Co-designing the Adaptive MyPractice Sim for Undergraduate Students

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Abstract: To improve retention rate of factual knowledge for health students we set out to design a game which challenges students to continue testing themselves during their studies. Since we intend for them to play this game for at least two years, we had two major challenges to overcome. Firstly, how can students feel motivated to continue playing for two years on end, and secondly, how can enough content be generated for a two-year game play. The first challenge was solved by tapping into a core motivation of health students: many intend to start their own practice and for that, they want to be involved with other practitioners. We, therefore, proposed a sim-type game in which students cannot just practice on virtual patients but also on practitioners logged in as a patient. The second challenge was tackled by building a flexible framework for case collection, and including the production of those cases in the curricula of the involved programmes.

Keywords: Content generation, Sustained motivation, Continuous testing, Health education game, Adaptive sim

1. Background

For health professionals, it is imperative that they have a wide range of knowledge at their fingertips, not just recently learned information, but many facts learned throughout their entire curriculum (Dijksterhuis, 2014; Bligh, 2003). At the same time, however, analysis of relevant studies has shown that medical students will have forgotten about 30% of their basic medical knowledge within one year of passing their tests and approximately 50% after two years (Custers, 2010). It is hypothesized that this loss of factual knowledge results from, among other things, the way students prepare for their tests. Just before a test is due, they will plan a few 'cramming nights', and rely on that short-term knowledge for their exams. However, cramming, first described by Ebbinghaus in 1885, has long been identified as an ineffective study strategy when it comes to retention (McIntyre & Munson, 2008). Despite these well-known negative effects, however, cramming survived as the preferred method (Bickerdike et al., 2016).
It is far more effective to implement not only spaced studying – multiple moments of studying the same material over an extended period (Bahrick et al., 1993) – but also spaced testing: continuous testing of knowledge (not just once to pass a test but again and again). Of these two strategies, continuous testing seems to be the most effective, but mainly because spaced testing induces spaced studying (Roediger & Karpicke, 2006). This study, therefore, set out to develop a way to structurally facilitate (or elicit) a spaced studying/testing strategy for first- and second-year allied health professional students (dental hygienists, dental technicians, speech therapists, etc.).

2. Gamifying medical testing

Nowadays, when attempting to increase the time-on-task and academic learning time of students (i.e. spaced studying/testing), it is a small step to borrow strategies from the world of gaming. It has been shown repeatedly that introducing gamification in educational processes improves retention for individual elements of a programme (Gorbanev et al., 2018; Smits, Schenk & Van Ewijk 2019). In games, continuous testing is a common mechanic and players willingly submit themselves to these challenges. That is exactly the attitude we want for our students.

Therefore, this study researches the design options for a game that improves the retention rates of students' knowledge by facilitating these strategies. There are specific challenges, however. The result of this study is not meant to be a game that supports just one part of a course. The resulting game is to keep students engaged for the full two years of their programme. That poses at least two major questions:

- Firstly, how can students be motivated to sustain a two-year game play?
- Secondly, how can a diversity of renewable content be provided to sustain a two-year game play?

We will elaborate on these questions below.

3. Motivating the target audience

To address the issue of keeping students motivated we did a preliminary study. In a co-design set-up, graduate students researched game mechanics and game concepts, and eventually designed potential games. The main goal of these sessions was to explore what drives these allied health students and what motivates them to play.

During this study a recurrent result was that for students 'having fun' was not a major reason for playing this game. They were, however, extrinsically motivated to play if playing would benefit their studies and themselves. According to Deci and Ryan's self-determination theory (2000), the following three reasons promote autonomous regulation for extrinsically motivated behaviours:

- People will be more motivated if the behaviours are valued by others to whom they feel attached or related. In our case this refers to their programmes, but even more importantly to their future professional fields. In one of the co-creation sessions this was operationalized by the idea of involving practitioners, so gaming would facilitate a connection with future colleagues.
- People are more likely to adopt activities if they feel competent in those activities. This was operationalized as a game that adapts to the level of the player. Finding the optimal balance between skill and challenge is essential to maintain a player's status of flow: a state in which players are fully immersed and want to continue playing (Csikszentmihalyi, 2009).
- People are more likely to adopt activities if their social context supports them in their learning by providing positive feedback, in order to achieve autonomy.

Health professional students, involved in co-creation sessions, stated furthermore that their ultimate goal, and that of their peers, is to start their own practice; all is geared towards this long-term motivation. This motivation was operationalized by student concepts that all implemented some form of a sim-type of game, aimed at running a practice: the better you did in the game, the more profitable your practice became; the more it grew, the more positive reviews it would receive on a virtual Yelp page, etc. All of these concepts were well-received by our stakeholders.

Elaborating on these concepts, we are designing the next iteration of this MyPractice sim-game. Its primary goal is to run a successful practice, by solving patient cases (Figure 1). In order to solve these cases, factual knowledge is essential. In any of the case-dialogues, the patient can be computer-simulated, or it could be a real person logged in as a patient: a fourth-year student, a teacher, or a practitioner. The conversation is then less structured, choices will be more complex as a result, and working through a case will result in actual live feedback left by the 'patient'.

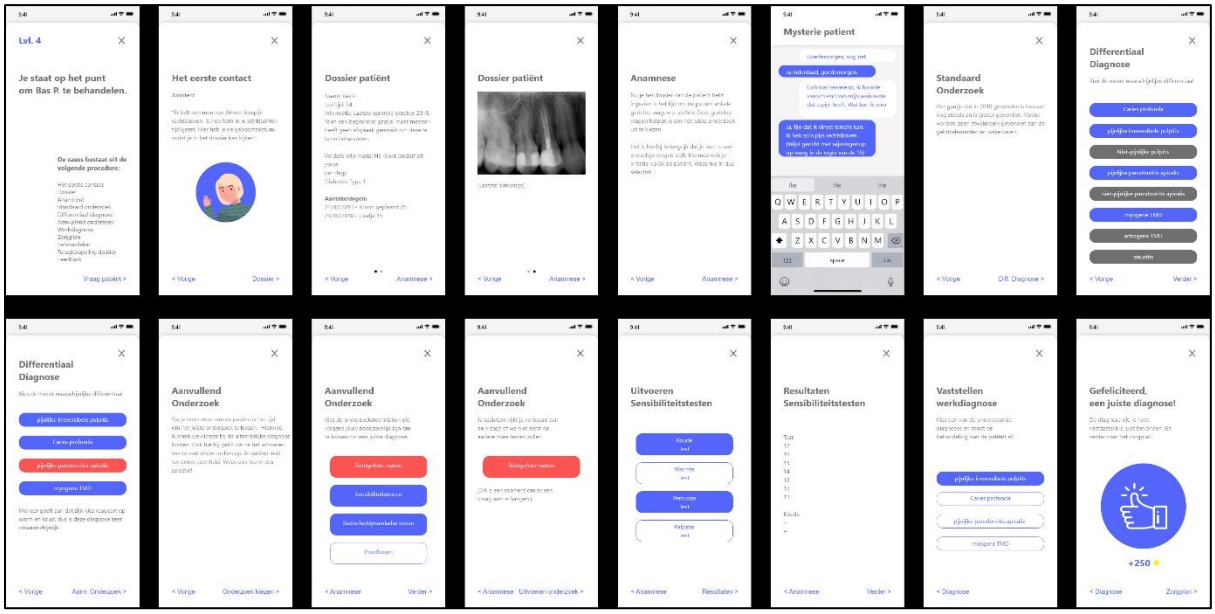

Figure 1: A case from the MyPractice game

4. Generation of content

It is notoriously hard to accumulate sufficient content for online quizzes, learning environments, etc. Generating enough content to sustain a two-year game, however, brings that dilemma to a whole new level. Specifically, when (1) the content does not consist of simple multiple-choice questions, but entire patient cases of varying complexity, and (2) when the content needs to be renewed on a regular basis. A first sub-challenge is, therefore, to design a content management system (CMS) that is versatile enough to accommodate all possible cases from all possible programmes in all their forms and shapes, and that aids in the construction of these cases. A second sub-challenge is to find a way to collect content in a sustainable way.

For the design of the content management system, this study chose a bottom-up approach and we are designing with all stakeholders as design partners, and not just as informers. According to Ampatzidou and Gugerell (2019), this approach will improve the result, make it more suitable for different contexts and create a sense of ownership among all of our stakeholders. Using issues with virtual patients described in literature as a starting point, we analysed a limited set of relevant cases and simultaneously designed a database structure and a process for content creators to follow to properly populate that database. The next step is to test if both the structure and the process holds for a wider range of cases.

A well-functioning CMS is just the first step. The next challenge concerns the process of creating cases, a notoriously time-consuming task. In order to tackle this, we are investigating procedures that make case creation an automatic part of the daily workload. For instance, third and fourth-year students could convert patients encountered during their internship into cases. Reporting on these cases (in the content management system) would then be part of their reflection and reporting on their period as an intern. Supervised by their teachers, they will each add a few cases, as a result ensuring a constant flow of new experiences. We are still collecting user input on these and other suggestions that all follow the guiding principle: how to incorporate case creation into the daily workload instead of framing it as an extra task.

5. Future work

This is a work in progress that should lead to a game we can implement in the allied health programmes participating in this project. Up until now we have focused on designing the game concept and mechanics, and the back end (the content environment). Our next step will be to develop a set of functional prototypes of both the back end and front end, that can be tested iteratively. The final step, in two years' time, will be to evaluate our ultimate goal: do students who use this game have a higher retention rate of factual knowledge and enjoy acquiring that knowledge more than students who employ more traditional study strategies?

6. Acknowledgements

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