game is for the age of 17-18, because the mathematical rules, concepts and tasks are provided from the textbooks of senior classes.

**What makes the game challenging and fun?**

"The maze" is fast and interesting three-dimensional mathematical game that make math even more interesting and easier to study for students. Successfully to move through the mathematical maze is challenging and more interesting game that help players improve their mathematics skills.

This game improve the teaching process in the classroom, and is great tool for stimulating students and motivating them to learn mathematics. It has been tested that by playing this game, pupils become more active and acquire better critical and logical thinking skills, pay pupils' attention and improve memory, quick orientation and mathematical knowledge.
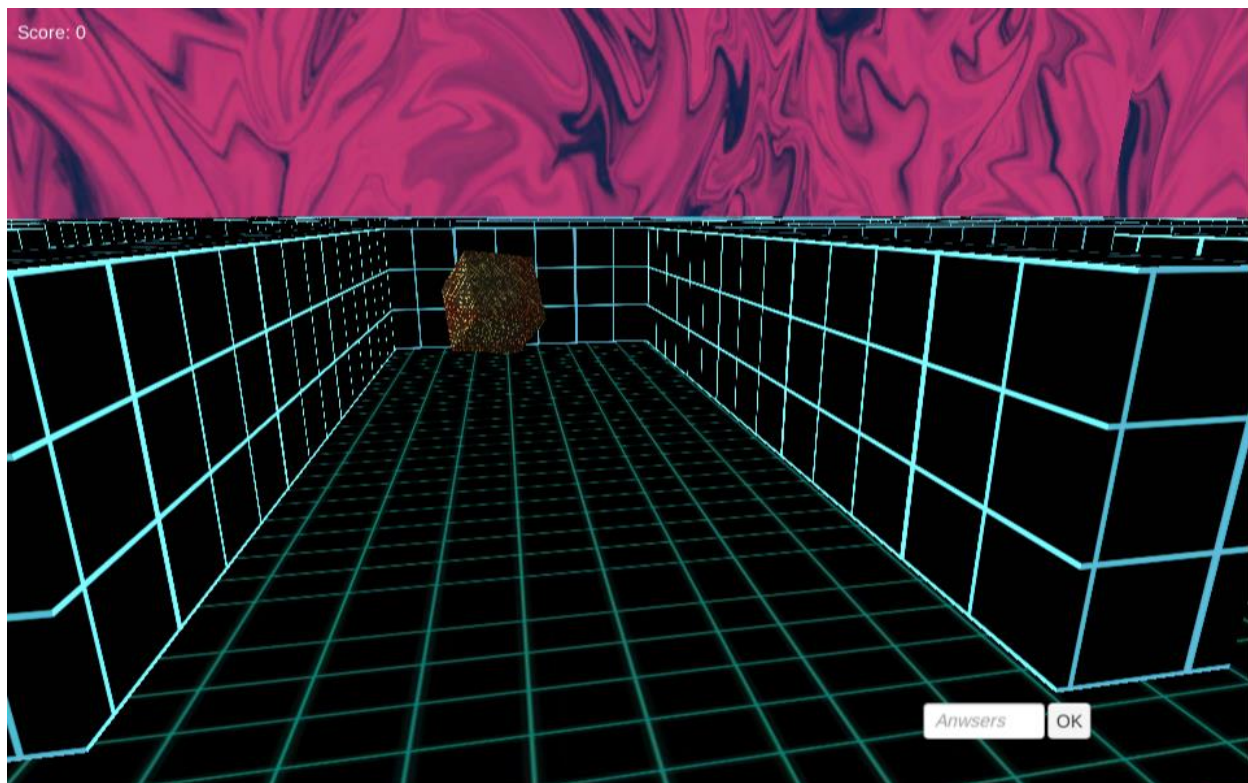
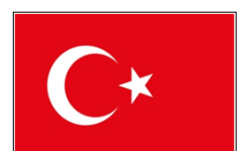This are the main challenges of the game:

- Teach how to use manuals.
- Develop logical and critical thinking and help solve problems.
- Require the good hand and eye coordination and improve the spatial skills.
- Teach/learn to carry out several actions at once.
- Teach quick thinking and making a quick decision and the situation analysis.
- Promote accuracy.
- Develop math skills.
- Improve memory and concentration.
- Encourage to take risks.

We are considering of improving our game in the future. If the student chooses the wrong answer, he or she will receive a tutorial how to solve the problem and have the opportunity to catch up with his/her classmates playing the game.

# CATCH THE BALL
# -GAME ANALYZE-

"Catch the ball" can be an useful educational tool. The objective of the video-game is to train attention, eye-hand coordination and fine hand motor skills. Can be played in the classroom or at home.

**What is the activity?**

There are three boxes. From above a yellow or a blue ball is fallen – from right, left, middle. Pupils have to "catch" the ball in the right box, matching the color of the ball with the color of the box.

**How does it work?**

Pupils had to use the arrows or the A,S, and D keys to change the color of the box. If a yellow ball is falling from middle, pupils had to use the "S" key to change the color of the box from blue to yellow, if the next ball is blue, it has to do it again. The speed of falling ball increase after each level, and that is the difficulty. The player has three lives, so can make two mistakes. Also in the upper left corner the score is visible.
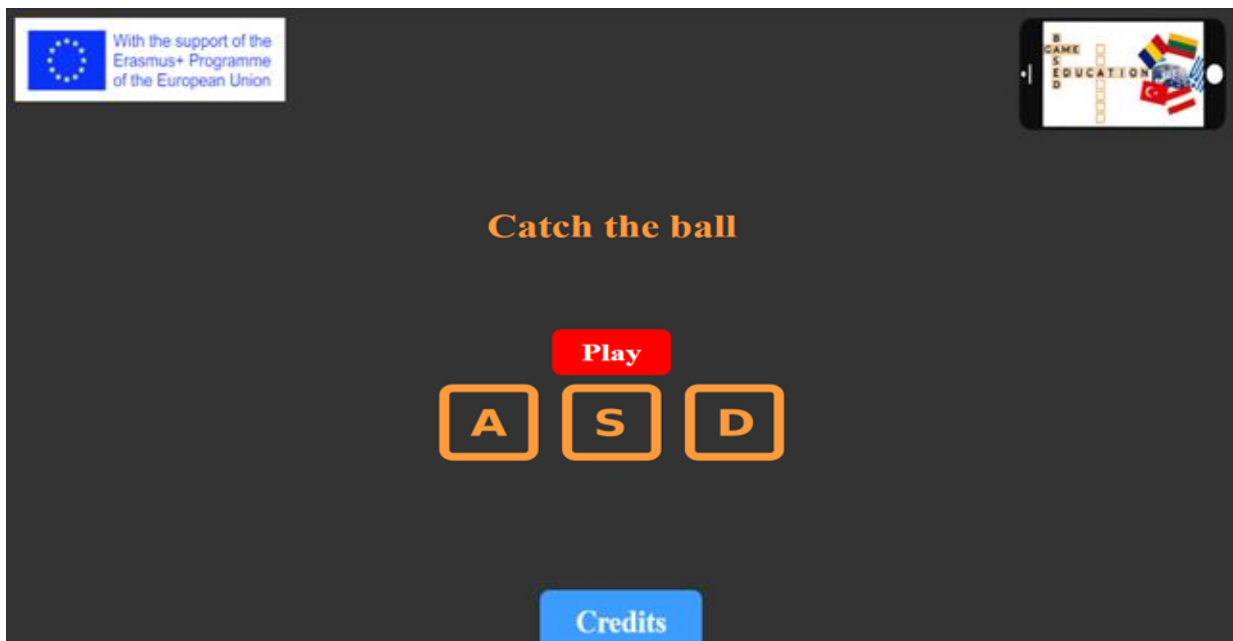
**What is needed equipment for playing?**

In order to play the game you need basic equipment that should be available in any classroom. It can be played on a computer, a laptop, a tablet, or an interactive table.

**What about the players?**

It can be played as single player. The age is 6+.

What makes the game challenging and fun?

This game is design for all children who want to improve their fine hand motor skills, attention span, develop a good eye-hand coordination, and have a lot of fun. Because the score is kept, can be played by all classmates, and make a contest of who gets a better score.
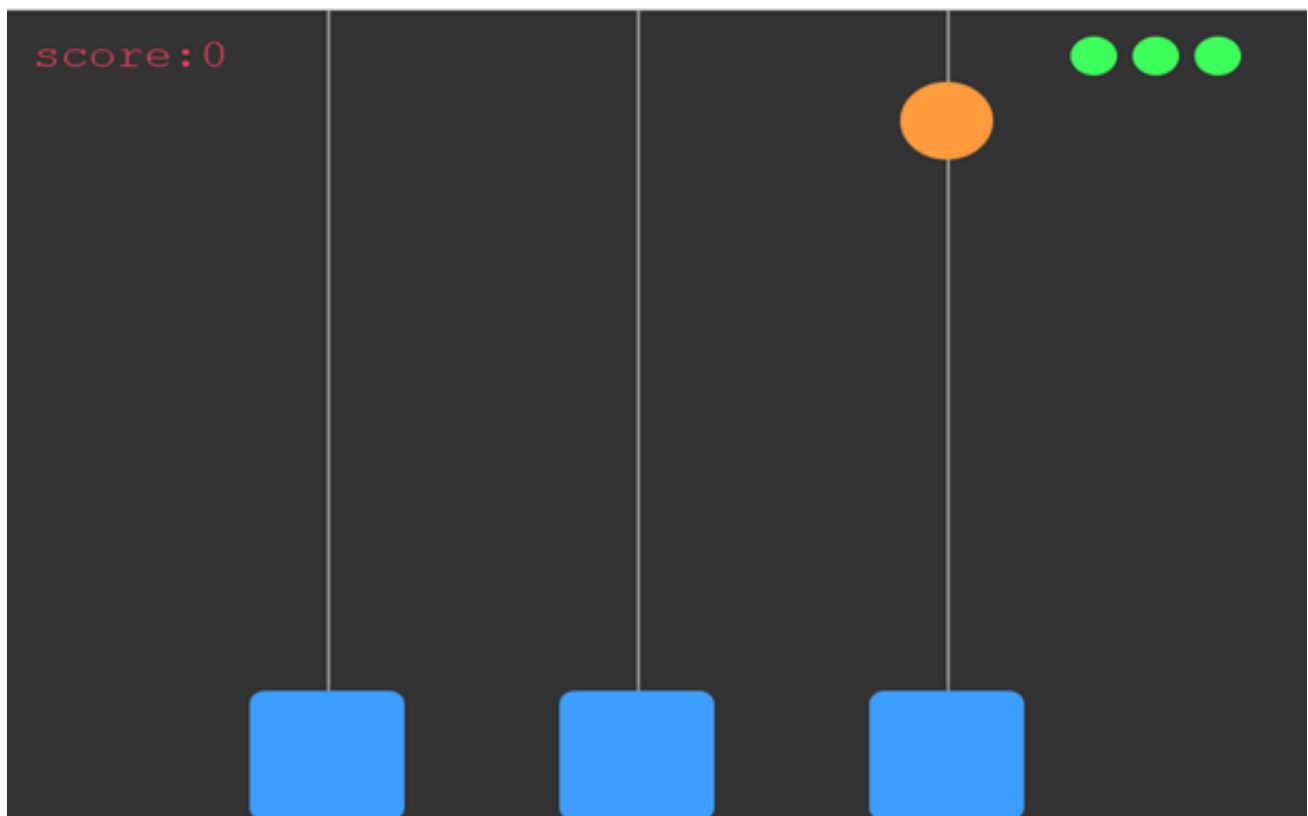
# POP THE BALLOON
# -GAME ANALYZE-

"Pop the balloon" can be an useful educational tool. The objective of the video-game is to train math and science competences by combining elementary mathematical operations and intuitive understanding of the light reflection phenomenon. In the classroom or at home pupils of all abilities can train their addition, subtraction, multiplication and division.

## What is the activity?

An exercise is written on the sun and balloons with answers fly up into the sky. The only trouble is - which is the correct one? The pupil has to figure it out and pop the right balloon by hovering over it the reflected sun ray. Sun reflection is the educational content introduced into the game structure in a hidden way.

## How does it work?

Use the right and left arrows in order to set the mirror's angle of reflection to project the sun ray toward a balloon. When the light hovers over a balloon, the color of the balloon will start to fade. The fading of the balloon means that it's thickness becomes thinner until it disappears.

- If the right balloon disappears other exercises will appear on the sun and new balloons will rise from the bottom of the screen.

- If the balloons with the wrong answer disappears, aim at the remaining options.
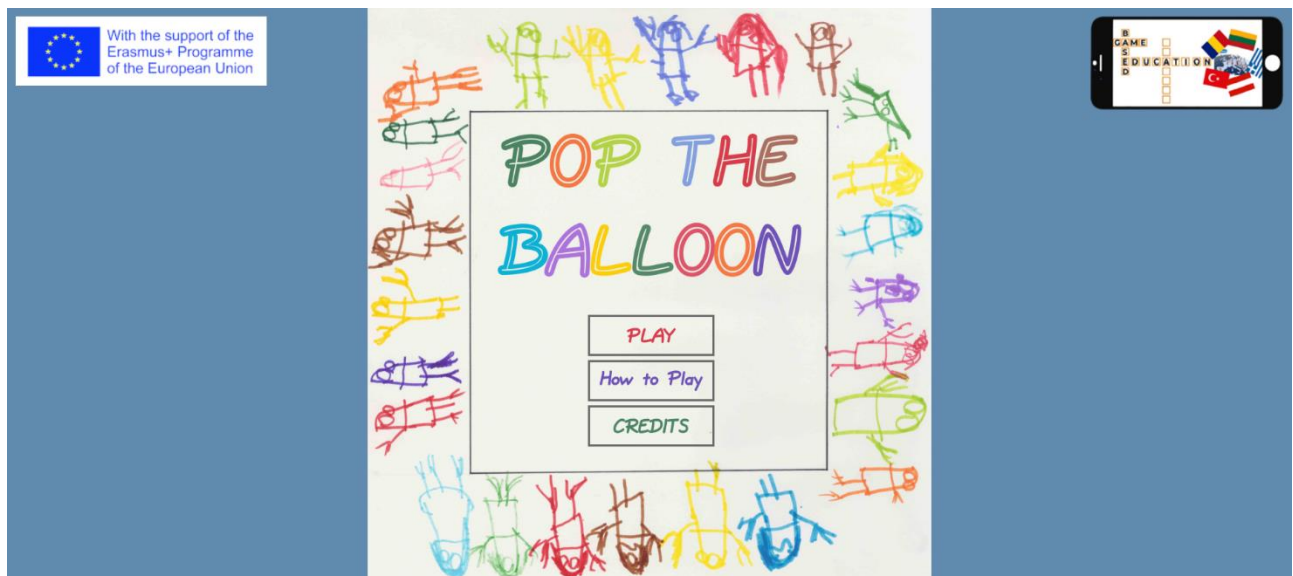
- If you want to change the answer change the direction of the sun ray.

- If you need a hint press the hint-man button on the left side of your screen.

What is needed equipment for playing?

In order to play the game you need basic equipment that should be available in any classroom. The resolution of the game is adaptable therefore it can be played on a computer, a laptop or an interactive table.

**What about the players?**

This game is a good learning tool for pupils that are in the process of acquiring basic math skills. It can be played as single player game or can be used in the classroom in different creative ways.

The age range is 7-14 for special education and 5-9 for neurotypical pupils.

What makes the game challenging and fun?

The main fun thing about this game is the beautiful and naive drawing of the pupils.

This game is design to children with mental disabilities therefore, errors are seen as opportunities to improve and ease the assimilation of new concepts.

There are no indicators of failure; this way the pupil is motivated to discover the right answer by trial and error. The main idea being that everyone should manage to finish a set of exercises without getting frustrated, sad or discouraged. Knowing that frustration reduces the implication and motivation of the pupil.
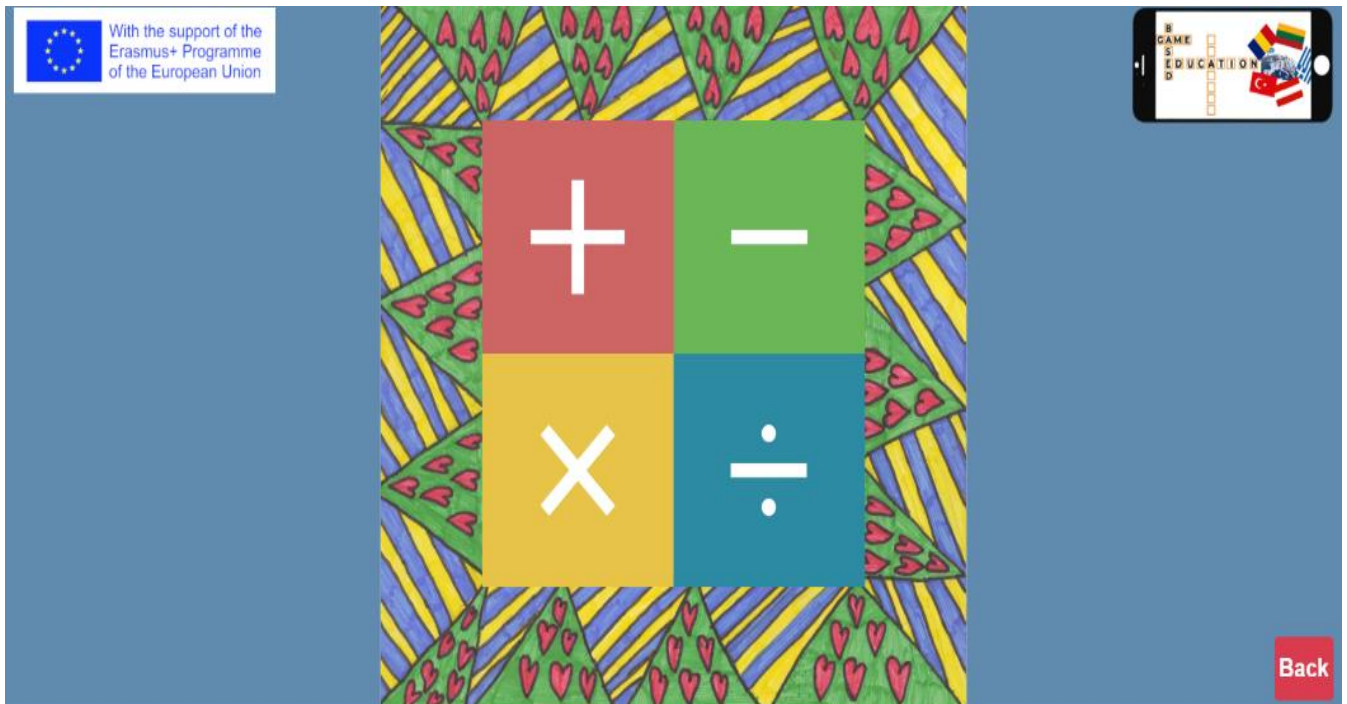
Also by being viewed as a teacher's tool the creativity of the teacher is also being challenged. The teacher can coordinate the activity and make it more challenging and fun by creating individual or team contests and by adding time limits or other incentives. They know the player's characteristic and can prevent unwanted behaviors such as fixation or inappropriate conducts of the child.

Advantages of using this game as an educational tool:

Due to pupils natural attraction towards games they can be used as an encouragement mechanism for better attention, concentration and motivation resulting in increased active implication for training math abilities. How? By making the learning process easier using an environment based on discovery and focusing the attention and concentration of the pupil to solve concrete problems, without creating frustration.

In conclusion, we have created a simple accessible game with colorful naive graphics that can be used in different learning situations. Teachers or parents can use it as a tool and can add some extra challenge like time limit, teamwork, etc.

As a perspective for the future, we propose to make it a multi-level game where the difficulty increases gradually this way the learning process can be in rise. At each level, the cognitive weakness should decrease and the challenge should be greater by adding time limit, energy levels and increasing number of exercises.
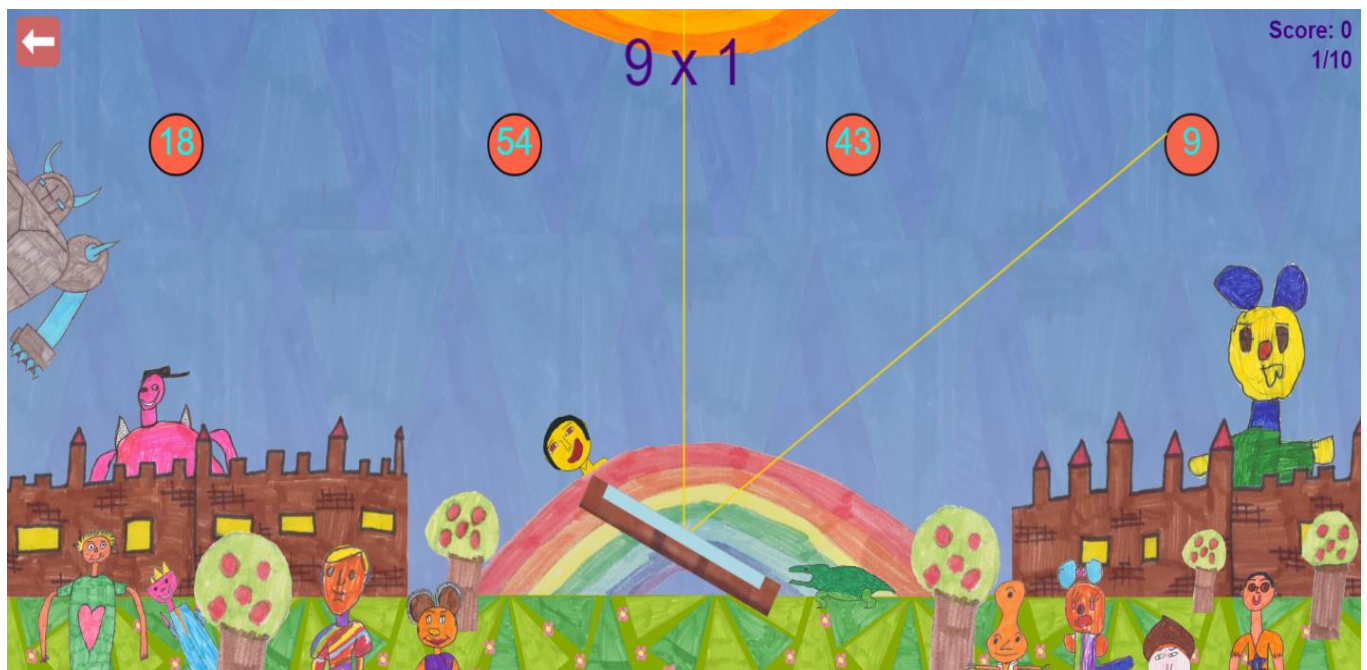
# GUESS THE ELEMENT GET THE POKEMON
## -GAME ANALYZE-

"Guess The Element Get The Pokemon" can be an useful educational game. The block based game aims to teach the subjects of science and art. It can be played in the classroom or at home. The pupils of all levels can train their addition, subtraction, multiplication and division.

**What materials/equipment do you need to play?**

In order to play the game you need basic equipment that should be available in any classroom or home. A computer with a scratch program, tablet or phone will suffice.

**Players**

It can be played as single player game or can be used in the classroom in different creative ways. The age range is 10-14 for secondary school students because they start to learn the elements at these ages. This game is a good learning tool for pupils that are in the process of acquiring basic elements' names and features.
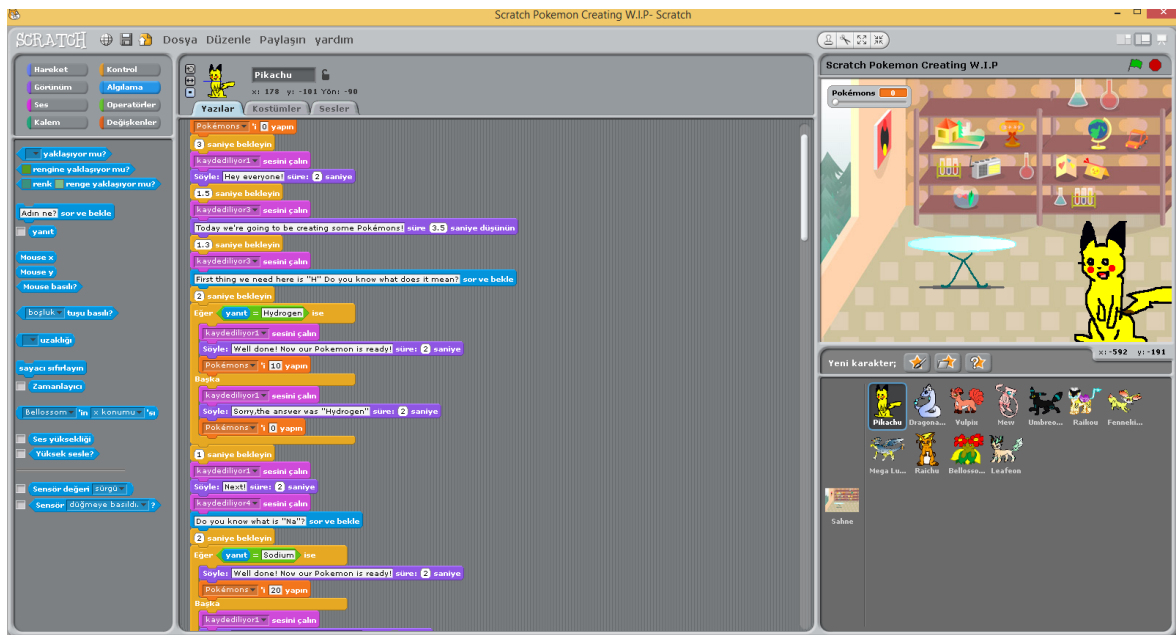
**What is the aim of the game?**

The aim of the game is to give information about the elements' names, features and, the most importantly, the elements' usage areas which are difficult to learn.

**What are the objectives of the game?**

The objectives of the game are to provide fun while teaching the elements and to improve their drawing skills.

**What are the required actions for playing the game?**

To know the names of the elements and the areas where the elements, to match them.

**What do you do to play this game?**

✓ You have to guess the full name of the elements in the questions.

✓ If you do it wrong, you still will have +10 points from the other question.

✓ You cannot get a hint because they are easy.

✓ The Pokemons are going to appear randomly whether you guess the elements true or false.
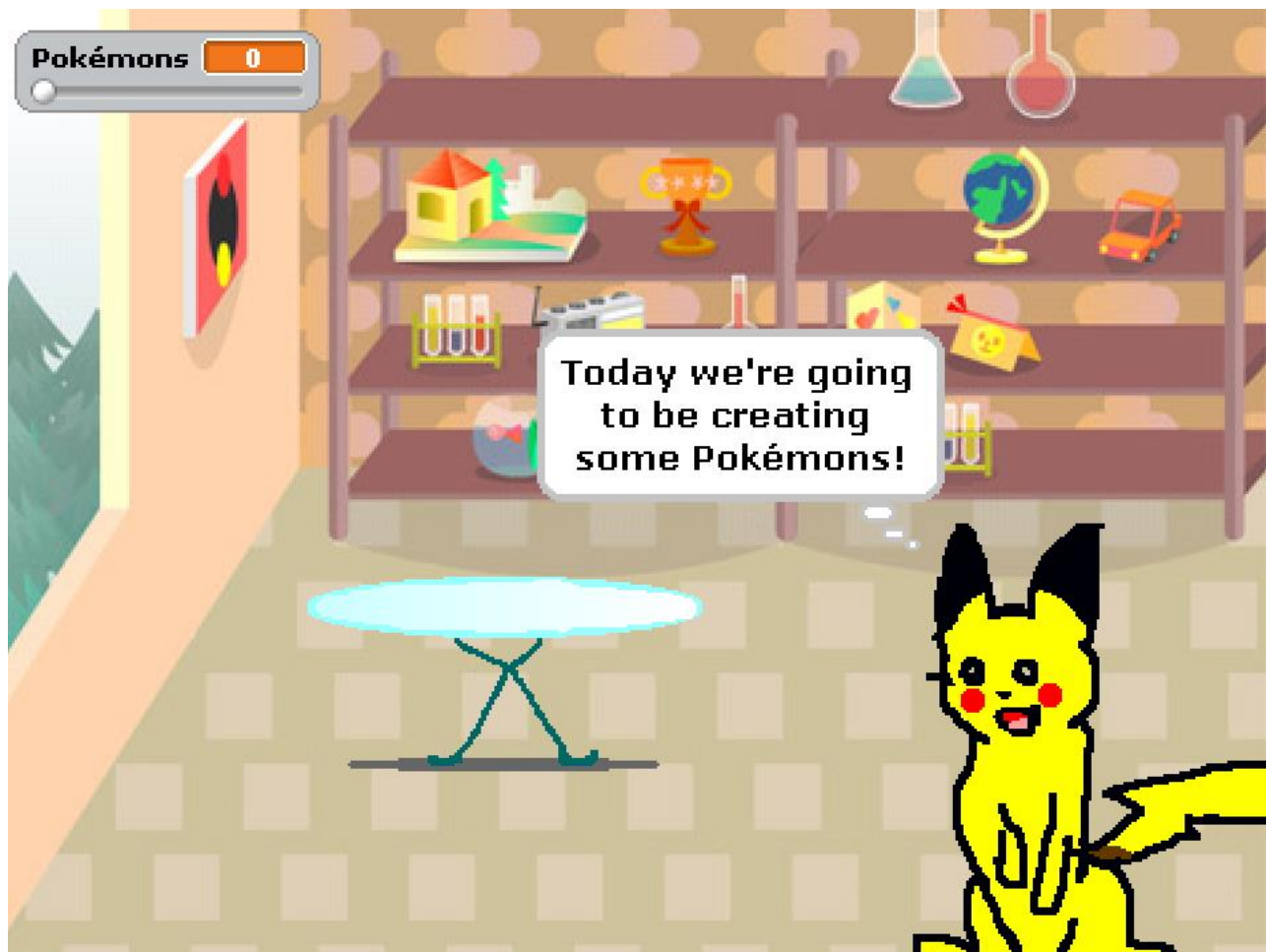
✓ All the Pokémons exist like the Elements.

**What makes this game fun?**

The most fun part of this game is that the students are together with the characters of a cartoon that they all love. The colorful images attract attention.

**Can we consider it an educational game and why?**

Yes, it can be considered as an educational game because thanks to the game, students can learn the elements and their usage areas.
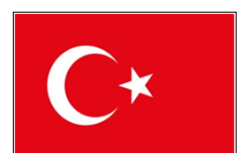
**Project web site:**

**[www.edu-games.eu](www.edu-games.eu)**