USING COMPUTER GAMES OR COMPUTER APPLICATIONS SPECIALLY CREATED, TO SUPPORT TEACHING IN THE FIELD OF SPATIAL PLANNING AND URBANISM

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Abstract: *During their studies in the field of Urbanism and Spatial Planning, Romanian students must acquire theoretical and practical knowledge in the chosen field. This paper proposes the use of computer games or other computer applications specially created, to support teaching in the field of spatial planning and urbanism. Computer games can be a plus in developing students' visual and spatial logic, critical thinking, management and problems solving, well as practicing theoretical knowledge in the field of interest, starting from certain required topics or exercises.*

Keywords: *games for learning, landscape planning games, urban games, spatial planning*

1 Introduction

In the last two decades – especially, and in the last decade - particulary, more than ever, video games, computer games and computer applications have become an important part of young peoples' daily lives. Video games and computer applications are already vital in everyday life for most children, young people and many adults up to the age of 45.

Even if overuse of video games and computer games can have unwanted consequences such as addiction or social self-isolation, no one can deny the huge potential they can have in education, of course, provided that games or applications are specially designed and created to meet certain goals, very well established.

In recent years, many educational platforms have been developed dedicated to both pupils of all ages and students. In the last year and a half, following the isolation due to the pandemic situation, all these educational platforms or video games have demonstrated both their usefulness and their weaknesses.

Due to the widespread use by young people of computer games and especially mobile applications, they can be a valuable instrument in teaching and can be used as a support for teaching many disciplines from the first years of school to university.

2 Video games and computer applications

In order to be able to present as clearly as possible how computer applications or computer games can be used in teaching, a better understanding of these terms is needed, which are defined below.

A computer application is a program designed for end users to accomplish one or more specific task or use. [2]

A game is a physical or mental competition conducted according to rules with the participants in direct opposition to each other or an activity engaged in for diversion or amusement. [3] There is no single definition of the game. The definition given above is one of the most concrete and simple definitions of the game. The same happens in the case of defining the computer game.

A computer game is an interactive digital entertainment that you can play via computer or mobile device as phone or tablet. Games can be 2D or 3D, single or multiplayers; depending on their type can be Card Games, Board Games, Puzzles, Fighting, Action, Adventure, Role Playing, Strategy, Sport, Simulation, etc. [1]

Educational computer games are games used in educational process. Their overall goal is to capture students' attention and help them gain knowledge using a fun, effective and enjoyable way.

2.1 Video games and computer applications in teaching

The study of games and their impact on young people has become a topic of interest for researchers in various fields (computer science, psychology, education) especially since this industry has "exploded" and games are used daily by young people and not only by them.

Studies in the field cover a wide range of topics such as *access and use* - difference according to sex, age, and socio-economic status, *subject matter* - thematic genres, structure, origin and background, *social perceptions* - discourses on technology, youth issues, education, *positive and negative effects* - aggression, addiction, social and cognitive skills, educational achievement and potential, impact on socialization and family functioning, etc., *other applications and consequences* – medical or didactic: special education, research in artificial intelligence, user impact on technology, introduction of new technologies into society, etc. [6]

As we mentioned before, the main aim of educational computer games is motivation and fun. [9]

However, a computer application or a computer game is based on rules, capturing the attention and motivation of the user (through various scores, stars, etc.), provides immediate feedback or in a short time. Such a "tool" used in teaching can help the student to accumulate new knowledge, sediment the knowledge already obtained, can develop logic or develop rapid strategic thinking or can help solve real problems in the field of interest (certain case studies).

In “Games, motivation, and learning: A research and practice model”, Garris et al. introduced a game-based learning model to show how the integration between computer games and education is implemented. [4]

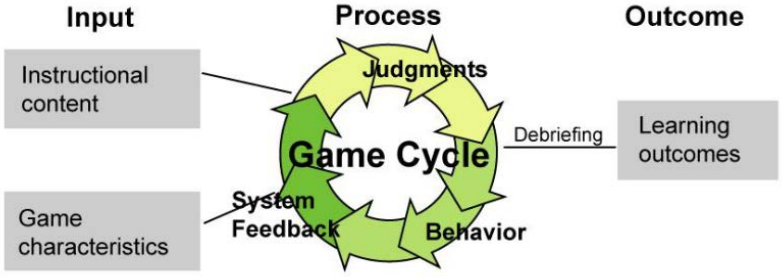

Fig. 1 Model Game-Based learning [4]

In Figure 1 is presented the Model Game-Based learning which we explain briefly: for educational computer games are important features, rules of the game and educational content (questions, exercises, problems proposed to be solved in the game); in the game, the proposed topics are judged by the student in order to solve them and practically to learn new elements,

to apply certain theoretical notions already studied or to practice and sediment the notions already learned. Depending on the student's judgment - on the options offered by the game or on the answers given (as the case may be), the game is played and depending on these behaviors a feedback is generated.

This cycle (as seen in Figure 1 and explained above) includes user judgments, reactions such as enjoyment or interest, user behaviors such as greater persistence or time on task, and further system feedback. [7]

2.2 Computer games and computer applications in the field of landscape planning and urbanism

The idea of using games in the field of Spatial Planning and Urbanism is not a new idea. On first hand, *simulation games* that successfully use the theme of landscaping, such as SimCity, began to be loved by users since the early 1990s, and on the other hand, *public participation games* with the help of which motivate citizens to get involved in making decisions about the design of their neighborhood, for example, began to be increasingly present in the virtual environment.

Games that are part of the simulation type, even if they were not created for educational purposes, can be used to discuss certain case studies, to analyze how certain decisions can influence the development of a city (over time).

3 Using computer games or computer applications specially created, to support teaching in the field of spatial planning and urbanism

In the following, we will present 2 ideas: the first to make an educational mobile application and the second to make an educational video game. Both ideas are dedicated to their use in academic environment, in Urbanism and Spatial Planning courses.

3.1 Educational mobile application for Urbanism and Spatial Planning courses

For starters, we propose an application that can be easily used from any mobile device. Mobile devices are part of the daily lives of young people, and such an application is much more accessible than an application designed only for the computer.

The application we propose is based primarily on the contents of the discipline Urbanism and Spatial Planning. We propose an application on modules, one module for each week of the course. In each module are briefly presented theoretical elements related to the topic proposed for the current week.

For each module are created a series of grid questions, with one or more correct answers, questions to help the student in verifying the acquired knowledge. The verification questions could be accessed by the student at any time, not being mandatory to go through the proposed theoretical elements, because they could have been read previously, during the classes, no longer being necessary to recapitulate them. In this case, we propose that the feedback be immediate, and if the chosen answer is wrong, the student should be given the opportunity to access once again the theoretical information needed to answer the question correctly.

To motivate the student, for each correct question he will receive a score, an attractive reward. The scores will be available on each module and could be improved, while data on student progress remain in the application.

At the end, certain tests will be available for students, with random questions from all modules, in order to verify the acquired knowledge along the semester.

This is a brief presentation of the application.

Such an application over time can be improved by adding new features, for example a dedicated account for the student, with more options, or a dedicated account for the teacher to

be able to enrich the question base or to modify the contents of the modules, to be able to manage classes and see the progress of students in a particular group.

Of course, the application must be easy to access, stable, and its interface must be user friendly and intuitive. These elements can be seen in the sketches (mockups) in Figure 2.

A mockup is a sketch of a possible user interface (UI) of the application that helps to agree on broad aspects of the UI and can be easily created. [8] This sketch can be made by hand or on a computer and defines the main sections and elements, as well as their position and relative size.

Mockups fill in the visual details (such as colors, typography, etc.) and are usually static. By looking at a mockup, you should get a good idea ofhow the final product will look and a rough idea of how it might function (even if the functions aren’t yet working). [5]

The images below capture three sketches (mockups) for the presented application.

Fig. 2 Mockups for the presented application

As we mentioned before, such an application must be easy to use and intuitive so that anyone can understand and use it. The sketches in Figure 2 outline the desired clean design for the application.

3.2 Educational computer game for Urbanism and Spatial Planning courses

The basic idea of the computer game that we will present next is to offer students a way to learn more easily the elements related to spatial planning.

Like the previously presented application and the game we propose, it is based on the contents of the disciplines of Urbanism and spatial planning and is thought out, planned on levels.

The challenges of each level are thought by the specialized teacher, according to the objectives established for that practical class. The exercises proposed at each module / level are based on one or more problems, which must be solved by the student, applying the theoretical knowledge previously acquired.

For a better understanding of the challenges of the game, we give as an example a problem that could be proposed to students:

- *Make an urban zonal plan, for Home design, kindergarten, sports base with synthetic surface, accesses and green areas. The details of this issue would be:*
  - *20 residential plots*
  - *Kindergarten (building + playground)*
  - *Sports base with synthetic surface*

- *Accesses*
- *Green areas*

During the game, students would have access to these requirements, to a map of the terrain on which they have to work, to the dimensions of the terrain (on which certain elements are already positioned, such as the main access road, rivers, etc.) and other supporting documents, for example a Town Planning Certificate can be attached - which in Romania is a document issued by the mayor's office and which includes all the elements that are required to achieve the objective of interest (such as the percentage of land occupation, height regime, existing utility networks in the area, necessary permits, etc.)

For the game is designed a system of rewards that are received by the student depending on the fulfillment of the requirements. With the obtained coins they could unlock certain (optional) facilities.

Of course, even if such a game challenges the student and motivates him to complete the requirements, the teacher's presence is mandatory. Starting from the space planning (according to the given example), discussions can start regarding the correctness of the requirements, the observance of the mentions from the Urbanism Certificate issued by the mayor's office and made available to the student, etc.

Such a game can be developed in Unity, which is a cross-platform game engine, primarily used to develop video games and simulations for computers, consoles and mobile devices.

Figure 3 captures an idea of organizing the game, made in Unity. In this image we can see the requirements with the possibility to extend them or not - for viewing, the work area, with a map (on which the main access path is highlighted), the classes - with the options to move from one level to another (because in this case it is necessary the possibility to randomly access the levels) and the possibility to access certain help documents in solving the requirements.

The main menu is the one that offers the user the possibility to access the special tools, the options of access roads and buildings that can be positioned on the plan as well as those of measurements, necessary to solve the requirements - division on plots, etc.

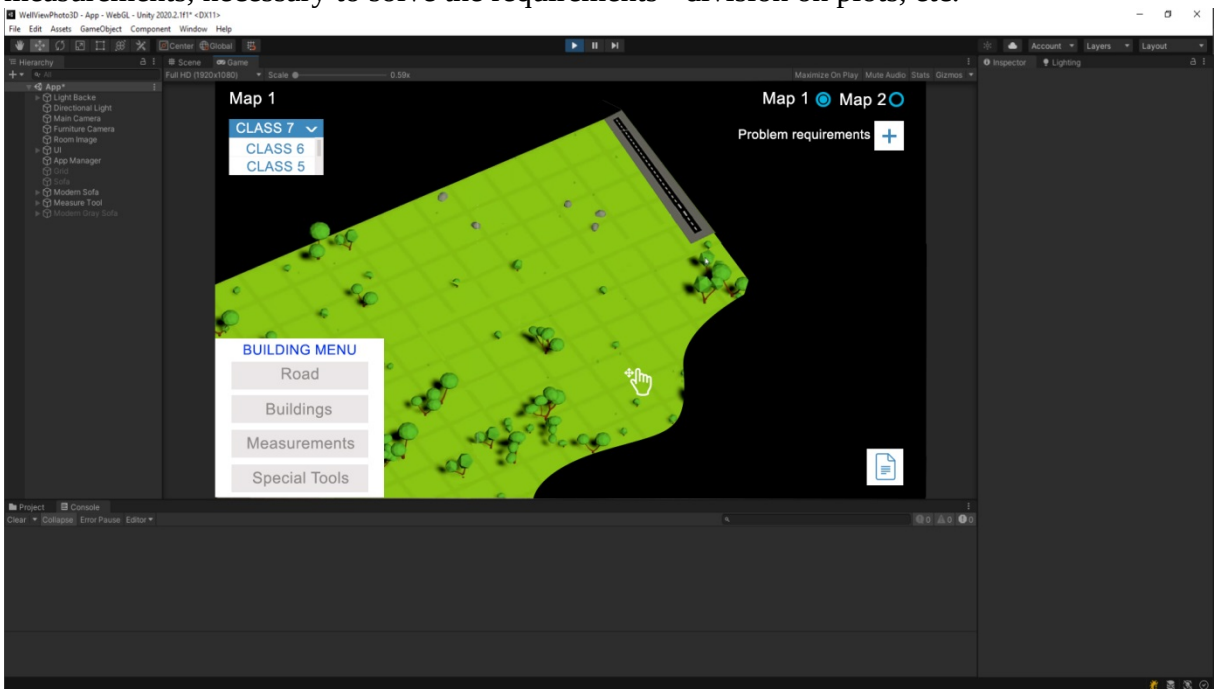

Fig. 3 Computer game for Urbanism and Spatial Planning courses – first design, Unity

As mentioned before, this is a basic idea that can be created in the implementation of the game. The game can be adapted according to the needs and requirements imposed by the content of the discipline and the desire of the teacher.

4 Conclusion

In the case of using computer games as a "teaching tool", not only the rules of the game are important, but also its implementation in the most attractive way, in order to capture and maintain the students' attention.

Teamwork is required to create such applications and educational games. The contents of the disciplines, the teacher's experience in presenting the elements of Urbanism and Spatial Planning need to be "intertwined" with the programmer's skills in order to create applications or interactive games that capture the student's attention, motivate him and at the same time help him obtain new knowledge or put into practice those already obtained.

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