NEW MODEL OF MOBILE LEARNING FOR THE HIGH SCHOOL STUDENTS PREPARING FOR THE UNIFIED STATE EXAM

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ABSTRACT

In this paper we study a new model of mobile learning for the Unified State Exam (*USE*) preparation in Russian Federation. USE - is the test school graduates need to pass in order to obtain Russian matura. In recent years the efforts teachers put for preparation of their students to the *USE* diminish how well the subject is actually mastered by the students. The problem lays in the key performance indicators the teachers must reach. The *KPI* is not unified across the country, but often it includes, in one or another form, the *USE* score the students get.
The main proposition of this research is to use gamification in order to transfer the *USE* preparation out of the classroom activities. The most natural platform for this gamification is the ecosystem of the smartphones and social media available to the students. We build the *USE* preparation didactical model that addresses the challenges the teachers currently have. Then we discuss the architecture and the implementation for the whole solution.

KEYWORDS

Mobile learning, education, software engineering, education technology, pedagogy, unified state exam.

1. INTRODUCTION

We have been studying gamification for different settings (Khasianov et al., 2016, Suleymanov et al., 2016). Now we shall consider the unified state exam (*USE*) school graduates have to pass in order to apply for the tertiary education institutions. Often the teacher has the bonus reduced if the students perform below certain threshold in the *USE*. Thus the teacher is not motivated to invest time in teaching really complex topics, neither the teacher is motivated to pursue the deep understanding of the subject. The students in turn only get to master very basic competences just enough to perform above the threshold. This sort of the extra work does not improve the understanding of the subject by the students.

There are two challenges: a) remove the unnecessary workload from the teachers without compromising performance of their students according to *USE*, b) increase the students' involvement, and let the teachers spend their time to actually teach the subject.

We propose to a) remove the *USE* activities from the classroom; b) involve the students in the self-sustained process of the subject mastery, while thoroughly learning the subject; c) measure what *USE* score the students get.

Our proposal is to shift the most routine tasks from the classroom to the mobile application. Then we "gamify" process of solving the typical tasks one by one. We make the students get involved in the competition. We also motivate the students to help each other in learning how to solve the typical cases their classmates don't understand. We already have started the experiment in one of the schools, we have collected the teachers feedback, and implemented their user stories in the application the children will get on their smartphones. During the next two years we shall be collecting the data on the general mastery of the subjects involved, and the *USE* performance of the participants of the experiment. All the activity is done extracurricularly, the teacher's participation is limited to the roles shown below in the model description. The children use the smartphone application to solve problems, search for tutors and tutees and improve their scores.

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2. DESCRIPTION OF THE MODEL

The project called *Gamified preparation for the Unified State Exam (GUSE)* can shortly be described with the use-case diagram. We follow here the *three agent systems* design pattern described earlier in Suleymanov et al., 2011 and Khasianov et al., 2017. According to the *three agent* approach the digital education environment is build around the three agents: the *teacher*, the *student*, and the *system itself as an actor*. In this case the student can take one of the two roles, or even both at the same time for different topics: the *tutee* and the *tutor*.

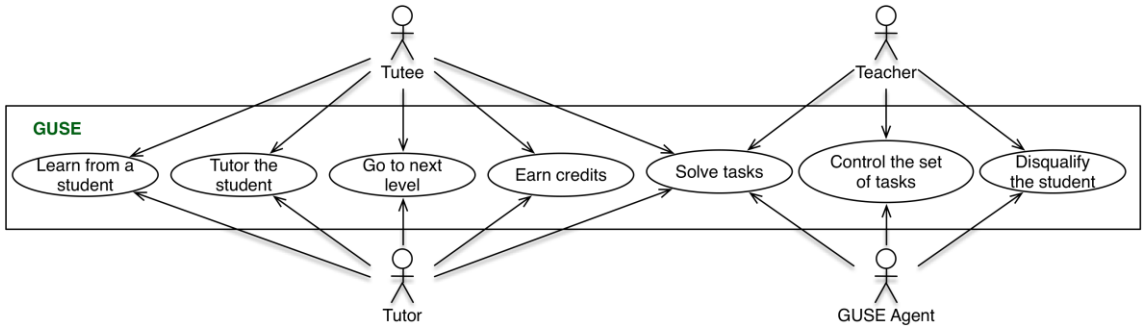

Figure 1. Use case diagram for the GUSE.

The *teacher* and the *intelligent agent* can both *control the set of tasks* the system takes form the open sets of the assignments. Both of the two actors may also *disqualify* a students for certain inappropriate use of the system. The student can either *tutor* another student, or *learn* from a *tutor* student. According to the performance and the achievements the student in either role (*tutor* or *tutee*) can earn credits, and even can be *promoted to the next level*. The *level* is the rough representation of how far the student will get in the actual *USE* exam according to the currently demonstrated performance. Some tasks the student solves as a *tutee* may need a human peer review, therefore the *teacher* is still involved in the activity. But the total amount of workload of the teacher is dramatically reduced when using the system, since major part of the work related to assigning unique test sets and control of the students feedback is done without the teacher's intervention.

For some cases a *tutor* student can also be involved in the solutions evaluation. Thus we extend the range of possible solutions the students get introduced to. We thus also further reduce the teacher's workload. The tutoring also speeds up the student's transition from the unconscious incompetence to the conscious incompetence, and then further through the conscious competence to the unconscious competence (Sprague and Stuart, 2000). The feedback is crucial for the knowledge acquisition (see e.g. Butler and Winnie, 1995), and both the submissions feedback and the tutee-tutor interaction gives the student the right kind of feedback for the *self-regulated learning* setting we create. The general principles of cognitive tutors design are well presented as early as in Anderson et.al., 1995. For the rather simple *GUSE Agent* we follow the same guidelines.

This model is an instance of the blended learning approach (see Bonk et.al., 2006). The teacher can't be excluded from the system. We don't want the learning degrade down to the automated *USE* training. Our main objective is to let the teacher do the job, while the routine tasks of *USE* preparation are taken care off.

The process of tutoring and learning, where the *tutor* and the *tutee* are involved, happens outside the application. Preferably, in a face-to-face manner. The application only registers the shear fact of the relation and the topics being tutored. The application also lets the students evaluate each party, and then tracks the performance gains of the *tutees,* within the topics worked through with the *tutor,* in order to increase the credits of the *tutor* student.

We should be careful with the motivation (see Atkinson, 1964). Our goal is to reinforce the students' motivation of mastering the subject and performing their best at the *USE.* But we should not replace that motivation with the *game*. In order to create the right *motivation* we a) let the student expect better performance at the *USE* after doing what the model suggests; b) show that the higher *USE* score opens better future tertiary education opportunities - that assigns value to mastering the subject.

The model creates the setting where the students not only have a lot of practice, but also assign clear goals to their practice. Thus we expect the goal-provided students to perform measurably better than average as a result of their goal-directed practice (Rothkopf and Billington, 1979).

The *Levels* communicate the students relevant information on how close they have come to reach their *goals*. This information is timely provided when the students still can correct their learning strategies. Moreover, there are motivated *tutors* that would seek for the *tutees*, in order to increase their own credits and understanding. The *tutor-tutee* relationship also gives the students feedback on the concrete reasons the students underperform in certain tasks, unveil the blind spots and particular flows in the *tutors'* understanding of the material. That in turn improves learning (Cardelle and Corno, 1981).

The application limits how much practice the student can take in a day. Thus we let the students have time to develop knowledge (Carey, 2014).

The gamification made right also creates productive and positive climate around the *USE* preparation. Provides the students with the feel of control, and makes the whole (normally stressful) preparation for one of the most important exam in their lives a bit fun. We know that the climate the students live in, while learning, has tremendous effects on what and how well they learn (Astin, 1993).

3. GAME MECHANICS

According to Salen and Zimmerman, 2003, game has three important aspects: *rules*, *play* and *culture*. All of the objects in the game should be in the system of well-defined relationships that create clear rules. The players choose strategies to reach their goals within the rules of the game. Social and cultural context of the real life apparently affects the players' behavior in the game. Thus, any game has three aspects: *cognitive, emotional and social* (Lee & Hammer, 2011). Each of these aspects is reflected by the corresponding game mechanics.

The *cognitive* component of the game supports experimentation and discovery. Understandable and achievable *goals* and *challenges* that gradually increase their difficulty according to the skills development of the players are also essential to keep the students in the proximal development zone (Vygotsky, 2005). It is also important for the *goals* to be desired by the students (Atkinson, 1964), while leaving the freedom of how the goals are actually achieved. In our case, the *goal* would be passing the USE with the highest possible score, and the *challenges* are the tasks to solve in order to achieve the desired score (Khasianov et al., 2016).

The next aspect is the *emotional*. The *USE* preparation takes time, and the absence of the continuous feedback may diminish the students' motivation. It is crucial for the student to receive the continuous feedback. We implement this through the progress indicators, that show the players how close they have come to their goals, and correct their strategies if needed. The progress indicators are presented in terms of *points*, *levels* and *badges*. *Points* are the progress units the student receives when completing a tasks. The total number of *points* creates an individual *score* of the student that can be used to show his/her rating. *Levels* represent the difficulty levels that correspond to the parts of the *USE*. *Badges* are awards that can be received by the student doing certain activities. A *goal achievement* is awarded with a *badge*, in addition, the *badges* can be obtained by performing certain *challenges* or combinations of certain actions in the mobile application. In order to create positive emotional climate, and avoid the stress accumulation. It is very important to let the students do mistakes.

The *social component* allows players to try new social roles, and establish communications in the game environment. In the *GUSE* context a player who has achieved certain rating level can become a *tutor* and help other players to reach their *goals*. It allows to strengthen the positions of the students (as a *tutor* and a *tutee*) in the social environment. One more way to organize effective communication and involvement is a *competition* which provides another opportunity to get the proper feedback about the exam preparation progress.

4. CONCLUSION

We propose a model that puts the right weight for the course mastery and the test preparation activities during the graduation year at the high school. We start the experiment with the high school students in order to prove our approach right or wrong, although we put thorough theoretical basis under our development. There are several aspects of the model that can be listed shortly: a) the teacher is relieved from the routine activity; b) the students get timely informative feedback in terms of approaching their goal and in terms of

what is wrong with their mastery of the subject in particular; c) the systems provides a lot of practice, but the problem sets and the time limits a set individually with accordance to the student's workload, performance, and the assignments other students get; e) the model works only as a part of *blended learning* paradigm; f) the model encourages social interactions and creates positive climate giving the goal, the value, the feel of control and introduces a bit of a fun game with friendly competition in the initially very stressful situation - we take the attention away from the actual moment of the *USE* that is glooming over the cohort in the nearest future; g) the model supports inherent motivation, and this is important; h) the general architecture is built around *three-agent* concept for educational digital tools, where the system can take actions, depending on the individual and social dynamic of the learners.

There certainly will be further research of the subject, as well as the analysis of the experimental data.

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