LEARNING STIMULATING EFFECTS OF COMMERCIAL OFF-THE-SHELF GAMES

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ABSTRACT

Playing games to support learning is an old concept that has got a revival today in the widespread use of computer games. To insert educational content into various types of computer games is a strong trend that some researchers have described as a mad rush. Game based learning has become a wide and heterogeneous field with large variations in design between serious games that has been developed for a distinct educational purpose, and Commercial Off-The-Shelf (COTS) games designed for playability and entertainment.

The aim of this article is to discuss the possible learning stimulating effects of COTS games in a long-term perspective. We argue that COTS game players’ attitudes towards learning may change in a positive direction even in cases where the direct learning outcomes are not that high. This may be the case when in-game skills are described in terms of real life skills commonly associated with higher education, such as engineering, electronics or geology. A common game design is that when a high enough skill level is achieved, then and only then is the player rewarded with access to better equipment, access to interesting areas and similar pleasant experiences. The game then has a potential to trigger an important psychological reward mechanism in the player’s mind.

COTS games could like educational games have more than just in-game goals and the meta goals in a game are the ones that remain in the player’s mind after the game has ended. The causality of the perceived experience is ideally that with high enough skills, the player receives positive stimulation. With this approach it would not matter that the actual learning will have to take place elsewhere, and most likely later when the player makes decisions about his or her higher education. The contribution of the gaming lies not in the short-term learning outcome, but rather in the long-term effects it may have on personal development and future educational choices.

Even if such a game do not fulfill the criteria for learning games it may still be seen as a learning stimulating game. Future research should include a large scale study investigating the relationship between playing COTS games and students’ choices and results in higher education.

KEYWORDS

Learning stimulation, Computer games, Commercial off-the-shelf games, Learning stimulating games

1 INTRODUCTION

Computer games may have an effect on what learning is going on in a society in several ways. With a direct approach to game based learning, the goal is to train the player using computer games containing relevant information and/or setups supporting the learning process of the player, either using specifically developed educational games, or by using Commercial Off-The-Shelf (COTS) games for learning purposes. In addition, a possible long-term learning stimulating effect of playing computer games may exist; games that reward players with increased (simulated) skills in areas commonly associated with higher education could play a role in attitudes towards future academic studies.

2 RESEARCH SUPPORTING COMPUTER GAMES IN LEARNING CONTEXTS

Research in the area of specific advantages of computer games as educational tools has pointed out several aspects where games fit very well into key patterns of successful learning. As Gee points out, these aspects need not be related to such features that are often noted regarding
computer games, such as the graphics: “The secret of a videogame as a teaching machine isn’t its immersive 3-D graphics, but its underlying architecture. Each level dances around the outer limits of the players abilities, seeking at every point to be hard enough to be just doable”. [1]

This underlying architecture, as Gee puts it, separates computer games from many other activities in modern society that instead rewards the participant with easy instant gratification, as remarked by Steven Johnson in his analysis of popular culture: “You’ll often hear video games included on the list of debased instant gratification that abound in our culture, right up there with raunchy music videos and fast food. But compared to most forms of popular entertainment, games turn out to be all about delayed gratification – sometimes so long delayed that you wonder if the gratification is ever going to show”. [2]

The positive aspect of something being hard, and the danger of making things too easy, is also discussed by Papert: “What is best about the best games is that they draw kids into some very hard learning ... The fact is that kids prefer things that are hard, as long as they are also interesting”. [3] A high difficulty level can also act as a strong motivator to collaboration in games that support this, as described by Hämäläinen et al. regarding ways of making players cooperate rather than play separately from each other: “... one option is to design highly difficult and even frustrating puzzles. In fact, apparently impossible tasks seem to be one of the strongest factors promoting player collaboration. After all, games are all about facing challenges and succeeding after a series of failures”. [4]

This touches on the Practice Principle, outlined by Gee as one of several principles involved in successful learning situations: “Learners get lots and lots of practice in a context where the practice is not boring (i.e. in a virtual world that is compelling to learners on their own terms and where the learners experience ongoing success)”. [5] Among other notable such principles are the Achievement Principle: “For learners of all levels of skill there are intrinsic rewards from the beginning, customized to each learners level, effort, and growing mastery and signalling the learners ongoing achievements”, the Ongoing Learning Principle (abbreviated): “The distinction between learner and master is vague, since learners ... must, at higher and higher levels, undo their routinized mastery to adapt to new or changed conditions ...”, and the Probing Principle: “Learning is a cycle of probing the world (doing something); reflecting in and on this action and, on the basis, forming a hypothesis; reprobing the world to test this hypothesis; and then accepting or rethinking the hypothesis”. [5]

In the light of these features, it becomes clear that computer games can fit very well as an educational tool. To exemplify we can consider the NASA massively multiplayer on-line learning game initiative launched by the Goddard Space Flight Center in an effort to increase learning in science, technology, engineering and mathematics, something which is important for NASA’s human resources regrowth in the future. As detailed in the associated announcement for research document [6], this project is aimed at using computer games for learning purposes in the direct sense discussed so far: “Virtual worlds with scientifically accurate simulations could permit learners to tinker with chemical reactions in living cells, practice operating and repairing expensive equipment, and experience microgravity, making it easier to grasp complex concepts and transfer this understanding quickly to practical problems”. [6]

3 RESEARCH CRITICIZING COMPUTER GAMES IN LEARNING CONTEXTS

However, a number of disappointments regarding the direct approach, implemented in the form of specifically developed game based learning software sometimes referred to as edutainment or serious games, have been noted. Such edutainment, is the result of efforts trying to explore the advantages of the game format and fill it with more traditional school curriculum oriented material. However, the usefulness of such edutainment software has been questioned in many cases, as observed by Kirriemuir: “However, when game-oriented entertainment and learning or educational material are combined, the result has often been
disappointing; the educational value is debatable or irrelevant, and the gaming and engagement qualities compare poorly to those of pure games”. [7]

A similar standpoint is taken by Papert, viewing this edutainment offspring from games and education software as one possessing none of the best features from either parent: “Shavian reversals – offspring that keep the bad features of each parent and lose the good ones – are visible in most software products that claim to come from a mating of education and entertainment”. [3] More specifically, Kirriemuir and McFarlane identify several reasons for these shortcomings: “Most edutainment has failed to realise expectations, either because:

- The games have been too simplistic in comparison to competing video games ...
- The tasks are poorly designed and do not support progressive understanding ...
- The target audience becomes aware that it is being coerced into ‘learning’, in possibly a patronising manner”. [8]

In addition, it can also be noted that edutainment products that rely on the users first having familiarised themselves with instructions or introductions in order to play the game successfully face the risk of being especially unsuccessful, as discussed by Jenson et al. regarding a computer game for learning baroque music: “In none of the play sessions did we observe anyone paying attention to or reading in any way instructions for the game...”; and “…they would not look to instructions even after failing and would instead seek out something more ‘playable’ …”. [9] Furthermore, even if an educational game is successful in the sense that it is engaging while also containing relevant material as discussed by Kirremuir, McFarlane and Papert above, an additional problem is described in [10]. Coining the term Gamer Mode, Frank observed students detaching themselves from the underlying domain that is in focus from a learning perspective, instead focusing partly or fully on the game itself, exploiting its functionality in order to win the game at any cost [10].

By distancing themselves from the subject to be studied, the learning occurring is that of mastering the game as such, and not the domain the game simulates. Such a situation constitutes a break from the effectiveness criterion as described by Hays who found that an instructional game “will only be effective if it is designed to meet specific instructional objectives and used as it was intended.”. [11] Students going into gamer mode as described by Frank above, is an example of the game not being used as it was intended in Hays’s sense.

Finally, there is the critique formulated by Linderoth regarding certain types of games having a design that may give the illusion of learning rather than actual learning. While not rejecting the concept of learning games in general, Linderoth [12] describes cases where the underlying design of some games reward the amount of time spent playing, rather than tasks hard to complete.

Such a game design may give a sense of achievement and progress even if only repetitive and non-challenging task are performed by the player: “From the ecological perspective, observations of someone being able to play and progress in a game cannot be taken for granted as constituting the outcome of advanced learning processes. What we see might just as well be progression that is built into the game system, and a practice that, compared to other domains, requires very little learning from its practitioners.” and “Games can give us the sensation of progress and empower us without demanding that we develop the kind of skills that many other domains require. Thus, perhaps some good video games offer a pleasure that comes from a continuous ‘illusion of learning’.” [12]

4 POSSIBLE LONG-TERM LEARNING STIMULATING EFFECTS FROM COMPUTER GAME USE

On the other hand also an indirect, or meta level learning increasing effect from games is conceivable, by which none or very little actual learning takes place in the game, but instead the player is indirectly stimulated to undertake learning at a later time. This could be staged on a symbolic level in the game world, due to the way
skills are typically represented in many computer games.

Using the NASA case as an example, with the direct game based learning approach first mentioned, there might be such things as quests failing if a player in orbit around a planet tried to travel much faster than another vehicle in the same orbit, as this would traverse him or her into another higher orbit. Given that the player then realizes that two objects cannot travel with different speeds in the same orbit, learning will have occurred. Unfortunately, this approach may suffer from the drawbacks regarding edutainment, or serious games, described earlier.

With an indirect meta approach aiming at long-term effects regarding later learning however, there might instead be such things as labs with confused scientists and experiments having gone wrong. The related quests might have goals vaguely describing the need to help the scientists by locating missing equipment, symbolically turning knobs on the lab equipment, or even fight experimental robots wreaking havoc, without any actual knowledge being gained in this immediate process.

The acting mechanism with this meta approach would instead be the quest reward, typically consisting of increased skills in fields related to the type of lab. This could be indicated by an increasing numerical skill level value accessible through the game interface, as well as associated positive messages informing the player that he or she has gained skills like engineering, electronics and similar.

If the meta, or indirect learning approach game is then designed so that when a high enough skill level in say, space technology is achieved, then and only then can the player proceed (through space travel) to an amazing-looking space station on the surface of the moon, then the game has a potential to trigger an important psychological reward mechanism in the player’s mind. The causality of the perceived experience is ideally that with high enough skills, I could travel to the moon.

With this approach it would not matter that the actual learning will have to take place elsewhere, and most likely later when the player makes decisions about his or her higher education. The important thing with this concept would rather be positive experiences associated with reaching in-game goals of high enough skills and the subsequent rewards of going into space and similar pleasant adventures. The meta level goals strived for by the game developer would be these positive feelings and their association with acquiring skills, residing in the player’s mind, and remaining as (conscious or unconscious) memories long after the computer game has ended.

What would happen at game-time in a game with such a (hypothetically working) meta approach is not learning in the classical sense, but something perhaps even more interesting from a long term society perspective: the player’s attitude towards learning may change in a positive direction. This would not be a learning game, but a learning stimulating game.

That this suggested learning stimulation effect may result from playing games not specifically designed for learning purposes is particularly interesting, as learning games and serious games have been criticised for lack of stimulation and that they sometimes tend to be too serious and not particularly engaging [13]. This also means that at least indirect learning effects may result from games closer to the Dutch historian and cultural theorist Johan Huizinga’s definition of play. In his well-known book Homo Ludens, Huizinga claims that play should be seen as a non serious and free activity. [14]

How Huizinga’s view of play should be interpreted and related to game based learning has been discussed and there is no clear consensus [15], [16]. Huizinga’s description of Homo Ludens as a naturally playing man with play as a prime condition for the generation of culture could be traced back to the romantic idea of Friedrich Schiller on play drive (spieltrieb). Here man is found to be fully human only when he is playing. In his series of letters On the Aesthetic Education of Man [17] Schiller stated that:

“Man plays only when he is in the full sense of the word a human being, and he is only fully a human being when he plays.”

Even if the essential ideas in Huizinga’s book are on playing rather than on gaming [16] the book has brought in ideas in to modern game research in articles on playing everything from digital
online multiplayer games like World of Warcraft [18] to more traditional multiplayer games like Football [19]. Play and logic are essentially different phenomena and there must also be a distinction between playing and gaming [16]. Games are defined by rules and with abstract challenges that result in quantifiable outcomes [20]. To insert educational content into various kinds of educational games is a strong trend that some researchers have described as a mad rush where sound educational principles and theories sometimes are absent [21].

This touches on the issue of whether playing and learning could be viewed as intertwined activities both contributing together to knowledge acquisition, or as a pair of separate activities where the former is limited to a being motivator for the latter. Restricting the role of the game playing component to a motivator for learning still means that considerable care has to be taken to implement the pair in a suitable way. As Sigurdardottir summarises: “One of the fundamental discussions related to DGBL is the discussion about play on one hand and learning on the other. While most of the contributors to the debate argue that playing is a good motivator for learning, some have claimed play to be overestimated. Amongst those who do view play as a good motivating factor there is still a debate about whether or not it is adequately employed in educational games.” [22].

In a broad sense educational games might be defined as games that are designed to teach someone something and that almost any initiative that combines gaming and education can be considered as game based learning [23]. Serious games on the other hand should be designed for a distinct purpose and not for pure entertainment [20], and they have also been presented as:

“... a mental contest, played with a computer in accordance with specific rules, that uses entertainment to further government or corporate training, education, health, public policy, and strategic communication objectives.” [24]

In the widest sense, the suggested learning stimulating effects from COTS games discussed here could be included under the umbrella of game based learning. This could be the case even though the involved games are not actual learning games by design, a concept that also has support in the field of pedagogy. Especially in constructivism, the potential of combining games with learning has been discussed.

In older constructivism intelligence has been defined as the development of an assimilatory activity elaborated by the interaction between itself and the external environment [25]. The meaning of interaction and playing games as has been described by the Russian pedagogue Lev Vygotsky [26], another constructivist that find games to have a potential for training that might be applied in real world situations. He has also distinguished between a learner’s actual development and the potential development that is possible only under guidance and collaboration.

A more radical constructivist view in which knowledge is only inter-subjectively or even only subjectively constructed seems harder to combine with curricula at university level, at least in natural and computer sciences. The Situated learning concept related to constructivism that has been described by Jean Lave and Etienne Wenger appears to be more applicable to modern adult learning. This is a type of learning where individuals are supposed to construct knowledge by socialisation, visualisation, and problem solving [27]. However, it is not possible to find any guidelines in constructivism covering how games should be designed more in detail to be engaging and to support learning at the same time. On the other hand, as some researchers have pointed out in the exploration of game design for the modern Homo Ludens generation, it is likely the case that: “pleasure comes before performance and engagement before clarity” [28].

As the potential learning stimulating effect of playing games discussed in this paper is separate in time from future learning environments, this particular aspect of games and learning does not suffer from some problems otherwise arising when combining these areas. To illustrate this, Heidegger’s concept of breakdown and the related terms ready-to-hand and present-at-hand [29] may be in conflict with the concept of flow [30, [31]. As discussed in [32] breakdown may
be beneficial from a learning perspective, while on the other hand it may be a desirable game design goal to keep the player in a highly enjoyable mental state of uninterrupted flow as much as possible [33]. These mechanisms are not in conflict with each other if not occurring in the same context.

It is interesting that in the critique put forward by Linderoth that some game designs may give the illusion of learning rather than actual learning, one possible positive effects of such an illusion is touched upon: "Since one of the reasons why players might feel motivated could be that games give us a feeling of having achieved more than we have, this design pattern gives us an illusion of learning. An experience of becoming better and progressing towards a goal without having to develop skill might not be something that educational institutions benefit from. Maybe it can be used in order to enhance self-esteem for low achieving students where the illusion of progression can be something positive and have an effect on real performance." [34].

The view suggested in this paper is both in line and at the same time not in line with Linderoth’s comment above, when we expand the learning illusion effect to a wider scenario. While agreeing that illusion of progression may have an effect on learning performance where enhancing self esteem is an issue, we argue that educational institutions may also benefit from the illusion of learning in a wider sense. When seen in a long-term societal context, memories of previous in-game success enabled by illusorically achieving skills may be a factor when decisions to apply for higher education are made.

This possible long-term effect of games portraying skill increases in areas associated with higher education is something that goes beyond the debate on pros and cons of learning games. Learning stimulating games can be seen as a “third thing” in game based learning, with indirect acting mechanisms which may affect what later learning is undertaken.

5 FUTURE RESEARCH

To investigate further what in this study is referred to as learning stimulation effects, a long term as well as large scale study is needed. Initially, key variables might be level of higher education in relation to previous gaming experience. This first step could be carried out through a survey focusing on quantitative data from respondents constituting a societal cross-section of a specific age group.

Comparing average prior gaming activity among university students with that of other groups may show a distinct pattern, but is in itself only a first step towards a deeper understanding. To get a deeper understanding of the topic, the quantitative study should be complemented with an in-depth qualitative study based on interviews. Through this combination of data sources, issues regarding causality can be discussed such as the possible learning stimulating effects suggested in this paper.

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