DISCOVER project details

The DISCOVER Project (Helping teacher to discover the pleasure of learning and teaching) responds to widespread, existing and enduring needs by proposing teaching and learning methods which accommodate different learning styles and requirements, involve and engage users in their learning process, support the motivation of learning and the ability to learn how to learn and to take pleasure from it. This is combined with a multicultural dimension which strongly characterises the Global Society of the 21st century.

Three pillars, distinct but coherently linked together, are the key elements of the project: games-based learning, discovery of cultural diversity and pleasure of learning.

The DISCOVER project (http://www.discoverproject.net) aims at supporting the professional development of teachers by giving them tools, methods, community experiences and training actions which enable them to respond to changing educational requirements and support the personal, social, cultural and cognitive development of their students.

This book is based on Guidelines for Game-Based Learning by Pivec, Koubek and Dondi (Eds.), published 2004 (ISBN 3-89967-193-7) and aimed at university teachers. The contents of this book have been updated, extended, consolidated and developed to meet the needs of teachers of primary and second-ary schools.

Project consortium

- Ölands Folk High School (S): http://www.oland.fhsk.se
- SCIENTER (I): http://www.scienter.org/
- Associazione Tia: Scoprire Il Piacere Di Apprendere (I)
- Centro de estudos dos povos e culturas de expressao Portuguesa (P): www.cepcep.fch.lisboa.ucp.pt
- FH JOANNEUM Gesellschaft mbH (A): http://www.fh-joanneum.at/

- Fundació Privada Applicació (E): http://www.atlasdeladiversidad.net http://www.callusdigital.org
- Lambrakis Foundation (GR): http:// www.lrf.gr

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The knowledge and experience in the field of game-based learning, gathered and presented in this book is partially based on two previous projects related to games, i.e. UniGame research project, financially supported by EU Socrates program (Minerva, 101288-CP-1-2002-1-AT-MINERVA-M), and SIG-GLUE – Special Interest Group for Game Based Learning in Universities and lifelong learning, EU E-Learning Initiative project (2003 - 4704 / 001 – 001 EDU-ELEARN).

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How to use this book

The primary target-group of these guidelines is practitioners i.e. all pedagogues, teachers and trainers that teach children age 10 - 15 and want to implement game-based learning in their classes. The book will help them to systematically find commercial games and introduce them into their classes, or to implement their own ideas in the form of an educational game. Activities included in the chapters offer support in this proactive behavior.

For researchers, educational game designers and policy makers, the guidelines offer the latest insights into the application of game-based learning approach that is a basis for further research issues and activities in introducing innovative learning approaches. In addition, it can also introduce a dialogue between game producers and educators to create appealing educational games, which would be most preferable.

The book chapters can be read and applied independently. Below is a short summary of the chapters, emphasizing issues of particular importance for the practitioners, and focusing on application of the guidelines.

Chapter one begins with key messages about game-based learning. Introductory thoughts are given to games as educational experience and possible additional activities to motivate students. The theoretical background of gamebased learning is outlined. With help of short reflection within the chapter, the reader is encouraged to think about his/her personal experiences with and about game-based learning and how to establish a dialogue about the games in the class.

Chapter two presents learning through time and culture. The key characteristics of game-based learning are described, as well as different types of learning while playing games. A range of existing game classifications introduce the innovative 'UniGame' game classification that is based on learning goals, and relates games that help to achieve them. This classification offers guidance to practitioners in choosing an existing game to complement their classroom studies, and provides ideas for creating new educational games.

Learning and teaching perspectives in formal learning (e.g universities), nonformal learning (i.e professional training) and informal learning are outlined. The chapter concludes with contextualised examples of game-based learning and interesting school practices (digital as well as classic games).

Chapter three describes the process of choosing and using a game for class use. The substantial part of chapter three is focused on quality perspectives of games, outlining pedagogical and context criteria, content criteria and technical criteria that practitioners can consider when selecting a game.

The reader is invited to implement the guides to evaluate the quality and learning value of an educational game.

A guide to introducing games into a course is outlined, for example, selecting and finding appropriate game, considering skills of tutors and students, technical conditions, etc. The chapter reflection supports the reader's focus on the pre-requisites and constraints related to her/his specific educational setting.

Chapter four supports practitioners in defining their own educational game. On the model of game-based learning it is explained how educational game design blurs game elements and instructional design to create a challenging environment where learners increase their knowledge and skills. Various educational games for children age 10 - 15 are outlined to spark the ideas and present the possibilities.

The chapter defines steps for educational game design, provides guidelines for gender appropriate design, software tools for implementation of ideas and how to evaluate player enjoyment.

The activity provided at the end of the chapter will support you in designing an educational game for your classroom or school. Based on experience with the game industry and analysis of educational requirements, this exercise has been created, utilised, and refined by the authors, at various levels of tertiary teaching with enormous success. Throughout the chapter there are numerous ideas provided on how to use game design as a motivating classroom activity and how to modify the activities for your class.

Supplementary material available via the Internet

The DISCOVER Project (Helping teacher to discover the pleasure of learning and teaching) http://www.discoverproject.net/. In the section Project results and Resources visitors will find many reports and resources of national and international relevance. Project results are made available in English, German, Italian, Spanish, Swedish and Portuguese.

SIG-GLUE (www.sig-glue) stands for Special Interest Group for Game-based Learning in Universities and Lifelong Learning. The SIG-GLUE mission statement is to foster more and better use of better learning games. Visitors can register with the community and join the discussions, exchange experiences with others and access the library, the link and game collections. Furthermore community members can share information and best practice via the newsletter and let others know about interesting new events, books, games and game platforms.

At the UniGame project web page (www.unigame.net), it is possible to access detailed project information along with research reports, published papers and a list of educational games.

On the "UniGame: Social skills and knowledge training" platform (http://unigame.fh-joanneum.at) detailed game idea along with guidelines on use of the platform and defining games are available.

Chapter 1: Game-based learning

1.1 Introduction (by Maja Pivec)

Already in the 80s and 90s, many scientists stated that computers and later hypermedia could be used as a cognitive tool for learning, and outlined a number of other potential advantages offered by the computer aided learning. According to Education Week (2001) the usage of school computers by students for assignment research is 96% of the project time, for writing papers – 91%, for homework – 62%, for visualizing new concepts – 60%. Despite many decades of research the present e-learning solutions still focus on technology instead on instructional support and support of learners' needs. Do modern e-learning technologies really support learning?

Over the last few years an emerging trend of digital games in the area of elearning has been observed. From early isolated reports on conferences and books reflecting about possible application of digital games for learning (Gee, 2003), more and more practitioners and researchers embraced the idea, including the e-learning community. In 2006 one of the biggest European e-learning conferences, Online Educa in Berlin, for the first time introduced a special game track.

The discussions related to digital games in classrooms are primarily focused on Pros and Cons of the application of games for learning, trying to find answers to *Why don't we use games more often in classrooms*? Often it is pointed at the difficulty to find games that cover the curricular topics, the low tolerance of the environment towards the games where the games are often perceived as unserious activity, with some lecturers fearing that the learning objectives would not be reached, and others might encounter difficulties with technical resources that schools don't have. Another important factor is the quality aspect of the games for learning where games should have an explicit learning purpose and can be used, adapted and adopted for supporting, improving and fostering learning processes (SIG-GLUE).

At the same time, a recent UK survey reported that 53% of eleven to fourteen year olds play games four times a week or more, and that 44% play for more than one hour at a time (McFarlane et al., 2002). Games have high presence at informal segments of learning. Unfortunately, in formal education, games are still often seen just as an unserious activity and the potentials of games for learning stay undiscovered.

85% of the parents, however, evaluating games with their children believed that computer games contributed to learning as well as providing entertainment (McFarlane et al., 2002).

The focus of this book is not on how to bring new teaching tools into the class. The book wants to use the momentum of digital games that have substantial role in the children's free time to create new levels of communication and bridge the gap between formal and informal learning, school time and leisure time.

The ideas and reflections, as well as related theoretical foundations presented in this book, strive to present contemporary views of learning that regard knowledge as self-creation and evaluation, a personal interpretation constructed from experience, and an active process, which must occur in a reality context. Games and digital games give us numerous opportunities to orchestrate adequate learning experience.

1.2 Games, motivation and learning (by Maja Pivec)

Why do we play games in the first place? To have fun, to immerse into an imaginary world, to take the challenge and outsmart the opponents and/or win, etc. There are probably as many slightly different reasons to play games as there are players.

When we have a look at the games within the learning context as opposed to the activity only for the leisure time, we have learners' and teachers' perspectives of using games for learning. From the learners' point of view using a game for learning can have various meanings, e.g. learning and having fun, taking the challenge and achieving better scores, trying out different roles, being able to experiment and seeing what happens, being able to express the feelings and to reflect about certain conflict situations, etc. "My knowledge of English comes from playing Monkey Island and not from English classes," claimed one of the students of Information Design when discussing game-based learning and possible benefits, "I could not imagine learn that much of English, playing just an educational game, it would be more like "learning" and less fun". "Playing adventure games fostered development of my observation skills and problem solving skills" was the experience of his colleague.

From the teachers' perspective, we choose to use games for learning to reach a new generation of learners with a medium they are used to interact with from their childhood. We can offer a game for introducing a new learning topic thus raising the learners' interest for this topic, or as a complementary activity for many other reasons, e.g. to create a complex learning opportunity, to increase the motivation of learners, to offer another way of interaction and communication.

In some cases, games can help to establish dialogue and break social and cultural boundaries. Games can also be used for personal development and to improve self esteem of the player i.e. learner (Pivec et al., 2005). For disabled people digital games can offer the opportunity to experience the world in a way the majority of us take for granted.

In a study of cerebral palsy students completed by Kearney (2005), it was found that the participants interviewed were not interested in learning games, or games specifically designed to help them to learn or to adjust to their environment. Rather, they wanted to play computer games that simulated the environment that others take for granted.

1.3 Games in learning (by Hamish Macleod)

Play and learning are fundamentally related. Marshall McLuhan (quoted in Prensky, 2001) has observed that "anyone who makes a distinction between games and education clearly does not know the first thing about either one". Where play-like activities are found in the animal world, one of the most parsimonious explanations of their function is as experiential preparation for adult life. It should be very natural therefore, for game-like activities to be found as key elements of educational programmes. Central to an understanding of the place of games in education however, is the prevailing philosophy of education that we espouse. Education can be seen as either a matter of the accumulation of factual knowledge, or as the forging of personal identity as someone in possession of particular expertise. Where the former model predominates, games may be seen as something of a distraction. If education is seen as being about the formation of identity however, play-like approaches, and the rule-based play of game settings, will be highly relevant.

This can be seen most clearly in the areas of professional education. One might suggest for example, that a medical student is 'playing at being a doctor'. In the early stages of the educational process, and indeed before the process begins formally, this play has a large element of fantasy. This fantasy is not viewed negatively, as presumption or self-delusion, but rather positively, as high aspiration and worthy ambition.

As the educational process proceeds, the medical student is increasingly asked to play the role of medical practitioner, and in that role-play knowledge and skills are both cultivated and tested. The role-play is thus used as a teaching method in medical education, and as a method of assessment. The pre-clinical aspects of medical education, in which "basic knowledge" is imparted, are frequently viewed less favourably by medical students in direct proportion to the extent to which they deviate from the agenda of personal development of the identity as a presumptive professional.

The methodology of problem-based learning (PBL) acknowledges the importance of perceived relevance as a motivator for student learning.

The rhetoric of continuing professional development and lifelong learning contextualises the business of formal study as an important part of the identity of the medical practitioner. The process by which the behaviour of a medical student ceases to be a role-play and is transformed into reality is a gradual one and the final transition might be difficult to notice were it not marked by a particular "right of passage". It is clear therefore, that there is nothing trivial or frivolous about these activities that are orchestrated by medical educators, and participated-in by medical students.

While this pattern of identity formation may be more obviously part of professional programmes in higher education (and can be seen too in the practicum and placement experience of the trainee teacher, or the moot court practices of legal education), what it tells us about the nature of learning is no less relevant in other academic disciplines.

While the "subject matter" of the discipline is presented to the student group, there is an increasing realisation that higher education is a matter of "learning to become" rather than "learning about". The product of a university pro-

gramme in, for example, psychology or history, is a person who thinks like a psychologist or a historian, rather than someone who knows a lot of names, dates or formulae. Of course the graduate knows the subject matter of his or her discipline, but the factual bases of the subject are more like resources to be used than the essence of what has been developed through the educational experience.

Indeed a number of prominent thinkers (Skinner and Einstein among them) have been credited with some variant of the observation that education is what remains when what was learned has been forgotten. Education should be about the active engagement of students with their subject matter, rather than any notion of the passive reception of that subject matter as delivered by the teacher.

1.3.1 Playful engagement

Intrinsic interest in a topic of study will stimulate a form of exploratory engagement that may be described as playful in nature. This notion has recently been used in the context of computer skills development (Pauli, May and Gilson, 2003; Potosky, 2002). For some people, the computer and its operation hold a fascination that encourages them to explore its functioning beyond the immediate task in hand.

They are therefore introduced collaterally to key skills that may then be called upon in some later pragmatic context. For others, the motivation lies in the completion of the task in hand, and so the potential to generalize to future situations is lessened.

The first task in identifying an appropriate game to support student learning is to identify the educational objectives that one is trying to promote. A number of classification systems have been constructed, of which the best known is probably the taxonomy created by Bloom (Bloom et al., 1954). Readers should see Chapter 2.3 for examples of game classifications, in particular the UniGame project classification in Chapter 2.3.1.

1.3.2 Games, computer games and game elements

Educators have long been interested in the potential of games in general (Avedon and Sutton-Smith, 1971), and computer-based games in particular (Foreman, 2004; Jayakanthan, 2002), to assist the learning process. Research on the potential of computer games to support learning dates from the earliest days of the microcomputer (Malone, 1980a, 1980b). In fact Avedon and Sutton-Smith (1971) note the part played by the computer in early examples of game-based learning in providing the data upon which a quantitative simulation exercise might be based.

The manifest "holding power" of the computer game (Turkle, 1984) suggested a new potential for educational activities. Malone's work on the nature of intrinsically motivating games suggested that the key features of the computer game that promoted such intense engagement were *fantasy*, *challenge* and *curiosity*. In the context of a learning exercise as discussed above, the fantasy element of a game provides the real-world relevance of the activity for the learner.

Challenge is provided by an appropriate goal for the task, along with performance feedback that lets the player know how successfully he or she is approaching that goal. Curiosity relates to the learner's desire to solve puzzles.

Challenge in a game is frequently sustained by incorporating a number of staged levels into the game. As the player becomes more skilled and experienced in the game domain, successful completion of one game level will gain him or her access to the next that will include more demanding tasks and puzzles. Gee (2003) notes this as an important learning principal which computer games have come to embody; that the player is constantly facing an optimum level of difficulty for progressive learning to take place. This is analogous to Vygotski's notion of the zone of proximal development (Vygotski, 1962), or Bruner's idea of "scaffolding" a learning task (Bruner, 1990).

Alexander & Boud (2001) list a number of key features of educational roleplays and simulations which contribute towards active learning, and which include

- immersion in an authentic and relevant experience;
- construction of a personal understanding of a topic based on a range of resources;
- the testing and challenging of one's personal understanding in interaction with the understandings of others participants;
- reflection on one's achievements in relation to concrete goals which have been defined.

The game judges the competence level of the player/learner, and progressively increases the demands of the game to a point that is just beyond the player's comfort level, but not so much beyond that the player loses heart and gives up. The player is thus always moving forward at a rate that maintains optimal excitement.

When these features are developed in a game-based learning experience, one may expect intense engagement on the part of the learner. For game-based approaches to provide their maximal educational benefit, an explicit process of "debriefing" may need to be formally built into the learning agenda. Kolb (1984) has proposed a cyclical model of the stages that need to exist in the process of active learning, based on the work of Kurt Lewin (see Atherton 2002). *The Kolb Cycle* is a four stage process in which an experience in the world (1) is reflected upon (2), and through that reflection is generated an abstract conceptualisation (3) from which can be derived hypotheses for action (4) which lead to further concrete experiences (1). The learning game may contain within itself all, or a number, of these stages.

1.3.3 Games as educational experiences

Constructivist understandings of learning emphasise the active role played by the learner in the organising of his or her own understanding, and many highly influential early approaches to the use of computers in teaching and learning have built on this theoretical basis. Papert (1980, 1993) for example, coined the term *constructionism* to refer to the forging of understanding through the creation of real-world objects or artefacts (like a computer program), and reflection on that creative experience. By this understanding, the role of the teacher is to "orchestrate" experiences that will engage the learner (Caine & Caine, 1994), and provide him or her with opportunity and encouragement to reflect on their actions in the world. Following from this analysis, game-based learning is best regarded as a special case of experiential learning (Boud et al., 1993; Boud & Miller, 1996).

There is no doubt that games can be engaging and compelling activities. They provide intrinsic motivation that hold the player's attention, and can produce intense and prolonged participation. A game is essentially a voluntary activity however, and participation with a game constitutes an end in itself.

Some approaches to "game-based learning" have appeared to be attempts to use a game to apply an extrinsic reward for engagement with a learning task. Successful completion of the learning task buys access to an opportunity to play the game.

This "sugaring the pill" is likely to do more harm than good, as research has repeatedly shown that the application of an extrinsic reward for engagement in a valued activity is likely to decrease the intrinsic attraction of the activity in the eyes of the participant (Bruning et al., 1999). This has been called the *Mary Poppins Approach* by Avedon & Sutton-Smith (1971). There is another model of motivation to be derived from *Mary Poppins* however – "In every job that must be done, there is an element of fun. Find the fun …". This is the promise that is held out for the contribution of games to education, although in very different ways, by Prensky (2001) and Gee (2003). They argue that we need to transform education on the basis of our understanding of the intrinsically motivating characteristics of games.

How can these characteristics of games be understood in the context of learning and teaching, and how can they be used to help us design and deploy successful educational experiences for our students? Good teaching is importantly about finding the right tasks for students to carry out which, if the students engage actively with those tasks, will support their understanding of the topic in hand. The story or fantasy element of the game is all important here. It is the "back story" which transforms an arbitrary learning task into something of personal importance and relevance to the learner.

Paradoxically, it is the fantasy element of the game that can make the link to the real world aspirations of the student, and to the professional setting in which they would like to see themselves located.

Goals and objectives, coupled with the rules that define the constraints on the route to achieving them, form the problem space of the game. Learning the nature of the constraints that operate in a given world may be the key learning outcome of the game engagement. Learning outcomes may relate to the final solution to the problems posed by the game. Feedback refers to the intermediate information provided by the game situation, and used by the player to converge on an appropriate solution, or range of solutions. A good game will be one that is open-ended, affording a wide range of possible outcomes, some more successful than others, and some manifestly unsuccessful. Games provide safe opportunities to make mistakes, and to learn from these mistakes. A student will be able to learn as much, if not more, from an unsuccessful outcome as from a successful one. A further advantage of the game-based environment is that it provides a relatively risk-free context for experiential learning.

Schön (1991) talks about the value of "virtual worlds" in which safe learning opportunities can be found. Gee (2003) invokes Erickson's notion of the psychosocial moratorium as a way of talking about situations or settings in which the consequences of our actions can be rendered less dangerous, or in which negative effects can be reversed. An obvious example of this would be a simulation-based game in which the learner can take risks of a physical, financial, or psychological nature without having to carry the real-world cost of a bad decision.

Students need to be presented with situations in which they can fail without that failure having too negative an effect of their self esteem, and the representational world of the game may be structured to allow this. Game situations can be understood by the students - indeed, can be presented explicitly to them - in a spirit of "win some, lose some".

As the game protects the learner from the real-world consequences of his or her actions, it can engender an exploratory and meta-cognitive approach to tackling problems. The game experience provides the learner with a way of thinking about problems that he or she might encounter in the future.

- 1. What is your personal opinion about using games for learning and games in the classroom?
- 2. What is the level of acceptance and general opinion in your environment about using games and game-based learning?
- Short Reflection 3. Did you experience / Can you think of any example of game-based learning?
 - 4. How can we apply games to learn and foster freedom of speech and discussion about democracy?

1.4 Games ABC (by Maja Pivec, Tanja Schoenbacher)

This chapter serves as a very short introduction about digital games for nongamers, and should initiate further independent research within your environment.

Majority of the games web sites as well as stores selling games group their offer related to the game platforms. Beside PC games, other home systems are Play Station (Sony), XboX 360 and XBOX (Microsoft), Game Cube and WII (both from Nintendo), a recent sales hit. Another group of game platforms are handheld systems, e.g. Nintendo DS, PSP (Sony Play Station Portable) and Game Boy Advance.

Many of the games on the market are available for most of the platforms. Interesting is to observe the trends on the market, which games are popular within various gender and age groups and why players like to play them.

We selected some popular recreational games that can have educational value. Sid Meier's **Civilization** is recognized as one of the greatest PC game franchises of all-time, with over 6-million sold examples. The latest version can be played in single player and multi player version, where players can influence and experience how the society is organised in the economical, political and religious perspectives. One can connect the game to talk about rise and fall of empires in the past and about influence of variables to development and wellbeing of society.

In Harry Potter and the Order of the Phoenix is a game available for PS2 and also for PC amongst others. The game is related to popular books and movies, that captured young and old in their adventures and fantasy world. The PC version of the game is available in German, Italian, French and English. – one could use this game as teaching and learning aid for foreign language classes. By interactive dialogues that are part of the gameplay, players practice understanding of the language and vocabulary, and the learning of language can be transformed in a situated learning experience.

Very popular quiz game for Play Station2, released in Europe in 2005 is **Buzz!** The Mega Quiz. The game is "who wants to be a millionaire" type of the game, including questions from different topics. Quiz type of games are appropriate to drill the facts and improve the basic knowledge. The game includes five different play modes e.g. multiplayer, single player, which can be used for preparation for a "competition", team mode is a cooperation mode or for short play time one can use Quickfire. Interesting option is also feature know as **Quiz Master**, which allows players to create their own questions to be answered by other players.

For Nintendo DS there are a lot of puzzle games available, e.g. Brain Jogging, English training, Big Brain Academy (single player & multiplayer), Touch Master (a collection of short games, training of speed, touch, pattern recognition & decision making), Tetris, Mah Jong, Chess, etc. Puzzle games are good for problem solving, patter recognition and spatial visualisation.

For the Nintendo WII there are numerous sports games that could be used in class to demonstrate and give the opportunity to try out in the virtual world different sports, not always common and accessible for the class, e.g. bowling, golf, tennis, etc.

Special category of games is mobile phone games, very popular with young and teenage children.

Use the momentum of games and talking about their leisure time to bridge two worlds, i.e. school and free time and related activities. The following questions might help you to spark interesting discussion with your learners.

- 1. Ask your learners about games they know and play.
- 2. Why do they like to play those games?

Short Reflection

- 3. Ask your learners about digital games & platforms.
- 4. Which games do they play? How alone or with friends? Why do they like to play these games? When do they play the games?
- 5. Ask your learners to reflect what they learned playing games?
- 6. Compare the answers. Are motives for playing classic games vs. digital games similar?
 - 7. Reflect on how you can use this discussion for structuring your class?