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Using Serious Games in Higher Education: Reclaiming the Learning Time

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Abstract. Today"s technology provides learners with full control of when, where and how they will access the learning material. Although the advantages are apparent , there are also some "side-effects". One of them is that the "learning time" is not explicitly defined anymore. It is the design of the learning application that should consider for this, reclaim the learning time and create the necessary conditions for the "learning momentum". The aim of this paper is to present a serious game that has been created for Law students at the University of Westminster, London, and to discuss the cognitive processes it activates. Serious games aim to teach students, using techniques from the game industry. Gamified elements are used alongside educational theories. The game presented here is a simulation of a tutorial that teaches the "Law of murder". Students are presented with a case, they are asked to apply the law and decide if this is a murder or not. During the game the main principle of "learning by doing" is applied. One of the objectives of the game is to make students to focus on the topic and make the best use of the "learning momentum".

Keywords. Serious Games, Learning Time, Cognitive Processes, Aspects of Serious Games

1. Technology in Higher Education: the "learning momentum"

Technology is used in education for quite long time; as a result we have enough evidence to decide about the advantages it offers to learners. Researchers agree about the educational benefits of technology, however they emphasize that there are a number of factors related with these benefits. Whatever the technology is, (from cloud computing and learning analytics to games and podcasts [2], [4], [5]) researchers seem to agree that the design of the educational application and the way it will be used are of enormous importance.[3]

Technology changes not only the way we access knowledge – it also changes the way we understand it. Especially the use of hypertext puts learners in the driving seat in relation to what information they access and how they will use it. Learners are in full control of when, where and how they will access the learning material – the advantages are apparent. On the other hand, having access to teaching material at any time and from anywhere directly affects the way the "class" or "tutorial time" is to be used. Huge amount of information and teaching material can be saved in order to be used, *"later"*.

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In Higher Education a "side-effect" of this advantage is that the perception of "class / tutorial time" changes. Traditionally "tutorial time" was considered as "time to learn". Today, students often do not make the best use of the tutorial time because they know that they can store the information. On one hand this is an enormous advantage because we achieve "any-time" "any-place" learning but on the other hand students tend to do less effort in the class. They are more keen to store information than to understand it. Even in cases where students have to produce something (e.g. create a diagram with specific data), they often prefer to take a picture of it with their mobile phones or tablets instead of recreating it from scratch or just copy it. The sense of safety – that they will be able to revisit the information at any time – reduces their attention and effort during tutorial time. As a result "learning" tends to be postponed for "later".

Storing information safely, often makes students to lose the "learning momentum" – they do not have the feeling that this is the time to concentrate, to understand, to learn. The term "momentum" has been used in Psychology (especially sports psychology) and Physics. There are several definitions of "momentum" [1]; it has been defined as the "perception that the actor is progressing toward his/her goal. Such a perception of progression toward the goal is associated with heightened levels of motivation and enhanced perceptions of control, confidence, optimism, energy and synchronism" ([9] p. 94) as well as a "positive or negative change in cognition, physiology, affect, and behavior caused by a precipitating event or series of events that will result in a shift in performance" ([8] p. 51). Most definitions of "momentum" seem to agree that is related to cognition and it results in changes in performance.

In this paper we define the "learning momentum" as the specific time or period in which learners intensify their cognitive skills in order to achieve their learning goals. During those times learners have to heighten their attention and motivation. The sense that almost everything can be postponed (because it is safely stored) can be considered as an obstacle in the effort to achieve the "learning momentum". The challenge is to use technology in order to achieve the "momentum" and "reclaim the learning time" – in other words, in order to make students focus on the learning material within limited time and maximize the use of their cognitive skills without compromising the advantages of "any-time, any-place" learning.

2. Serious Games @ Westminster: "The Law of Murder"

"Serious games" are simulations of real-world events or processes designed for the purpose of teaching and training. Their aim is to enhance understanding of key concepts, along with the development of cognitive skills. As they are more likely to capture the imagination of students than other more traditional forms of classroom teaching, they have been characterised as "valuable pedagogic mediums" [7].

Here we will present and discuss the design of a game we developed at the University of Westminster, for the needs of the second year module "Criminal Law". "Law" is a discipline where "language" plays a major role. Lecturers in Law should *"explain"* more than *"show"* (as it happens in other disciplines such as "Programming"). As a result the design of interactive material that is not boring or trivial is a challenging task.

The topic of the game is "The Law of Murder" and it is a simulation of the tutorial used by the Lecturer. The "story" is about two friends: Alf and Bob. After an argument

Alf makes and action that results in Bob"s death. Students have to decide if this is a murder or an accident. In order to do that, they have to study and analyze the "law of murder" and apply it to the specific facts. The IRAC framework (**I**ssue-**R**ule-**A**nalysis-**C**onclusion) that is used in the analysis of legal cases was followed. The game is a journey during which students have to go through 6 steps: factual analysis; understanding the law of murder; apply the law of murder on facts and identify issues; analyse causation; analyse intention and reach the final verdict (see Figure 1). In each step there are several game activities that try to keep students" interest alive and involve them with the case.

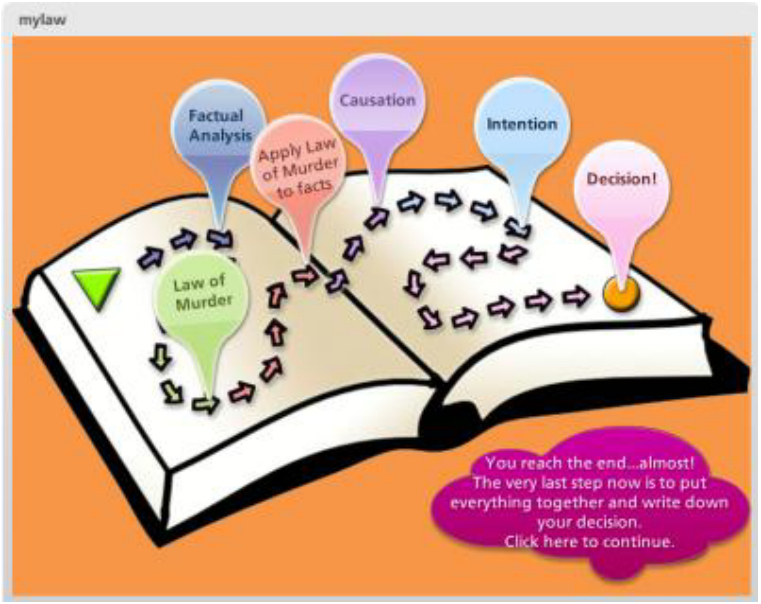

Figure 1. The "Law of Murder" – pathway

At the beginning, the story is presented as a "comic". Students have to identify evidence in the pictures and in the text that accompanies the pictures as well as in the dialogues between the two friends. Several activities with gamified elements were designed and implemented: multiple choice questions; give your own answer; complete the triangle, knowledge game. Simulation of elements of well known TV games (such as "50/50 help" and "Use the dictionary") has been used. Behind the "entertaining" character of this application there are several pedagogical objectives: active involvement of students; understanding; reading and writing skills.

One of the main challenges in this game was to create the "learning momentum". Based on the definition we provide before, we tried to make students to focus on the learning material within limited time and maximize the use of their cognitive skills.

3. Reclaiming the "learning time"

In order to create our game we simulated the steps that are usually taken during a tutorial. "Timed activities" and "active participation" were used.

3.1. Timed activities

Students are given the first and the last in a series of events and they are asked to use their knowledge and imagination in order to fill the gap. They are given 1 minute to answer the question "What kind of questions would you ask in order to find out what happened between Alf and Bob?" (see Figure 2). They are provided with space where they can write any question they like. Student answers are saved on a variable and are used in the next activity.

The main purpose of this activity is to make students work on the facts. They have to understand how the story started and how it ended. They are given very limited time in order to complete the answer. It is this limited time that creates the "momentum". Players do not have as much time as they want or several chances to complete the activity. If the activity is not completed within the given time then they lose marks and they might not be eligible to continue to the next step.

The decision about the time that is given to students to complete this exercise was an important one. The purpose was to keep the attention of players focused on the story and make them participate actively. Most teachers and psychologists agree that the ability to focus attention on a task is crucial when we try to achieve a specific goal. Although the importance of attention is undeniable the "attention span" (the amount of concentrated time one can spend on a task without becoming distracted) causes discussions among psychologists and it depends on how we define "attention". The short-term response to a stimulus ("transient attention") could be between 1 to 10 seconds [6]. The long-term attention could be up to 8 minutes. We decided to keep the time tight and we gave only one minute to this activity.

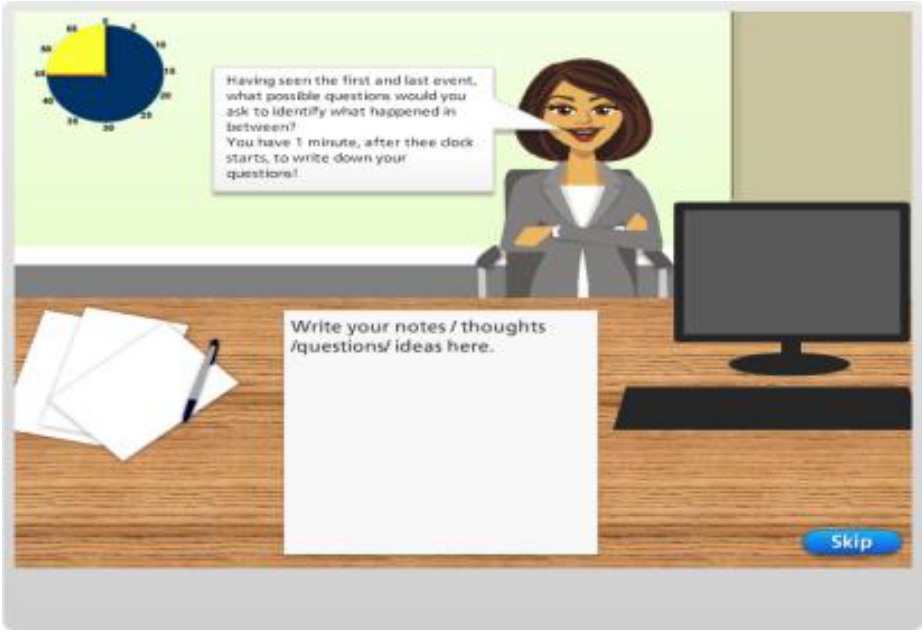

Figure 2. Timed Activity (1)

After the one minute expires, students continue to the next activity where they are presented with sample correct answers and their own answers; they are given another minute to compare them (see Figure 3). During this time they have to read and understand the correct answers and to "assess" themselves – in other words to find out if and how many of the correct answers they have managed to identify. The first timed activity requires from students to concentrate and compose their own answer and then it feeds the next timed activity where students are asked to compare their answer with possible correct answers. Although there is no personalized feedback at this stage, the way that this part is designed is a direct simulation of what happens during the tutorial time: students have to understand the correct answer and partially peer observe their work.

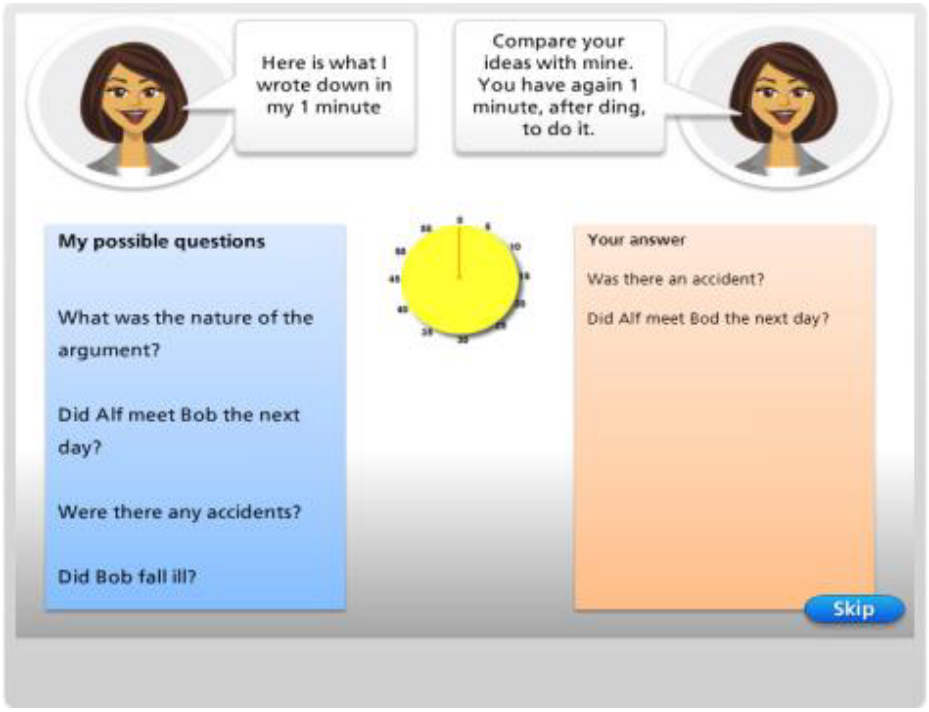

Figure 3. Timed Activity (2)

3.2. The "back" button

Another way to intensify learners" attention is the lack of "back" button. Deliberately the application does not provide any "back" button. Feedback – wherever it is needed – is provided on the spot and students are not given the chance to go back and do an activity again. The reason behind this design decision is not only because usually games do not have "back" buttons. Not having a "back button" in a learning application with gamified elements is done in order to achieve the maximum concentration. It is the effort to reclaim the "learning time" – the time that students have to focus and make the most out of it.

4. Implementation, evaluation and further work

The implementation has been done with "Articulate Storyline 2". Storyline is an e-learning authoring platform. There are several reasons why we chose to use an e-learning authoring software instead of a game creating tool. Some of them are:

- easiness of use;
- great tools to build interactivity;
- developers can add web objects as well as their own code.

Furthermore, a "Storyline" project can be published in multiple formats so students can use the output on their i-Pads or Android devices as well as desktops and laptops. Published projects can be distributed via "virtual learning environments", such as Blackboard and Moodle.

As the "game-tutorial" unfolds students have to complete several games where they gain points. The published version (HTML5) is connected with Google Documents. The results for each activity are saved in variables in a Google Form. Furthermore, all the actions of students are saved on variables; for example, we can see how many efforts students did before they provided the correct answer as well as what the previous efforts were. The game consists of 97 variables that are related with learning objectives. Variables 26-33 are related with the following question (see Figure 4) and provide information about the answers players tried before the correct one, if they used any "help" ("Use the dictionary" and / or "50/50") as well as the points they gained from this questions and the total score at this stage of the game.

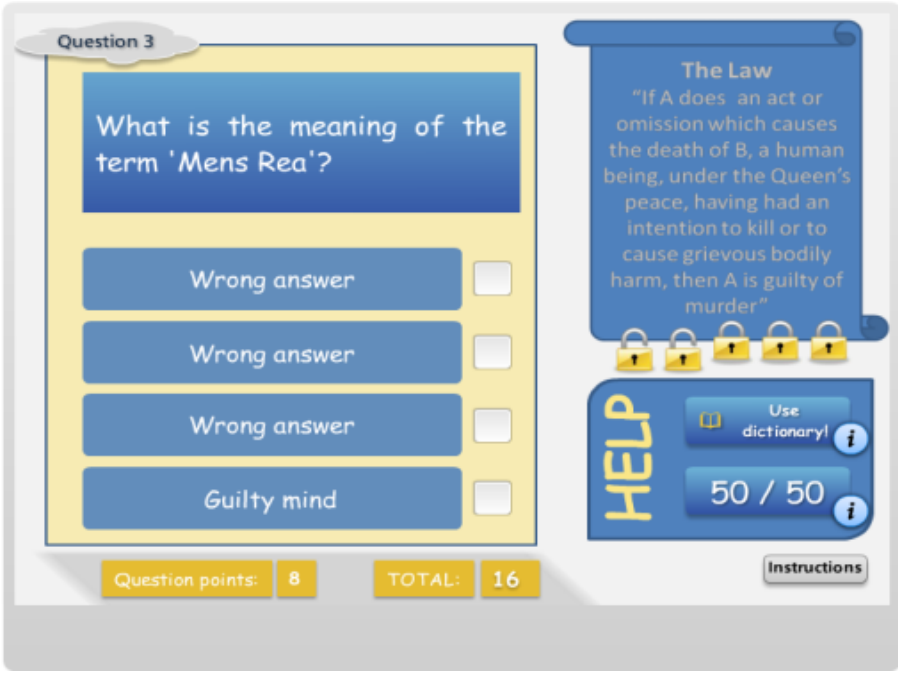

Figure 4. Question with help

Up to spring 2015, an initial expert evaluation has been completed. The game was evaluated with 4 lecturers at the Westminster School of Law. All of them were delighted with this and we received some very good comments. Among the feedback we received were questions in relation to the "back button". As explained before, the lack of "back button" was done on purpose.

The above described game was developed for the "Criminal Law" module, at the University of Westminster, that is attended by over 300 students. A proper testing has been designed for students and it is expected to take place during summer / autumn 2015.

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