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# *Why so serious?* On the Relation of Serious Games and Learning

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> Daughter: Daddy, are these conversations serious?
>
> Father: Certainly they are.
>
> Daughter: They're not a sort of game that you play with me?
>
> Father: God forbid… but they are a sort of game that we play together
>
> Daughter: Then they're not serious! (Bateson 1953)

Serious games have become both a growing market in the video games industry (Alvarez and Michaud 2008; Susi et al., 2007) and a field of academic research (Ritterfeld et al. 2009). While the vast majority of these games are targeted at learning and education, many studies and texts on serious games lack overviews of the possibilities of using serious games for learning. To address this issue we performed a literature review and looked at existing definitions of games in general and serious games in particular. The inconsistencies and shortcomings of existing definitions and typologies are discussed in this paper and more adaptable and open classifications are presented. We suggest design and implementation strategies that allow the integration of commercial off-the-shelf entertainment games and of specially designed serious/educational games in embedded learning settings. As a classification system for digital and serious games for learning we promote the use of labels (tags) instead of fixed genres (categories). The aim of this paper is to expand the focus from what serious games for learning are currently to what they can be now and with regard to future developments in gaming technology.

## Tautologies & Oxymorons

In recent years serious games have gained the interest of many scholars from diverse fields such as psychology, cultural studies, computer science, sociology and pedagogy. An indicator of the academic and economic popularity of serious games is the growing number of companies, conferences and publications devoted to the subject (see e.g. Ratan and Ritterfeld 2009). Despite the increased attention and importance which serious games have been receiving lately, the definition of the term 'serious game' often varies depending on who uses it and in what context. The term 'serious game' in itself is somewhat questionable. For some the expression 'serious games' appears to be a contradiction. Are games not fun by definition and hence not serious? On the other hand, one could argue that all games are serious. Play and games have an evolutionary background as instruments for survival training and in

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most cases the players take the games they play seriously. Depending on the definitions of ‘serious’ and ‘game’, ‘serious games’ can be considered an oxymoron or a tautology.

The idea of using games for purposes other than fun was first formulated in the book *Serious Games* by Clark C. Abt (1975). When he introduces the subject of his book, he states: “We are concerned with *serious games* in the sense that these games have an explicit and carefully thought-out educational purpose and are not intended to be played primarily for amusement.” (Abt 1975, p.9). The educational purpose of Abt’s serious games does not necessarily have to be in the game’s design, but can be assigned to the game by the context it is used or embedded in. What this means is that for example a board game originally designed for fun can be used in a military training context to teach strategic thinking and the principles of tactical warfare. While the learning process takes place via the game, the effect intended by it may well be an exogenous one. The term ‘serious game’ as it applies to digital games was coined by Ben Sawyer in his 2003 paper on the potential of using digital games for policy making (Sawyer 2003).

If we look at current definitions of serious games that imply that we are dealing with digital games, we can see that Abt’s definition is still mostly valid. Game designers Michael and Chen (2006) e.g. define serious games as follows: “A serious game is a game in which education (in its various forms) is the primary goal, rather than entertainment” (Michael and Chen 2006, p.17). This definition, however, can only be considered valid with a very broad understanding of education. As mentioned before, there are serious games that do not have a direct educational focus, but can still be considered serious. Examples of such games include art games or games used to distract patients undergoing painful therapies. A more open definition is offered by Michael Zyda (2005) who states: “Serious games have more than just story, art, and software, however. (…) They involve pedagogy: activities that educate or instruct, thereby imparting knowledge or skill. This addition makes games serious” (Zyda 2005, p.26). Again, for this definition to match the heterogeneous field of serious games, pedagogy would have to be defined flexibly as any form of change in a person brought about by external measures such as (educational) games.

An open question concerning these purposes is to what extent they need to be socially desirable to label a game serious. As we will discuss in the further thrust of the paper, there are e.g. serious games that have political contents. If we just take the formal game structure into account, games that contain extremist propaganda would also be serious games as they do want to inform or educate (or in this case rather indoctrinate) their players (Swertz 2009). Since the normative evaluation of educational contents strongly depends on who uses them and in what context they are employed, the question of the acceptability of subjects and ideologies cannot be dealt with in a definition of serious games. This means that the label ‘serious games’ is not equivalent to socially desirable effects on the player.

The definitions quoted here are just a snapshot from a great number of definitions which differ in some respects, but the great majority share the core statement that serious games are games which are used for more than just mere entertainment (Susi et al. 2007).

If this common denominator of serious games definitions is agreed upon, we need to ask what the opposite of a serious game is. Are there ‘non-serious games’ and if so which games belong to this category?

The usual answer to this question is that any commercial game which was designed primarily or solely to entertain its players is not a serious game. That these games are not so ‘non-serious’ should be clear from the fact that they, too, can have effects (which are researched even more intensely than those of serious games) and that players do take these games seriously. Moreover, the definition by Abt (1975) demonstrates that the educational purposes do not have to be designed into the games, but can be associated with a game by teachers or educators who want to use a game to achieve a specific learning goal. This is also valid for digital games. Not only specifically designed games can be used for learning. Commercial off-the-shelf (COTS) games, as they are often called, can also be used for ‘serious’ purposes (Charsky and Mims 2008; Shute et al. 2009; Squire and Jenkins 2003; van Eck 2006).

The aim of this paper is to map the current landscape of serious games and potentials for its expansion with a special focus on the relation between serious games and learning. We will first relate serious games to other educational concepts like edutainment or e-learning to see which attributes they share and in which manners they differ. Following this we will identify actual and possible modes of learning in and around serious games which will then inform our suggestion for a flexible and open taxonomic system to classify digital games and their use for serious (educational) purposes. This novel classification approach shall give hints for future research and design directions and facilitate the evaluation and comparison of games in learning contexts.

## Serious Games and their Relatives

Considering the long history of efforts to align learning and fun and the design of media-based or mediated learning settings one might ask how serious games differ from other concepts like edutainment, entertainment education or e-learning. Edutainment became a buzzword in the production and evaluation of educational media during the 1990s (Michael and Chen 2006). Since the aim of blending entertainment and education or fun and learning is also the driving force behind the serious games movement, one could ask whether serious games are just a new branch of edutainment. Michael and Chen (2006) disagree and postulate that serious games “are more than just ‘edutainment’” (Michael and Chen 2006, p. XV). The distinction that Michael and Chen make concerns the purposes of serious games which go beyond traditional modes of teaching and learning as stated before. But also within the field of learning and education, the learning modes that serious games employ differ from those of older edutainment media. While early attempts in edutainment focused on teaching facts mainly through rote memorization, serious games have a broader potential. According Michael and Chen’s seminal book title, they can teach, train and educate. Another difference they point out is that edutainment concepts were in most cases designed for the target group of school children and pre-schoolers, whereas serious games can and do reach adult audiences as well. Unlike Michael and Chen, the Entertainment Software Rating

Board (ESRB) uses serious games and edutainment as synonyms (Ratan and Ritterfeld 2009). Most game designers and researchers, however, agree that serious games go beyond edutainment, i.e. edutainment games are a subset of serious games (Rankin and Sampayo Vargas 2008; Ratan and Ritterfeld 2009; Susi et al. 2007). According to this view, edutainment games are those games within the serious games family which are mainly developed for use in K-12 education, have a focus on the conveyance of curricular textbook knowledge and rather pursue additive combinations of entertainment and education in a motivator or reinforcement paradigm as described above. To avoid confusion with the early attempts of enjoyable learning games in the 1980s and 1990s, some authors use the unabbreviated expression 'entertainment education' as an overarching category (Shen et al., 2009). Other concepts which are similar and partly overlapping with the category of serious games are e-learning and (digital) game-based learning (Susi et al. 2007). E-Learning is a concept that has been and still is as popular as serious games and is researched in various disciplines like psychology, pedagogy or computer and information science (for an overview see e.g. Haythornthwaite and Andrews 2007). Similar to entertainment education e-learning is a more general term that refers to any type of computer-based learning. While entertainment education is generally not bound to any specific medium, e-learning is coupled to the use of computers. It does not imply any need for entertainment and fun in the learning process. The central advantage of e-learning is that it enables remote learning and learner groups distributed over different locations as well as nonparallel or asynchronous and flexible learning. E-learning is essentially about flexibility of learning in time and space. When using the broadest possible definition of e-learning as computer-based learning of any type, one could subsume serious games as a subcategory (Koubek and Macleaod 2004). Accordingly, all forms of serious digital games are subtypes of e-learning. Another label that overlaps with serious games is that of game-based or digital game-based learning that Marc Prensky uses in his book of the same title (Prensky 2007). While game-based learning is almost identical to Abt's pre-video game definition of serious games, Prensky's digital game-based learning (DGBL) is identical to the modern use of 'serious games' for computer and video games with/for educational purposes. Prensky's (2007) own initial definition of DGBL, however, corresponds better to the characteristics of e-learning as he dubs DGBL as "any learning on a computer or online" (Prensky 2007, p.146). Figure 1 summarizes the relations of edutainment, entertainment education, (digital) game-based learning, e-learning and serious games.

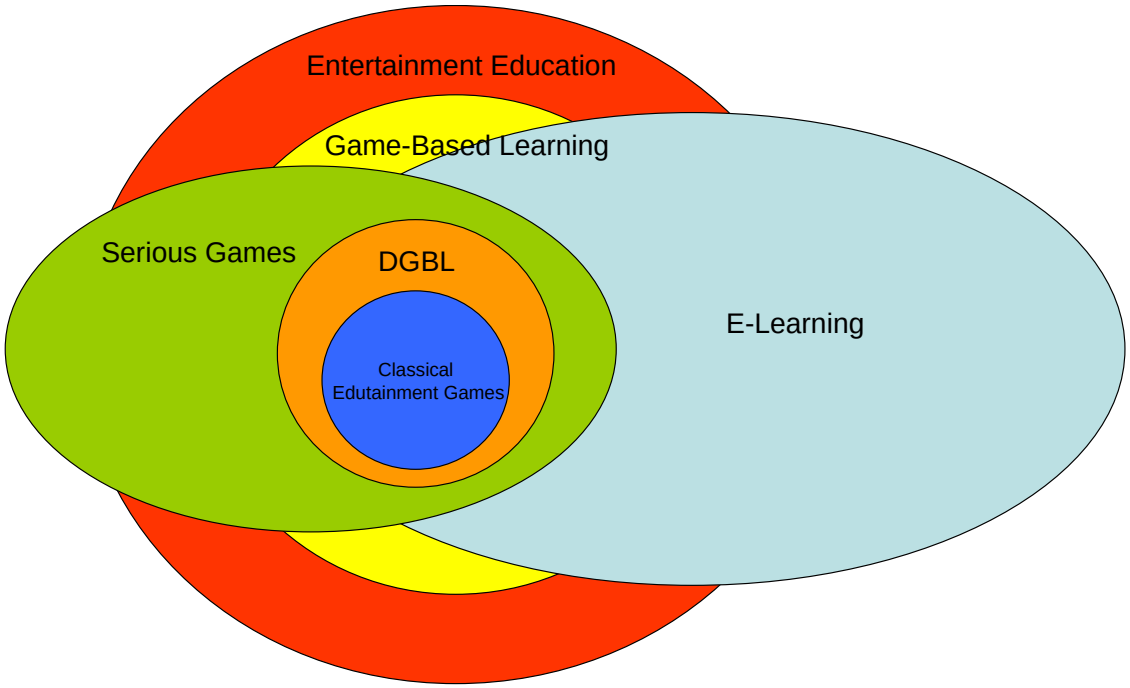


*Figure 1: The relations between serious games and similar educational concepts*

This figure is the result of the comparison and combination of the different definitions and classifications discussed above. Entertainment education here refers to any attempt to make learning (more) enjoyable, no matter if media-based, mediated or within a classroom setting. Game-Based Learning is a subset of this including the use of any type of games (e.g. board games, card games, sports or digital games) for learning/educational purposes. Serious games, however, also have application fields outside of education and learning (art, therapy, advertising etc.). Digital game-based learning (DGBL) is the section of serious games, which incorporates education/learning as the main or sole purpose. The classical edutainment video games that experienced their advent in the 1990s are one segment of DGBL. We will see in the next section what other types of games 'serious games' include. E-Learning is different from this categorical system as it does not imply any coupling of entertainment and education, but a combination of (digital) media and learning. While serious games can belong to the e-learning methods, not all e-learning systems are supposed to be entertaining (e.g. podcasts of lectures or computer-based online examinations) and not all serious games are learning games. After clarifying the position of serious games within the framework of educational concepts, we will now discuss how accurate and inclusive existing typologies of serious games are and can be and how they can or should be extended.

## Hard Fun & Easy Learning

After looking at what serious games are and how they relate to other forms of joyful and mediated learning, we will now discuss the opportunities for learning that serious games offer and how these are and can be aligned with the gaming experience. In

public discourse learning and playing are often seen as opposites (especially by the learners themselves). While learning is usually associated with work, effort and concentration, playing has connotations of freedom, joy and diversion (Mitgutsch 2009). Despite these stereotypes there is more than one characteristic which games/play and learning share.

Video games are very often long, complex and difficult to master (Gee, 2008). Nevertheless, players enjoy them and stay motivated over a long period when playing them. The effort needed to enjoy most digital games makes playing them 'hard fun' (Papert 1998). Learning is usually a long, complex, and difficult process and while people enjoy challenging games, they dislike and avoid challenging learning experiences in school education or professional training. This opposition is even more intriguing if we consider that playing a game is always associated with learning. Wong et al. (2007) stress that this relation is also true when reversed and state, "all forms of play are learning and all forms of learning are play" (Wong et al. 2007, p.2-3). Like games, learning is an interactive process, challenges the learners and has more or less explicit rules on how to acquire new knowledge or skills. Marc Prensky (2007) uses a quote from the famous media theorist Marshall McLuhan to illustrate the (elective) affinities between games and learning: "Anyone who makes a distinction between games and education clearly does not know the first thing about them" (Prensky 2007, p.90).

If digital games require learning, effort and willingness to invest time and resources and this is often experienced as unpleasant in other contexts, then why are they so entertaining? One crucial reason for the attractiveness of digital games is the specific mode of interactivity they offer.

This form of human-computer interaction can happen on different levels:

1. On a micro-level of individual inputs and outputs (e.g. you push a button and your character moves)

2. On a narrative level (i.e. you interact with game elements such as non-player characters to progress through the game and unfold its story)

3. On a meta-level of setting and manipulating the game's rules (this includes choosing a difficulty levels as well as cheating or creating your own game content via editors)

What all these chances for interaction have in common is that they give the player a feeling of self-efficacy (Bandura, 1977; White, 1959). Players experience their own actions to be effective in the virtual game world. This sense of control is pleasurable and motivates further interaction. The third level of interaction is also important for the experience of flow (Csikszentmihalyi, 1990) within the optimal balance between challenges and skills that has been identified as a central prerequisite for enjoyment. As players are differently experienced the adaptivity and adaptability of games is crucial to enable the flow state in which the player allocates all her/his cognitive resources to the game, is completely taken up by the playing experience and even loses track of time (Prensky 2007; Rieber 1996). Games that are engaging hover around the borders of a player's competencies (Gee 2003). To keep the players

playing games have to be “pleasantly frustrating” (Gee 2008, p.36), i.e. they need to be challenging without being unmanageable. Failures do not necessarily impair the enjoyment of playing if a reasonable amount of practice or trying a different approach enables to player to overcome the obstacles she/he failed in tackling before (Gee 2008).

The criteria for an intrinsically motivating game are largely similar to those for an intrinsically motivating learning environment that according to Rieber (1996) are challenge, curiosity, fantasy and control. Research by Cordova & Lepper (1996) has shown that contextualization, personalization and choice positively influence a learner’s intrinsic motivation, depth of engagement in learning and learning performance. If you look at these obvious parallels between games and learning, it becomes clear that games have a great potential as tools and environments for learning in addition to learning being essential for gaming. Although playing and learning share major attributes, their meaningful integration for specific educational purposes is non-trivial.

## Lure, Reward & Mix

Despite the similarities between games and learning, it is not sufficient to just assume that all forms of games are equally suitable for learning and that simply presenting material in a game-like setting will increase the quantity and quality of learning. As we will see in the following sections, simply adding educational material to an enjoyable game concept is similarly not sufficient to create an interesting and effective game for educational purposes. To motivate players as learners it is necessary to find an optimal balance between entertainment and learning. This ideal mixture has often been called the ‘sweet spot’ of blending games and learning scenarios (Squire and Jenkins 2003).

Regarding the integration of entertainment and learning in digital games, Ritterfeld and Weber (2006) identify three different approaches:

1. Reinforcement paradigm: The entertaining parts of the game are offered as rewards for successful learning

2. Motivation paradigm: Entertaining game elements are used to evoke the learner’s interest, focus her/his attention and make her/him ready for the learning procedure

3. Blending paradigm: The learning procedure itself is designed to be entertaining, i.e. the enjoyment of mastery in the game is equivalent to the enjoyment of the acquisition and use of knowledge and skills

While the motivational and the blending paradigm aim at fostering intrinsic motivation, the reinforcement paradigm relies on the potential of entertaining content as an extrinsic motivator. Which paradigm is chosen in educational settings does not only depend on the available material and the prevalent subject matter, but also on the assumed effect of entertainment on learning. According to Ritterfeld and Weber

(2006) there are basically three possible relationships between entertainment and learning:

1. Linear positive (facilitator hypothesis): More entertainment means more effective learning

2. Linear negative (distraction hypothesis): Entertainment distracts from learning, i.e. more entertainment leads to a decrease in the learning performance

3. Inverse U-shaped (moderate entertainment hypotheses): Entertainment is beneficial for learning, but only until a certain point. If this amount is exceeded, the added entertainment value is detrimental for the learning outcome

It is reasonable to assume that the 3rd relation is most likely to be true as the effectiveness of games for learning does depend on the enjoyment the players experience (Prensky 2007) and the obvious differences between commercial entertainment games and specially designed learning games show that, indeed, there seems to be a trade-off between entertainment and learning.

When comparing the three combination strategies explained above the first two represent the notion of simply juxtaposing learning and entertainment. This, however, ignores the potential enjoyment of learning itself and the inherent learning processes in playing. These processes can serve as an ideal starting point for a blending strategy. As Rodriguez (2006) puts it, instead of beginning with the question of how to use games as ideal learning tools, the initial step should be to identify the playful elements of learning and to design games for educational purposes accordingly. When following this approach, games are not just a vehicle to maximize the effectiveness of learning, but a new way of understanding and organizing learning. This strategy is even more favourable when considering that not only has the media environment changed, but also due to the exposure to and use of modern information and entertainment technologies the learners themselves have changed (Prensky 2001). This is especially true for the generation that grew up and has been socialized with digital media like personal computers, gaming consoles and the Internet. Digital games have become a part of everyday culture (Oblinger 2006a) and are played by people from all age groups and social backgrounds (ESA 2008). Prensky (2001) calls this generation the ‘digital natives’ as they do not need to learn the language of technology use like a foreign language, but rather intuitively acquire the skills it takes to communicate and learn via media. The habits of media use also shape attitudes towards information and learning. For those who grew up using computers and the World Wide Web, parallel processing and connected, interlinked learning processes are natural ways of gaining knowledge or acquiring skills (Prensky 2007).

Given this background, the ideal educational game combines entertainment and learning in a way that the players/learners do not experience the learning part as something external to the game. This idea of ’stealth learning’ should inform any approach to designing, using and evaluating (digital) games for prescribed educational aims.

## Contextualize, Blend & Embed

When designing and choosing serious games for learning it is not only important to implement the right learning modes in the actual game, but too also position the use of a digital game for learning in a motivating and stimulating learning scenario or environment. As suggested before, this perspective allows the development of learning strategies for COTS games as well. Despite the simplifications, inaccuracies and misconceptions many COTS games include (Liebermann 2006; Squire and Jenkins 2003) these games can still be integrated in educational settings. If the educators are aware of these 'flaws', they can use these as links to address questions that are posed or left open by and in these games. They serve as an ideal anchor for complementing educational activities (Charsky and Mims 2008). Listing and discussing historically inaccurate parts of a COTS game could be one example of using popular entertainment games for learning and teaching. To meaningfully integrate COTS games in education, Charsky and Mims (2008) propose three types of accompanying or complimentary activities:

1. Learning the game: Mastering the controls, understanding the contents and purposes of the game

2. Complementing activities to correct errors or misconceptions conveyed through the game: Searching for and pointing out faulty representations, supplementing missing information etc.

3. Conceptualizing the game as a theory of the content: Foster media literacy and discuss how and why certain political, historical or scientific facts are portrayed the way they are in COTS games

The main concept behind this is what Charsky and Mims (2008) call the identification of "teachable moments" (Charsky and Mims 2008, p.41) of a game. One could even think of using two or more COTS games in parallel to offer different points of view and ways of representation for the same topic/content. Van Eck (2006) gives the example of using a simulation game like *Civilization* for a view on history which is focused on breadth and a FPS in a historical setting like *Call of Duty* to enable a more direct first-person experience focused on depth in representation. Games like the *Civilization* series can represent something like a laboratory for testing alternative histories (Squire and Jenkins, 2003).

Digital games can be used not only as learning tools, but also as motivators or generators of interest. In this vein, Floyd and Portnow (2008) present the idea of what they call tangential learning in games. Following their suggestion, digital games and in particular popular COTS games can be used to get learners engaged and spark interest for specific topics. Apart from the scientific, historical or economical facts many games make use of or include in their subject matter, an even bigger number of games use references of some kind. For instance the game *Age of Mythology* features a huge number of references to ancient mythology (Greek, Roman, Egyptian). It is not uncommon that a game makes players curious about references and their sources so they look them up and voluntarily start reading books or watching documentaries on these topics. This is different from informal or implicit learning as the knowledge facts are not included in the games themselves and require active information retrieval by the players. Thus the problem of learners

rejecting or disliking a game because it is labelled as an educational or serious game (Shen et al. 2009) is avoided. To take these tangential learning opportunities into account also on the game designers'/producers' side, Floyd and Portnow (2008) recommend that references in games should include links to relevant web resources or Wikipedia articles (this is already common practice on many websites). Another, slightly more obvious method is to integrate knowledge databases into the game like the 'civilopedia' in the *Civilization* games or the codex in *Mass Effect*. These enhancements do not inhibit the game play or scare players away by an 'in-your-face' manner of presenting facts or even social values (this has been and still is an issue in many educational films in which learners are repeatedly exposed to very obvious and often apodictic messages, which may be frustrating to the learners and undermine the perceived value of the material). The strategy of tangential learning is also a promising concept for explicitly serious games, thus offering an option for learners/players to receive additional and more detailed information if they desire. This notion of 'pull-knowledge' instead of 'push-knowledge' can surely help to foster more self-directed and proactive learning and to help reduce the scepticism of players towards educational/serious games. Consequently, digital games can be learning tools, motivators and generators of curiosity.

## Types & Classes of Serious Games

Just like there are many partially conflicting definitions of serious games and their use for learning purposes, there are also several different attempts to classify serious games in genres or similar typologies. The criteria used to classify the games vary largely. Two central aspects which Michael and Chen (2006) include in their comparison between serious games and edutainment are learning modes and target audience. However, the criteria most commonly used are the educational content and the application field of serious games. The diversity of lists with and classifications of serious games is even greater than that of serious games definitions. Michael and Chen (2006) name military, government, educational, corporate, healthcare, political, religious and art games. This typology is solely based on the application areas of the games. And even for these, various subcategories are possible. For health games, Susi et al. (2007) list the subgroups of exergaming (Graves et al. 2007), health education (Liebermann 1997), biofeedback (Raposa, 2003) and therapy (Griffitths 2003). A taxonomy with a higher resolution that is oriented along non-academic lines is suggested by Sawyer and Smith (2008). They cross game and learning types with application areas to achieve a finer granularity. As game types they list advergames, games for work or games for health. The core innovation of Sawyer and Smith was to separate designed purpose from actual application areas. Exemplary application fields are defence, government and NGOs or marketing & communication. The problem in the taxonomy suggested by Sawyer and Smith is that the separation of design purpose and application can become redundant when they are equal or very similar which makes finding suitable examples impossible. They go into further detail and present the same taxonomic system for each subcategory (e.g. health games) that again causes the issue of redundancy and the similarity of definition criteria and application areas.

A very elaborate approach to classifying serious games for learning that explicitly tackles these concerns is offered by Ratan and Ritterfeld (2009). While most typologies are usually defined a priori and existing games are then sorted accordingly, Ratan and Ritterfeld review existing games which have been labelled as 'serious' by their developers, in specified databases or on review websites. Overall, they reviewed a total of 612 games and generated a classification system from the descriptions that were available for these games. Through expert review and an iterative analysis they arrived at a classification system consisting of four dimensions:

1. Primary educational content
2. Primary learning principle
3. Target age group
4. Platform

For the dimension of educational content they distinguish between academic education, social change, occupation, health, military, and marketing with academic education being the most prevalent content in the reviewed games, accounting for 63%. Regarding age groups Ratan and Ritterfeld identify four levels: 1) preschool and below, 2) elementary school, 3) middle school and high school, and 4) college, adult and senior. The majority of games were targeted at elementary, middle and high school children (39%). For the dimension of primary learning principles four main concepts were extrapolated: practicing skills, knowledge gain through exploration, cognitive problem solving, or social problem solving. The primary learning principle most often implemented was practicing skills (in 48% of all reviewed games). The analysis of platform availability revealed that nearly all games were designed for personal computers (about 90%). Hence the only distinction made in the classification by Ratan and Ritterfeld is that between PC and other platforms (those included stationary gaming consoles, handhelds and other mobile platforms). The aim to make the classification as all-inclusive and its categories as mutually exclusive as possible is convincingly approximated in this work. Nevertheless, some categories are confounded. This is especially true for the educational content and the employed learning principles: The combination of academic educational content and a primary learning principle of practicing skills was by far the most common.

Overall, this classification gives a fairly detailed overview of the types of existing serious games that have been labelled and marketed as such by their developers. This methodically sound suggestion has a strength which turns out to also be its weakness: The descriptive approach only takes into account games that are already on the market and carry an explicit label imposed by their designers. Thus, games that are or can be used for educational purposes but are additionally or even primarily focused on entertainment are left out entirely. In addition, the bias towards (commercially) available games causes future prospects for new types of serious games to be marginalized. The growing research and work on pervasive gaming (Benford et al. 2006), augmented reality gaming (Squire and Jan 2007) and location-based gaming (Broll and Benford 2005) which has a great potential for 'serious' applications is excluded (Jenkins et al. 2009; Squire and Jenkins 2003). In order to be flexible enough to be able to fit upcoming developments in the field of serious

games, possible new areas for serious games to expand into need to be integrated in a typological system in addition to the state-of-the-art (Sawyer and Smith 2008). In the final section on recommendations and suggestions for improvement of existing definitions and typologies we will try to present a suggestion for a classification taxonomy that is all-inclusive, sufficiently granular in its distinctions and open for modifications and additions. We can conclude that serious games are used or can be used in various settings like school education, professional training or political campaigns, include different learning/teaching modes like skill practice, repetitive fact memorization and explorative problem-solving at the same time, are designed for and used on different platforms like personal computers, gaming consoles or mobile phones and have diverse topics & subject matters like history, politics, health awareness or mathematics.

## Sticky Notes Instead of Stone Tablets

Genre definitions are always controversial. There are myriads of suggestions for computer game genres. According to Oblinger (2006b), common video game genres are adventure games, puzzles, role-playing games, strategy, sports and first person shooters (FPS). This is but one list fragment amongst many. Even ignoring the fact that there are numerous genre hybrids which can and do combine all of the often identified 'basic' genres, technology-driven innovations in the games industry create new genres with every new platform or input device (e.g. all the 'physical' games on Nintendo's Wii like *Wii Fit*). Hence genres are a rather fluid category (Apperley 2006) and each genre taxonomy is not only debatable, but also quickly outdated by actual game developments. Moreover, genres are not usually categories creators of games think in when designing and producing games. The same holds true for most players. Genres may help as orientation marks when choosing a game and help players if they seek specific uses and gratifications of games (Katz et al. 1974) or mood states (Zillmann 1988), but they are not cast in stone and can only give hints to the nature of a (serious) game.

The possibility to use COTS games for education and learning suggests that the crucial difference lies rather in the purposes and modes of use than in the games themselves. A more neutral and open diction would to follow the title of a book chapter by Jenkins et al. (2009) and speak of and deal with serious gaming instead of serious games. Accordingly, a new taxonomy would have to focus on the 'serious' purposes a game has or can have and thus be a typology of serious gaming scenarios and games rather than serious games as an a priori category.

Regardless, it is necessary to use a classification approach that allows educators, players/learners and researchers alike to identify what they are dealing with. To overcome the problem of static and either incomplete or redundant genre systems, the use of labels or tags is a viable alternative that has already been suggested for digital games as well as other media (King and Krzywinska 2002). This method is already in use in many Web 2.0 services like blogs or social networking sites and even academia has its similar method in the form of 'keywords'. To avoid randomness in the assignment of labels (which is also very often an issue with keywords in academia) there should be categories for the labels, but without any limitation on the possible number and nature of these labels within each category.

Starting from the very promising work of Ratan and Rittefeld (2009), we would propose the following label categories that allow the inclusion of specifically designed serious games as well as COTS games for 'serious' purposes:

| Label/Tag Category | Exemplary Labels |
|---|---|
| 1. Platform | Personal Computer, Sony PlayStation 3, Nintendo Wii, Mobile Phone |
| 2. Subject Matter | World War II, Sustainable development, Physics, Shakespeare's works |
| 3. Learning Goals | Language skills, historical facts, environmental awareness |
| 4. Learning Principles | Rote memorization, exploration, observational learning, trial and error, conditioning |
| 5. Target audience | High school children, nurses, law students, general public, pre-schoolers, military recruits |
| 6. Interaction mode(s) | Multiplayer, Co-Tutoring, single player, massively multiplayer, tutoring agents |
| 7. Application area | Academic education, private use, professional training |
| 8. Controls/Interfaces | Gamepad controlled, mouse & keyboard, Wii balance board |
| 9. Common gaming labels | Puzzle, action, role-play, simulation, card game, quiz |

*Table 1: Label/tag categories for classifying serious games*

This classification system is flexible and open for additions and changes. It can be used not only by game designers to advertise their products, but also by researchers to describe and compare games and by educators and learners who use them to express their view of and experience with the game. If some games do not match existing genre groups, combining tags/labels from different categories or creating new ones is the more convenient way. Such tag lists can also be updated and edited for the same game (e.g. by different user groups or by players and researchers) and need not include each of the categories suggested above or to be limited to one tag per category.

## Conclusion and Outlook

Serious games are a growing market as well as an interesting area for inter- and multidisciplinary academic research. While serious games may have purposes other than learning and education, the majority of the games labelled serious are used in educational settings of various kinds. The modes of learning implemented in serious games can differ largely which differentiates them from other concepts of innovative education like edutainment or e-learning. Although the list of existing serious games is quite diverse, special emphasis needs to be placed on the necessity for a blended learning experience which seamlessly integrates enjoyment and learning and presents the learning content as something which is neither external to the game nor a juxtaposition of entertaining sequences and educational material. Many of the current definitions and typologies of serious games are limited in scope. A medium like digital games that changes continually and quickly, however, calls for flexible and open definitions and classification systems. Building on previous work on serious games typologies we developed a classification system based on variable labels and tags instead of fixed genre names. This tag/label system should help to inform the design and evaluation of available and future serious games. It also opens up the possibility to qualify COTS games in their potential for 'serious' purposes. This taxonomy should help to inform research on and the development and choice of (serious) digital games for learning purposes.

Since the digital games market is constantly changing, the development of and research on serious games needs to react to these changes quickly. When researching the effects and effectiveness of digital games for learning, the importance of enjoyment for/in education needs to be taken into account. This means that when the effectiveness of a serious game is assessed, the question about its entertainment value should always be addressed. Further research is needed to evaluate the potentials and outcomes of using COTS games in educational settings and especially in approaches, which do not conceptualize digital games (solely) as learning tools. Specifically, this means that research on game or media literacy needs to be combined with traditional effectiveness studies. Another area that needs further attention in empirical research is the potential of new gaming platforms and game types such as pervasive gaming or augmented reality games. There has been some research on this as mentioned before, but most of the studies performed focused on very specific examples of one game or prototype.

Effectiveness research should take into account the content-dependency of its results (e.g. relating to educational settings or target groups). To achieve this, effective and unobtrusive assessment methods for digital game-based learning need to be developed and evaluated to monitor not only the learning outcomes, but also the learning process (Bente and Breuer 2009; Shute et al. 2009). Here, it is important that not only the final outcomes are assessed, but also that the learning and training process itself is monitored continuously without impairing the playing/learning experiences (e.g. via psycho physiological measurements or automated logs/recordings of player behaviour). This is especially beneficial as it can inform new ways to make learning games more adaptive so that they can always offer help or additional information when the players need it (e.g. when they get stuck at a certain point of a game). The optimal ratio of information 'on demand' and 'just in time' as Gee (2008) distinguishes it must be empirically found. In order to promote self-

regulated and intrinsically motivated learning, the positive effects of customization and personalization which games usually offer via avatar creation and development should be explicitly addressed in upcoming research. To avoid the criticism of a one-sided perspective, effects research on serious games must also deal with possible negative effects such as media-induced reduction of invested mental effort (Salomon 1984), the learning of socially undesirable content, and misconceptions in learning due to reductions and 'simulation shortcuts' (Michael and Chen, 2006) in games. We hope that the connection of learning and enjoyment in digital games and the embedding of (serious) games in learning contexts discussed in this paper as well as the taxonomy developed based on existing and possible manifestations of 'serious gaming' can serve to inform future design and research and help to increase the scope and granularity of research questions in the field of serious games.

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