

# Ph.D. Study plan

## **The gameplay challenge in combining learning and computer games**

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### **1 Research Focus**

What traditionally binds games and learning together is the desire for learning to become more entertaining. This is the first argument brought forward by researchers, educators and teachers in the field and, only secondarily is the quality of learning through games discussed. In this sense computer games to a large degree follow other media surges. It seems that every new media invention is bound to go through a stage of being considered of potential high value for educational purposes, where you combine the magic of the new media with the traditional need for conveying information to new generations. It has been so for the book, television, cinema, computer and lately the computer game is warranting still more attention.

Although games are in some senses like other media they are different in their potential for interaction. When computer games work they draw the users into the experience, makes him loose sense of time and place, and put extraordinary strain on the users concentration, focus and energy. Games challenge the user to his limit and the user loves it. For every action the game demands a counter-action – a constant and high-paced ping-pong. It is this strain that lead some people to compare games with sports. It is also this phenomenon that makes researchers and educators believe in the learning potential of games and its superiority compared to other media. This despite the fact there is little

evidence (other than anecdotal) that computer games can provide a better learning experience than other learning forms.

The desire to use computer games for learning purposes is as old as the fear for the violent content in games and dates back to when the first games became popular among a wider audience in the late 1970's. Both learning and violence are a part of the same story. When addressing violence in games the fear is that kids will pick up unhealthy behavior from the games. It is this presumed link between games and reality that we try to exploit and control when talking about learning in games: How can we make sure that what goes on in the games are transferred to other contexts. A natural extension is the discussion whether it is possible to construct games that are both entertaining, engaging and have learning potential.

With the current development in games and notions like interactivity, emergence, immersion, narratives, virtual worlds, virtual reality and increased realism, we are moving back to a world of doing. We are seeing games that could be real alternatives to real life learning especially considering that the skills needed to get on in real life to a higher degree require symbolic and abstract processing. Today the majority of people have no use for learning how to saw, use a hammer, build ships or similar practical skills – but rather symbol manipulation. It is this form of learning that this project will explore more in depth. Not only establishing that this kind of learning take place but also how it happens, when it is effective, and the limits of learning in games.

## **1.1 Current status in the field**

Up till now the use of games for facilitating learning has not been very successful and is a scattered field without internal consistency and successful applications (also see Squire, 2002). Furthermore the current attempts have primarily focused on either adventure genre or simulation genre, which are two of the smallest genres and the ones with the smallest appeal to younger age groups. The development of games with learning potential have also to a large degree been lead by the 'faction' called edutainment, which is an invention made more by businessmen than people interested in the learning potential of games. Edutainment is short for education and entertainment but the genre has been more about entertainment than education. Games in this genre are for example *The adventures of Ulysses*, *Versailles series* and *Egypt 1156 BC*. Some researchers have tried to qualify the notions of edutainment, for example Prensky (2001) but without much success. Edutainment has taken patent on learning in games, and have established a frame that is not effective, and is not drawing on the expanding knowledge and fast development in the game industry. The edutainment genre seems to be lost in a narrow perception of learning, as a thing that goes on in school and can easily be measured and tested like for example arithmetic, the alphabet, words, sorting things or similar not very complex undertakings. Or alternatively become a fuzzy concept like problem solving, system understanding and overview, which can be applied to almost all games and indeed it is true that all games (as a human activity) have an intrinsic learning potential.

When learning is present in a game it is often presented in split-screens or separated from the game play (Egenfeldt-Nielsen, 2002). These attempts have yielded poor results in respect to learning despite this the educational game titles continue to sell. The encompassment and successful use of learning in games is often more based on vague assumptions than empirically derived and tested facts with few notable exceptions like the work of for example Debra Lieberman (2001), Leyland (1996), Yasmin

Kafai (1995) and the Playground project<sup>1</sup>. Learning and educational games lack the necessary depth and resources to make them viable alternatives to existing learning contexts. One of the least highlighted problems is the game play aspect although lately some project like Games-to-Teach at MIT and Through The Glass Wall have taken a broader approach to games.

One of the obvious problems with the field, even the more serious attempts, is a lack of division between different ways of using games, underdeveloped theory of how learning is facilitated and a confusion of the terms learning and education. The first step in looking at learning in games should be to distinguish between education being formal, structured and immense induced by school activity, where the term learning should be considered a broader term.

## **1.2 Project focus**

A distinct feature of computer games is what you could call gameplay, which means the most basic dynamics of a game. The gameplay in for example Chess is to move pieces with different properties to achieve victory. In Tetris you must fit falling pieces together to win and in Quake you must shoot monsters to win. Games at its most basic level are not concerned with smaller details but paint a broad picture, where you manipulate object in accordance with abstract principles to win. Several game designers like for example Sid Meier and Bruce Shelley like to present games, as a set of interesting decisions. These, in the game, crucial decisions are based on existing knowledge, time and space in the game. The player manipulates these variables in accordance with his success criteria for exemplifying getting a hi-score or building a neat city. In SimCity the player learn that pollution are bad for the citizens and therefore move the industry away from the residential areas. But the industry also needs easy access to the work force, so it would be unwise to move them to far away. Furthermore the residents don't want to drive that far to get to work. An interesting choice. The player acquires some knowledge in the game and uses it more or less successfully. From a learning perspective this is an interesting setup – acquire knowledge, use knowledge and reflect on the results within a short time span. The problems directly related to this are that often the knowledge necessary in games are of a general nature, sometimes incorrect and the transfer of it to other contexts are seldom successful (Egenfeldt-Nielsen, 2002). Leading some to say, that what you learn from playing computer games, are playing computer games. The important challenge that this project will take up is to determine if it is at all possible to facilitate specific relevant knowledge to the player, without jeopardizing the game part. At one level making games that are deep enough to deliver relevant knowledge within subjects that are not traditionally used in games, and still maintaining a good game play – the player must still make interesting decisions in the game.

More popularly this could also be described as the balance between entertainment and learning. This will include a search for a fitting learning paradigm for facilitating learning through games and will spur discussions about issues like the nature of games, history of learning in games, relevance of current learning theories, realism, gameplay, simulation, relevance and motivation in game settings.

## **2 Problem Statement**

This PhD project will explore learning in computer games with emphasis on how it is possible to facilitate learning through games, while maintaining a good gameplay. It is the project's goal to be

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<sup>1</sup> [http://www.ioe.ac.uk/playground/frame\\_f.htm](http://www.ioe.ac.uk/playground/frame_f.htm)

able to frame the learning experience in games, not as a clash between the learning material and gameplay but rather to use learning material as compelling material that supports and enriches the gameplay.

### 3 Theoretical Background

The project will draw on a broad basis of theories as a natural extension of the projects cross-disciplinary aim. The project will to a great extent study existing games and learning potential first hand but also draw on existing studies and additionally analysis of games in some amount, bearing in mind that the interactive nature of both games and learning make the use of game analysis quite hard. An important first step in addressing learning theory is choosing what perspective to take on learning. The last couple of years we have seen several attempts by Danish learning researchers to combine the very different learning perspectives for example by Hermansen (1997) and Illeris (2000) into one unifying theory or at least to see the different learning theories as different perspectives on the same phenomenon, where you stress different areas. A general distinction is often set between three different areas: A content dimension, a psychodynamic dimension and a social/societal dimension. Therefore I believe it to be immature to choose not to include one of these perspectives. Even so it is possible to narrow it down more. Below I have sketched what I initially see as the most central questions to address in relation to learning as:

- *The Fundamentals of learning*: What goes on when you learn in the most basic way. What theoretical stance is appropriate for studying and are some of these fundamentals modified by computer games?
- *The transfer problem*: How do we transfer skills and knowledge from one area to another, from the representations on a screen to real life activities?
- *Symbols and emotions*: The special traits of learning through computer games are the use of symbols and the new status of emotions, which alters important factors in the learning equation.
- *The physical entity*: It's place in learning and the consequences of the alteration and limited use of this in games – the learner's experience is not encapsulated or orientated in a body.

Below I have mentioned some of the theorists that I will use in the project.

- **Learning theory**: Bateson, Engeström, Dewey, Piaget, Kolb, Furth, Vygotsky, Bruner, Dreyfus, Gardner, Schank
- **Multimedia and learning theory**: Holm-Sørensen, Resnick, Papert, Danielsen, Bang, Baudrillard, Andresen, Larsen, Littleton
- **Computer Game theory**: Prensky, Squire, Rouse, Bates, Druin, Lieberman, Juul, Konzack, Laurel, Squire, Jenkins, Kirriemuir, Kafai, McFarlane, Jones.
- **Play theory**: Huizinga, Callois, Sutton-Smith, Csikszentmihalyi

### 4 Planned Research

The project will shift between exploration, readings, empirical studies, review, design, construction and theory. In line with the deficiencies mentioned earlier in the part *current status in the field*, a

thorough review of existing learning theories, and adjustment of these to computer games will be a significant part of the project. Furthermore to avoid stretching too far I will focus on facilitating learning in games for male players aged 12-19 year and focus on males with an existing interest in games. Otherwise I risk that my empirical studies are confounded by variables like lacking knowledge of game user interface and genre conventions. Preferable I will use a suited topic for this group for example history, history clearly being one of the most widespread topics among existing popular games with educational aim for example titles like *Time Machine*, *History of the world*, *Living in a Castle*. Similarly history plays a significant part in a lot of commercial titles that are typical presented as having learning potential like *Pirates*, *Europa Universalis*, *Age of Empires* and *Civilization*. These limitations will especially be necessary in the empirical part of the project. However the end-results should not be limited to a specific topic or user group – rather the perspective should slowly be broadened when the fundamentals are in place, with the topic and user group serving as explanatory example.

The empirical data will be gather from the perspective of producers, users and designers, achieving different perspectives on the life cycles of learning material in games. Hereby ensuring that the final learning theory live up to the use and expectations in these different settings. The following six steps constitute the entire process in short form.

1. **Exploration:** An exploration of the area: existing studies, study design & plan, find relevant companies and respondents, research (2 months)
2. **Data gathering A:** Empirical gathering of data on process of *creating games* through interviews and observations covering the roles of game designers and producers in game companies that make or has made learning games both good and bad ones (2 month).
3. **Data gathering B:** Gather data on popular historical commercial game titles through analysis of player's use of the game preferable in different setting ranging from school use to spare time. This will be done through observations and interviews, as actor research is considered problematic in relation to computer games highly immersive nature (2 month).
4. **Data analysis:** Analyzing results from the data gathered hereby trying to identify connections between design problems, production limits, and player's game experience and learning outcome (3 months).
5. **Theoretical reflection:** Constructing and understanding learning meaningfully in relation to games. Filtering the empirical problems encountered in praxis through a theoretical discussion (4½ months).
6. **Theory in practice:** A practical application of the principles and knowledge in constructing and evaluating a prototype for a game. Hereby highlighting conflicts and trying to practically solve or at least demonstrate theoretical notions (4½ months).
7. **Final theory:** A theory on learning in computer games constructed on the basis of work with learning games, theories on learning and testing of the theory in practice (6 months).

This order is not final but a good plan for what is to come. Furthermore some of the processes will overlap and continue into each other. The construction part will be scoped depending on time as the project progress.

## 5 Goals of the research project

- *Developing new theory* on facilitating learning through games, where the pivotal point will be the connection between gameplay and learning. Building on theories from psychology, sociology, game design, game research, learning theory and media science. This will especially focus on applying modern learning theories and adjust these to the limits and possibilities of computer games. In this context the relation between realism, simulation, learning and gameplay will be explored.
- *Establishing a prototype* of a game that facilitates learning in games. The focus will be to establish a game concept that facilitate learning through the use of relevant knowledge treating it as compelling material that work with the game play and not against it. Commercial titles would serve as inspiration and existing educational games would mostly be used as examples of how not to do it. As they have a number of flaws.
- *Evaluating* the potential learning and interactions in the games, hereby testing the theoretical discussions in an empirical setting. Hopefully contributing to new methodologies for testing learning in games and in general a stronger theory through out the PhD project.

At the end of the document I have attached a goal plan that operate with milestones, deliverables and significant events.

## 6 Stay abroad

It is still under consideration what options there is. It is perhaps easier to make contacts when I have made a final study plan and made connection with an advisory board and a co-supervisor. One possibility could be to visit MIT in connection with the project Games-To-teach. I have already corresponded a little with Kurt Squire from MIT. Another possibility could be to visit Interactive institute (Malmö or Göteborg).

## 7 Advisory board and Co-supervisor

I will set-up an advisory board to gain valuable input into the fast-moving field of computer games, and get feedback from cutting-edge researchers. I will soon contact the people short-listed below to hear if they are interested in participating in an advisory board:

Edith Ackermann (MIT/Lego)

Jørgen Bang (IMV Aarhus)

Amy Bruckman (Georgia Tech. University)

Donald Norman (NN/G)

Mitchell Resnick (MIT)

Seymour Papert (MIT)

Birgitte Holm Sørensen(DPU)

Marc Prensky (Games-to-Teach)

Carsten Jessen (DPU)

Kurt Squire (MIT)

Margit Neisig (TDC/RUC/ITC)

Yasmin Kafai (UCLA)

The *co-supervisor* will preferably have competences within both games and learning, and be within geographic reach. I have connection with Birgitte Holm-Sørensen and Carsten Jessen both from The Danish University of Education. They are both strong on learning theory and have connection to computer games research. As soon as the study plan is done I will clarify co-supervisor relation.

## **8 Conferences & Seminars**

I have started out by attending conferences to get a feel for the current state of the area and get some contacts:

- Playing the Future, April 4-7, 2002 (Manchester university, England)
- Computer Games and Digital Cultures, June 6-8, 2002 (Tampere, Finland)
- The GIMP Workshop, April 10 2002 (Malmö, Sweden)

Intend to attend 2 conferences a year to keep in touch with the field, gain new inspiration and test out work in progress. The following is of interest

- Digital Arts and Culture (DAC)
- Computer games and Digital Textualities (CGDC)
- Game Developers Conference (GDC)
- World Conference on Educational Multimedia, Hypermedia and Telecommunications (ED-MEDIA)
- Annual Conference of the Society for the Advancement of Games and Simulations in Education and Training

## **9 Educational requirements**

- Basic Programming, IT University, fall 2002, 7,5 ECTS
- Computer games: Developing an online multiplayer game, fall 2002, 7,5 ECTS
- Philosophy of science and types of knowledge, fall 2002, 10 ECTS (5-6 ECTS if I don't hand in paper)
- Project management & project organizing at Magisterforeningen, Spring 2003, 4 ECTS
- Computer games study group, IT-University, fall 2002, 1,0-5,0 ECTS

## **10 Supervision, teaching & other**

I have supervised 3 students in a 4-week assignment in spring 2002

Will supervise 5 students/ 3 master theses through fall 2002 and will teach a course in spring/fall 2003.

Project supervision of students in 4-week assignment in fall 2002 and/or thesis

Help start up Game centre

Help start up Digital Game Research Association

## 11 Promotions/talks

Will hopefully get at least four more articles accepted in peer-reviewed journals or highly respected journals in 2003-2005.

Presentation on Manchester conference (spring 2002)

Article in anthology "Play and Levels" (fall 2002)

Article in anthology by Carsten Jessen, no title yet (fall 2002)

Submitted article for Game Studies (fall 2002)

Will speak in co-operation with other members of Digital International Game Research Association (DiGRA) on IST Conference in Bella Center (Fall 2002).

Co-written two reports with Game-Research.com one on Online Gaming Habits (spring 2002) and one on Pro-gaming (fall 2002)

Interviewed to Urban 3 times for three different articles about computer games. Given public talk on Asminderød School in Fredensborg and Hillerød Kommune for Club workers. Written one article on DR Orbital (spring/summer, 2002)

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