EDUTAINMENT IN EDUCATION

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Abstract. In a rapidly changing world, teachers cannot stick to using only traditional methods if they want to teach successfully. As the generation that growing up today was born into an online world, education must also open towards smart devices. One way to do this is to use edutainment. Computer games made for educational purposes are called edutainment. Such instructional applications are very effective in practicing boring routine tasks, (for example in mathematics operations with fractions) or in very complex concepts (such as the operation of an ecosystem). In my article, besides introducing edutainment and its role in education, I deal with how to incorporate it into a university course.

Keywords: edutainment, courseware, gamification, IT education, computational thinking

1. Edutainment meaning, characterization

Edutainment, a portmanteau of the words "*education*" and "*entertainment*," refers to technologies and software products that combine education with entertainment in some way. In the digital age, many of these products and technologies seek to make education more attractive to young people and students.[3]

Edutainment technology has many forms. A streaming video platform or a prepackaged learning product can be categorized as edutainment if it has both entertainment and educational value. An app for a mobile phone, auto dashboard or projection screen can also be classified as examples of edutainment technology. Many edutainment tools may make use of delightful mascots or characters, either digital or in real-life films, in order to sell the entertainment value of the product. Edutainment is very much an issue in developing modern digital and hybrid curriculum for the classroom, and for supplementary educational use.[3]

Robert O. Brinkerhoff's study[4] has shown that participants in traditional training (methodology and environment) do not achieve sustainable behavioral change at 85% of participiants. This means that 10 people of 12 are unnecessarily involved in various trainings because the training is not followed by a lasting result.

Experience-based learning builds on our curiosity as a natural component of our human operation. The drive is a very strong urge to accompany us from our childhood. There may be a lot of hindrances in the learning process such as lack of motivation or disinterest. However the experience-based teaching can turn our knowledge into a problem-solving action, then we can be success.

If the new knowledge of the learning process can relate to an appropriate experience, it greatly contributes to the deepening and later recall of knowledge. [5]

2. Gamification

Edutainment is a subset of gamification. The most accepted definition of gamification is *"the use of game elements in a non-gaming context"*[2] (Deterding 2011). This definition accurately describes both the means (game elements) and the context of application (non-gaming).

3. The role of edutainment in education

By using an edutainment product, we can motivate our students, reduce the stress on them, as well as help them become more autonomous and participate in the decisions to be made in learning. When using an edutainment application, we use the following elements from games [12]:

3.1 Autonomy

While playing the game, students can get help, but they need to find a solution independently. This autonomy, although it takes more time, cannot be left out, as it creates opportunities for experimentation and re-planning.

3.2 Antidote to boredom

Many people and many times complain that students are "interested in nothing" at school nowadays. However, if we can connect playfulness to drier tasks, then students are more likely to attend classes.

3.3 Success and failure

Games are fundamentally different from the question of *success* and *failure* than traditional school assessment, and you should take advantage of this. It is a phenomenon known from teachers and parental reports that a bad mark can so much discourage the present-day students from finding it difficult to repair. The games that they had met well before school even in the case of loss encouraged them to restart the game and try again.

3.4 Immediate feedback

It is also a crucial element of well-designed games that we get a reward, that is, a sense of success, even when reaching smaller goals. The game's approach is to prioritize positive feedback because is not punished the fault, but the effort is appreciated. Of course, we still have to achieve the result, but the atmosphere of the way to it is quite different.

4. Examples of the appearance of edutainment

Many of these applications on the Internet are available for free, it is part of more and more foreign language textbooks or language schools. Gergely Nádori and Tibor Prievara gathered a number of edutainment games in their free Small Book of ICT [13].

However, we often want to create games for which no public application has yet been made. In this case, we need to create a product. Nowadays, there are many free interactive curriculum applications that are very easy to use. Let's look at some of these!

4.1 Quizlet

Quizlet is one of the most popular learning technology tools on the internet. [1] It is free available at https: /quizlet.com. On the English language page, we can create digital study sets for any subject. Then you can generate (and print) tests with a single click, and play educational games on an interactive board (or at home). [9] It is used primarily for learning a foreign language, but it is also suitable for practicing concepts and definitions, and for any task where we can form pairs of the curriculum. This is mainly due to two things. On the one hand, the content of the flashcards can be pronounced in English. On the other hand, the program only accepts the exact same string as a response, if the order is different or slides or space is omitted, an error is already reported.

The advantage of the site is that the pairs are practiced - by omitting the ones they have successfully learned - until the more problematic are fixed.

As a registered user, you can create new *sets* or *classes*. Then we can get a lot of information about these. We can see the activities of our registered students, and we also get information about which elements (cards) of our worksheets are often damaged by our students, and what are the examples that always correct.[10]

When you create a set, you must give a pair that consist of a *Term* and a *Definition*. You can select the *language* of the card for both elements. Languages include *Chemistry* and *Math/Symbols*, which include signs and sym-

bols used in chemistry and mathematics. They can be used to describe professionally the various formulas, equations and functions. You can also specify an image in the definition.

The quizlet generates the following types of tasks from our cards [10]:

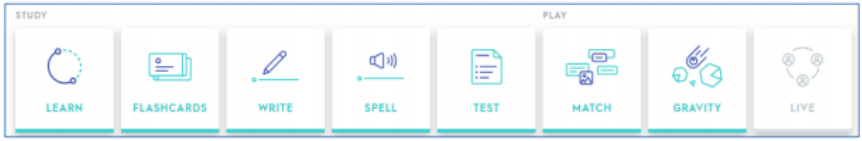


Figure 1: Quizlet task types [10]

- *Learn*: First learn the terms and definitions with a single answer. Click on the appropriate card to get the point. You can also listen to the texts by clicking on the speaker. At the end of the set, we see how many card pairs we practiced. Secondly we get one card of the set and we have to enter the pair. In the following the same task, but now the other side of the set is the question.
- *Flashcards*: Used to practice card pairs. Cards are displayed one by one and can be turned as needed to memorize the information on the other side.
- *Write*: The first page of the image card, ie the word entered in the first column (definition) appears and you must enter the word or definition you specified as your pair (term). At the end of the task line, we get feedback on our results. If we continue with the task, we will only receive the cards that we cannot solve - that is, they practice as long as the cards do not go flawlessly.
- *Test*: There are several types of tasks here: eg. Short answer, single choice, true-false assertion. By solving the test, we get the corrected answers immediately and the percentage feedback on our performance.
- *Match*: A game in which the right elements (two sides of the card) should be dragged together and they will disappear. The game goes on time, the first one wins a "match badge".
- *Gravity*: The story behind the game is that we must protect the planet from incoming asteroids by typing the missing word in the card before it reaches the asteroid on the planet. We should pay special attention to red asteroids. (These are words that we couldn't type correctly before.)

4.2 LearningApps

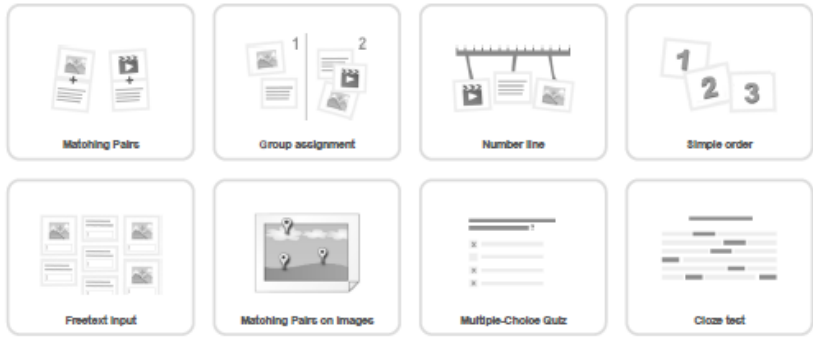
LearningApps.org is a Web 2.0 interactive multimedia application, to support learning and teaching processes with small interactive modules. Those modules can be used directly in learning materials, but also for self-studying. Easy to use, easy to learn. We can use it without registration, but we have to be satisfied with the opportunities created by others. However, after free registration, we have much more control over our blocks (called Apps) and our classes. [7]

For example, creating new blocks is also subject to registration. Our apps may be public or not visible to others. If it is public, anyone can use it to shape it. You can collect your own or other blocks, and arranges them in the folder.

It is possible to create classes and share links of tasks with our students. They do not have to register to do the tasks. However it is advisable to register, as this allows us to correspond with them and with the help of statistics, we can track their work and task.

It is also possible to create a multiplayer mode or create a collection of tasks.

The types of apps can be very diverse and are divided into three groups. They are separated by a single line. The first group is made up of the most popular, most manageable tasks. The second is more complex, more playful task types. The third group is the less well-known so-called tools. They are apps that can be used in teaching well and are complementary to the site.[8]



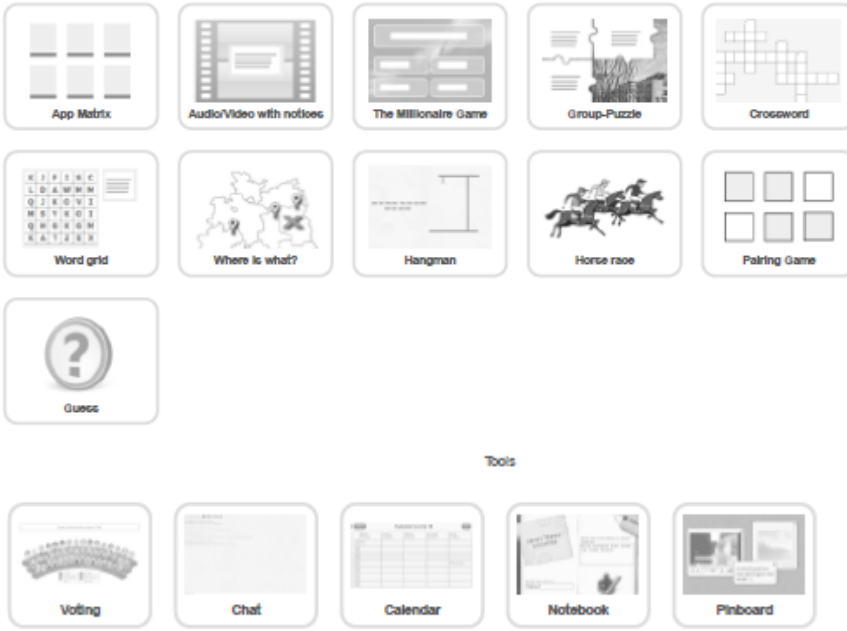


Figure 2: Learningsapp task type [7]

Most common task types:

- *Matching Pairs*: You can create text-to-text, picture-to-picture, text-to-picture, audio-to-picture, and audio-to-text pairs. Controlling can be done immediately when selecting pairs or after performing all pairing. Then it is possible to guess, to try several times as well.
- *Group assignment*: You can select assign to 2, 3 or 4 groups. We can group pictures, texts, and even write explanatory texts. Verification is done after grouping is complete.
- *Number line*: You need to sort the pairs in a range of ranges from a given range to from. The pair includes an element (text, image, audio or video) and the corresponding value (whole number, what can be found on the number line).
- *Simple order*: Arrange the text or images in the task in sequence from top to bottom, or from left to right. The check can be done during or at the end of the task, according to the setting.

- *Free text input*: We can ask the question in the help of text or pictures.
- *Matching Pairs or Images*: You can add answer options to the selected items in the image that students assign to that place marker. Markers can be multi-colored, the different colors can be a different or one large set of answers.
- *Multiple-Choice Quiz*: Choose the correct answer from the given. You can only proceed after the correct answer has been given.
- *Cloze text*: The task includes incomplete set rules, endless sentences, or text response to the image. It is important that the task only accepts the correctly described answer.

5. Edutainment in K-12 Education

My website [11] contains a self-made game program that can be used in any classroom. The name of the program is *memino*, which contains two games, memory, and domino. However, these games can be played not in the usual way with pictures or numbers, but with the knowledge appropriate to each subject. With the help of the program, the student can exercise the acquired knowledge playfully. In the games, you can play with different data tables, which are made from almost all subjects, and the subjects include more theme. One of the great advantages of the program is that not only can you game with contained curriculum, but you can easily modify and even create new ones.

The interesting feature of the program against similar game programs is that you cannot play with clean pairs, but it is possible that one card has more pairs. In this case, there may be two cards at the end that is not paired with each other. Then you have to return a card pair, what elements are pairs of the remaining cards. It may not be enough to put only one pair back.

For the sake of easier understanding, I will illustrate an example of the topic of mathematics. One element of the pairs is a number (12, 10, and 15) and the other is a property that tells you how to divide (by 2, 3, and 5). In Figure 3 we can see that each number has two (or more than two) pairs. We play a memory card with a few cards of this type (more than six). The last two remaining cards (Figure 4) may then be "10" and "divisible by 3" . These are not pairs to each other, so you have to put back a pair that can be divided by three, and its attribute is that it is a divisor of 10. For example, "15" and "divisible by 5", that can be seen in Figure 5. This way we can finish the game.

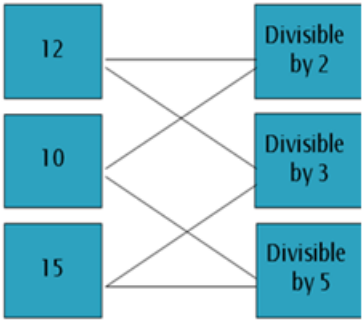


Figure 3: Initial state

Figure 4: At the end of the game, we may not end with a pair

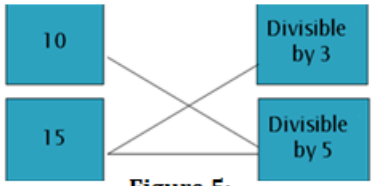


Figure 5: After putting back a proper pair

6. Edutainment appearance in "Algorithms and data structures" university course

The subject of algorithms and data structures in the reform of the ELTE IT training took a half-year earlier, ie instead of the previous 3rd and 4th semesters, it became part of the 2nd and 3rd semesters. Because of the theoretical nature of the subject, it will be more difficult for students to complete the course, which is why I started to expand the course with edutainment applications.

The apps were given as homework, available from my website.[6] If the students the task is completely solved, they get a point or *"5 minutes opportunity"*. The course has a total of 120 points available at test, and the points of the homework are added. The "5 minutes opportunity" is used for hourly delays, cumulative one-hour absence, or more time on the test. So it can be said that their rewards are quite modest, yet many listeners have dealt with it.

I also commented on the changes with the students in the form of an anonymous questionnaire. The questionnaire contained three short questions, which had to be filled in, and it was possible to write its own opinion in a non-compulsory section. The three questions looked at the sequence number, the curiosity of the task (How much did you like the apps? 1-5), and its utility (Did it help in learning? Y/N).

6.1 Group-puzzle to practice the topic of compression

To practice the topic of compression, I created a Group-Puzzle in LearningApps (shown in Figure 6). There are four *groups of concepts* in the puzzle: *"Huffman Coding", "LZW Coding", "Naive Coding"* and *"None"*. I also hid a task on behalf of the concept group.

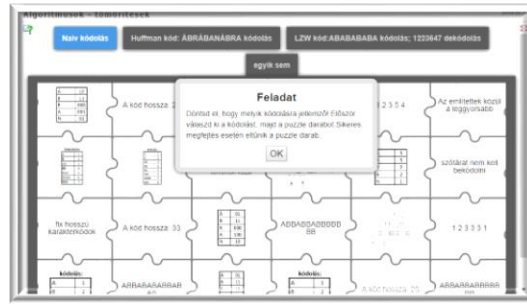


Figure 6: Puzzle starting image

The puzzle pieces are the definitions of each "group of concepts". First, you have to choose the group of concepts for the listener and then the corresponding puzzle. If you correct it, the puzzle piece disappears and the background becomes visible. The task of the students was to find out who the picture depicts. The solution was Abraham Lempel.

The puzzle pieces contained the solution of the hidden task in the name of the concept groups, the length of the calculated code, and the knowledge required for the exam.

Of course, the task can be solved with a thoughtless click, but it is much easier to think because in this case, the matching of the 24 puzzle pieces to the 4 groups involves a lot of "trial".

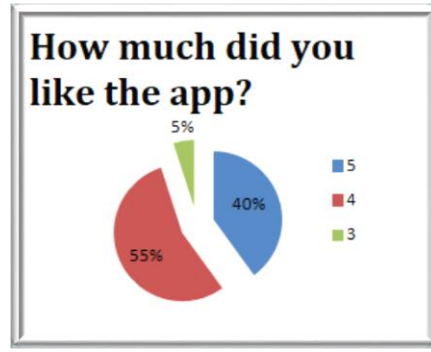


Figure 7: Students opinion on the application

Despite the modest rewards, students showed a high level of interest in the task, with over 65% participation. (32 out of 49 students.) The online questionnaire was filled by 22 students. Based on their assessment, we can say that they liked the task. (They were rated 4.32 on a 5-degree scale or found useful and everyone except one student said they helped them in learning.)

6.2 Matching Pairs for practicing AVL tree operations

To practice the operations of AVL trees, I created a memory game in LearningApps. Most of the pairs contain a *Tree before and after rotation*. (Figure 8) The other part of the pair contains *theoretical concepts and explanations* that will be necessary for the exam. Examples of such pairs are the definition of the Search Tree or the AVL Tree, the determination of the height of the AVL Tree, the textual description of the AVL Tree (Figure 9), and the relationship and difference between the AVL Tree and the Search Tree (Figure 10). I tried to show as many images as possible, thus giving an example; thereby facilitating the visualization of the theoretical curriculum.

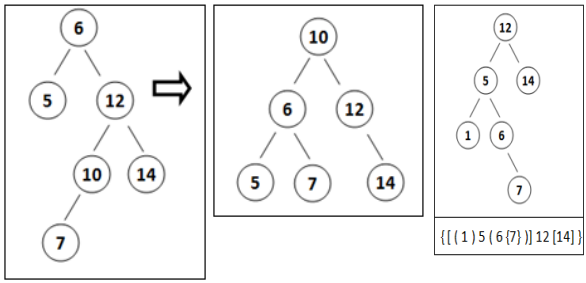


Figure 8:(++,-) rotation

Figure 9: AVL Tree textual description

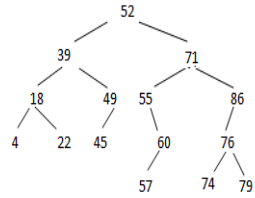


Figure 10: Search Tree, but not AVL Tree

Student participation in this task was much higher than in solving an average optional task. Of the *49* students, *21* dealt with the task *(43%)* and *20* worked well. The online questionnaire was filled by *24* students, evaluated for *4.375*, and found to be useful in *87.5%* (12 yes and 3 no). This is the task that has received most of the textual opinions that were very useful to me, including a constructive suggestion. Here are some examples of textual opinions: *"Very good and inspiring! Once I found myself drawing my 10th AVL tree in*

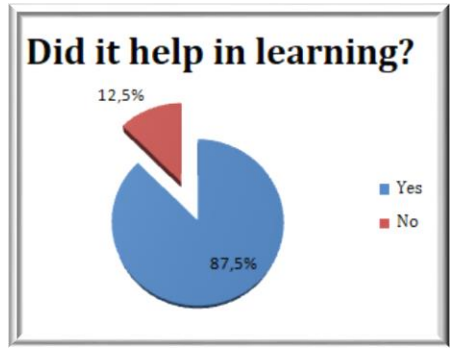


Figure 11: Students opinion on the application

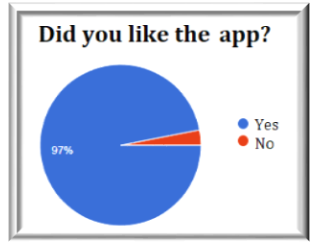
my exercise book. He managed to practice the lesson that I almost didn't seem to learn." "You can really practice the stuff with the games, I really like this method: D" "I really liked that until the man went on, the puzzle showed what was on it, so we could think about it all the way." "We had to scroll a lot and made the task more difficult and less enjoyable. Perhaps several smaller (3x3, 4x4) tasks could be split. The idea is to have a memory game that I like. "

6.3 Quizlet set to practice asymptotics

In the topic of asymptotic, I developed a Quizlet set for deepening their knowledge. Most of the pairs consist of a *function* and *its asymptotically sharp limit*, but some pairs include a *sort* and *its average time complexity*.

Figure 12: Quizlet: asymptotic

The students' opinion about the Quizlet is positive, *33* out of *43* students dealt with the task. (This means *77%* participation which is a very high rate at the university.) Everyone except a student liked to use it, and everyone except two students says that the application was helpful in learning. It was interesting to me, who did not like the Quizlet set, but also helped in learning, and the two students who were not helped by the Quizlet in learning said they liked it.



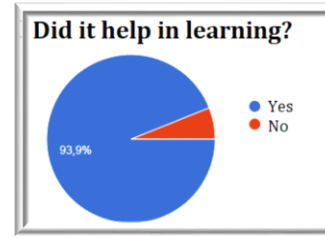


Figure 13 and 14: Students opinion on the set

Although it was not obligatory to write an opinion on it, it was more than expected. Some of these are: *"Useful and easy to learn."*

"Very good, so I noticed that I have shortcomings." "Summarizing what you need to know, I find it very useful and cool." "Ideal and helps a lot to get the knowledge you have learned in practice: D"

7. Conclusion

With appearances rapid technological changes, intergenerational differences are becoming more pronounced. The way of thinking or the way of life of the now-growing generation has radically changed. Some of the well-established pedagogical methods that have been used for decades have become obsolete, and we need to look for a new method that is related to the approach of the Z and alpha generations. There is an opportunity for gamification, which means the use of game elements in other areas of life. One of the interesting parts of gamification is when we teach different concepts with games. Computer games made for educational purposes are called edutainment. We use non-existing video games, mainly made for entertainment purposes, in our teaching, but introduce games specifically designed for educational purposes or applications into the classroom.

In my article, in addition to the brief description of edutainment, I have shown some possibilities for using in school. In addition, I investigated that which is the impact of the use of edutainment in "algorithms and data structures" university course to the student. The high participation of students in the experiment and their feedback clearly confirmed that there is a place for the use of edutainment applications not only in public education but also in higher education.

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