Using Serious Games to Support Learning in Healthcare

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Abstract - This paper discusses some of the challenges with learning in general and particularly with procedural learning within healthcare. The paper also presents an overview of the advantages that are offered when adopting a game based approach, this is elements like motivation, enjoyment, immersion and a strong desire to complete a training session. It is important to note that there also exist a number of challenges when creating games based learning, this includes how to incorporate motivational challenges, timely and relevant feedback whilst still remaining focused on the learning outcomes.

Keywords - Games based Learning, Procedural learning, Healthcare, Drill and Practice

I. INTRODUCTION

There has recently been a large increase in the use of game-based technologies to support operational activities in a wide range of industries, often referred to as Serious Games. Serious Games are based on a number of features of games technologies, which are beneficial in training and development.

Studies show that students show a lack of engagement, reluctance to learn and low motivation in facing the challenges of computer programming [1, 2].

One criticism that has been raised against this is that most of the research in game based learning is focused on reinforcement of conceptual knowledge by following a drill and practice approach [3]. There is, however, the need for such drill and practice training in many areas, and games can here be used as a motivational factor. From many studies of learning that have been done, from Rousseau to Piaget, we know the benefits of revisiting the same learning material repeatedly supporting reinforcement using drill and practice models.

The effect of repeated exposure to the same information again and again greatly increases the likelihood that the information is retained and aids in understanding and learning.

So it can be argued that in designing games for learning a major concern is to ensure that the game is used and reused by the participants. This is an aim we have in common with the commercial game producers.

Deep learning requires the commitment of time and effort. The gaming industry have invested heavily into getting players to commit the necessary time and effort to master their games, the challenge for educationalists is to tap into the same feelings, getting students to devote the same time and energy to learning as they do to playing games in the evenings.

One challenge facing educators today is that both young and not so young students
alike, when placed in a learning situation are not always eager to do difficult things. Two major choices that are regularly then chosen are either to force them or lower the requirements for a pass mark. However, in the gaming industry neither of these options are viable. People cannot be forced to buy and play the games, and, in general, players do not want the short and easy option. For educators, this raises an interesting question: “How do game designers manage to get new players to learn their games which are often long, complex and difficult, and even pay for the privilege? The notion of getting students hooked on learning, rather than seeing it as something they have to force themselves through, is every educator’s dream. The question that needs answering is: “How do we do it?”

The authors have previously carried out a series of trials and published the results, the trials were focused on: “Is a games-based environment a viable way to present learning material? In addition the experiment contributed to the overall question: What level of embedding of that material is necessary within a game?” [4] The answers are a definitive yes to the first, the second requires a longer answer and can be found in [5]. It is important to note that the challenges includes how to incorporate motivational challenges, timely and relevant feedback whilst still remaining focused on the learning outcomes.

II. BACKGROUND

Norman [6] identifies seven basic requirements of a learning environment:

- Provide a high intensity of interaction and feedback.
- Have specific goals and established procedures.
- Motivate.
- Provide a continual feeling of challenge that is neither so difficult as to create a sense of hopelessness and frustration, nor so easy as to produce boredom.
- Provide a sense of direct engagement, producing the feeling of directly experiencing the environment, directly working on the task.
- Provide appropriate tools that fit the user and task so well that they aid and do not distract.
- Avoid distractions and disruptions that intervene and destroy the subjective experience.

These characteristics are a good match for computer games designed for learning. Paras and Bizzocchi [7] write that if we accept Norman’s requirements for a learning environment, then we must acknowledge that learning is integrally related to games. “Games make learning look so much like fun that they mask the large amount of learning required to play them successfully”

Games and simulations can be incredibly effective when employed correctly and can be used to support both exploration and thereby supporting constructivist principles, or be used to support more procedural training models by wrapping material that needs to be learnt by drill and practice method into an enjoyable setting:

- Allowing students to practice skills in a safe, private environment.
- Offering a unique opportunity to engage students who may have struggled in traditional education/training environments.
- Allowing students to access and repeat learning on their own terms and at their own pace, as many times as they need to. This is not a process of memorisation, however, so much as internalising systems, steps or processes.
- Facilitating social learning by fostering ongoing collaboration and relationships between students.
- Providing a customisable environment that takes a student's skills and context into account.
- Supporting active participation through group play, reinforcing important practical skills like group communication, project management, conflict resolution, and group brainstorming.
• Accessing the higher order skills in Bloom’s Taxonomy (evaluation, synthesis, analysis, application).
• Allowing students to access experiences that are difficult or impossible in the real world. E.g. the burning factory
• Allowing formative assessment to be built-in to the experience, benefiting both student and instructor.

Csikszentmihalyi introduced the concept of flow, through a study of people involved in activities such as rock climbing, chess and dance in 1975 [8]. He describes flow as a state of complete absorption or engagement in an activity and refers to the optimal experience. During optimal experience, a person is in a psychological state where he or she is so involved with the goal driven activity that nothing else seems to matter. According to flow theory, flow can occur when an activity challenges an individual enough to encourage playful, exploratory behaviours, without the activity being beyond the individual’s reach. For example, if the activity is too demanding it may produce anxiety rather than flow. Or, if it is not challenging enough, boredom, not flow, may be the result

Past research [9] has shown that the flow state has positive impact on learning. A more thorough explanation in connection with computer games for learning has been produced by Kiili [10].

The games we propose to use as the foundation for our games environment will be based on games that, to a greater or lesser extent, tell a story. This does not require a fully developed story in the literary sense, with deeply developed plot and other story elements. The stories we envisage are primarily used as a setting for the learning activities that will take place, and require enough detail to be engaging and convincing as scenarios for those learning activities.

III. ADVANTAGES OF GAMES BASED LEARNING

There are a number of advantages and unfortunately challenges when trying to utilise games based learning, we are trying to go though in the authors opinion the most significant elements in this chapter.

Games are:
1. Immersive
2. Compelling
3. Non-invasive
4. Distributable
5. Customisable
6. Cost-effective

1. Immersive so that a player can achieve suspension of disbelief they will have more realistic reaction to the scenario they face.

In games players make things happen, they do not just sit back and let impressions and events wash over them. Video games are by definition interactive.

Deep learning requires commitment, the gaming industry have invested a large amount of effort into getting players to commit time and effort into their player character, the challenge for educationalists is to tap into the same feelings, getting students to devote the same time and energy into learning.

2. Once engaged in gameplay, players will happily spend considerable time and effort in repetitively undertaking tasks until they are successfully completed. Aldrich [11] have shown that students involved in a simulation with some game elements will spend around 50% longer learning, than in a similar environment without the game element.

Computer game designers are working very hard to make people finish a game they have started on, and preferably buy the sequel or next game in the series. The main “trick” game developers use to get a player to stay with the game or, when they have to leave, make them have the urge to return and continue, is by establishing emotional connections with the on screen characters, both the avatar used by the player and in game characters and non-player-characters (NOC). The emotional attachment between players is discussed earlier in the section on socialisation in a game environment. Freeman [12] presents this topic in his book on how to create emotion in video games.
3. For procedures or activities that carry physical or other risks to humans or facilities, reproducing those activities virtually enables staff to learn the procedure(s) without risk.

4. Training events can be carried out anywhere, anytime, without need for specialised equipment or the presence of specialist staff.

5. Once developed, a procedural or training game can be readily customised to enable training to be carried out for a wide variety of similar activities or events.

6. Although initial development cost are higher than those of standard training packages, once developed games can be reused extensively and in a distributed fashion at a much lower cost than running traditional training sessions. A library of training resources can be developed, covering both every day, and less common more specialist activities, providing ongoing support for both general and specialist training.

The main aim of the projects that is building in this knowledge is to develop a suite of training games, for use in both a virtualised hospital setting and in distributed web-delivered training sessions. These games will predominantly be focused on procedural learning of techniques, protocols, and interventions for medical support staff, health care professionals, patients, and relatives.

IV. CHALLENGES OF GAMES BASED LEARNING

Many of the challenges that we face when using a games based learning approach are the same as with any form of electronically based/supported education, eLearning for short. These challenges are:

1. Non-standard equipment
2. Technical infrastructure
3. Unfamiliarity

1. Health-care and other organisation do seldom have standardised equipment, some is old other is new most are already configured to suite one or more purpose. Running the games we envisage in this project on old and/or miss configured computers will not work, and are a major issue that will have to be handled. Given enough money the option is to buy all new computers, but this does leave the issue of where to place them. What is known form the start, getting games that are immersive and engaging running possible high end graphics does not match up well with current equipment.

2. Another major challenge is the technical infrastructure, be it network transfer-rate or network lag. And group task undertaken in an immersive, virtual work does require a certain network speed to maintain the engagement.

3. The existing skill-level of the users are variable. Some can hardly use a computer where as others are comfortable and are avid games in private. This was illustrated by an eLearning module recently run by the optometry department at the author’s university. The course was for opticians all around Norway and was given as blended learning. All users where given the task of uploading a small text describing themselves before the first weekend of lectures. This to make sure they all had access to the system and knew how to write and upload a simple text. All had a text written and uploaded by the time they met, however, a number of participant that had hired a professional writer to help them create and upload the text, and consequently knew nothing about how to use the system.

In addition to this, there is a challenge to overcome many people prejudice against the use of games for something other than pure entertainment. Computer games are frequently seen as time wasters and something that children do. This is slowly changing, and is no longer the case everywhere, as a significant part of the adult population engage in computer games on a regular basis. There is also an ongoing change on adaptation of games, 72% of all US household plays games and the main
element 78% of large US companies and non-profit use games with employees, still mostly for advertising and relaxation, but games for learning is getting a foothold. Also notice that 40% of gamers are women and the average games is 35 years old. (source: Institute for the future IFTF.ORG)

Even with all this, there is a significant challenge to get games based learning adopted.

V. FURTHER WORK

It is the authors firm belief that the advantages outweighs the challenges and in the near future there is an exercise planned to capture all user requirements for future games to be developed for the stakeholders involved. A rapid prototyping methodology will be applied to quickly prototype games, which will then be extensively user-tested, debugged, and finalised. Results will be determined from qualitative and quantitative evaluation exercises carried out with all stakeholders at the completion of the trials phase. Where appropriate, impact on staff performance and patient recovery will also be qualified relative to the use of the games. This results information will provide the evidence to conclusively demonstrate the value of gamification in health care, and will also indicate direction for future work in this area.

REFERENCES

(Arranged in the order of citation in the same fashion as the case of Footnotes.)


