

## Classifying Serious Games

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The fundamental goal of this research is to elucidate the important characteristics of current serious games, thus providing a tool through which future research can examine the impact of such games and ultimately contribute to their development. Understanding the true impact of serious game play requires first an understanding of what serious games are. The present research lays the foundation for such an understanding by developing a classification system of all serious games based on a dataset of over 600 serious games. This classification system could potentially contribute to rigorous empirical investigations of serious games, such as those that are reviewed in part II of this book, by presenting a framework within which such games could be analyzed systematically. By considering the dimensions and categories of serious games offered here, such research would be better positioned to suggest promising directions for the development of this valuable genre of digital games.

Serious games are an increasingly important medium with respect to education, training and social change (Michael & Chen, 2006). Such games are intended to facilitate deep and sustained learning (Gee, 2003, 2007) and to reach wide audiences by building on the “native tongue” of the Games Generation (Prensky, 2006). The past few years have shown an increase in the prevalence of such games, marked by the emergence of various organizations, web sites, and conferences dedicated to advancing this medium. Educators, health advocates and

CEOs of non-profit organizations are joining industry officials and game designers in advertising the assumed superiority of serious gaming as an innovative means to educate the public. Indeed, interactive games may prove more effective than other educational technologies and traditional pedagogy (c.f., Prensky, 2006; Ritterfeld & Weber, 2006).

Educators are searching for innovative learning strategies that blend enjoyment with education. Games technology would, so the assumption goes, provide the entertainment frame in which serious content could be embedded, resulting in the emergence of serious games as a distinct genre in the world of interactive media. Although some researchers claim that any digital game may provide (incidental) learning opportunities regardless of whether it is considered a serious game or a “non-serious” entertainment game (c.f., Ritterfeld & Weber, 2006), serious games is a genre that *explicitly* focuses on education. Thus, the genre has become associated with positively connoted features such as seriousness, education, or learning. Consequently, this recently developed genre may have the power to influence attitudes and selective exposure of digital gaming toward serious gaming by users, educators and parents.

With the serious games genre, developers took a distinct stand against only-for-entertainment games, claiming that the content of serious games is highly desirable from an educator’s perspective. The serious games genre implies that the outcome of playing these games is always advantageous for the player:

first, by facilitating learning experiences and, second, by not having any negative or harmful impacts. Games that would elicit aggression or addiction would not qualify as serious games. On the contrary, serious games should always work as intended, contributing to a self-guided, enjoyable and therefore deeply sustained learning experience.

Yet, not only is there a dearth of formal research about the true effectiveness of such games (Ritterfeld, Cody, & Vorderer, Chapter 1), but even the definition of a serious game is vague and needs clarification. There is a common stereotype that serious games are synonymous with “edutainment” games, defined by the Entertainment Software Rating Board (ESRB) as those that “provide users with specific skills development or reinforcement learning within an entertainment setting” where “skill development is an integral part of product” (Entertainment Software Rating Board, 2007). While all edutainment games are certainly serious games, the body of serious games extends beyond edutainment, enveloping almost every digital game that has a purpose in addition to entertainment. Consistent with this notion, the Social Impact Games website defines serious games as “entertaining games with non-entertainment goals” (Social Impact Games, 2008). But a problem arises when attempting to identify such goals because the game producer’s definition of its genre may not be consistent with the user’s experience nor the psychological reality behind that experience. Hence, identifying an exact definition of serious games is neither a

straightforward nor pragmatic endeavor. The simplest solution to this problem is to treat every game that has been called a serious game as a serious game.

In this chapter we temporarily accept the fact that some games are defined as serious by their publishers without reflecting on whether this claim does actually hold true in order to be able to describe and classify the current body of this new genre. Using only the qualification that a digital game has been deemed serious to some extent, we propose a classification system of serious games that categorizes each game along natural boundaries within the larger body of serious games. This classification system takes four dimensions into account: primary educational content, primary learning principle, target age group, and platform. The result is a basic map of the world of serious games intended to serve game scholars and developers to further their endeavors.

#### Developing a Classification System of Serious Games

In order to develop a classification system of serious games, it was necessary to assemble and analyze an extensive database of such games. Playing every single game was not possible, given the large number of serious games and limited amount resources, so information about each game was collected from secondary resources. This information served as the basis for analysis through which natural groupings of certain characteristics were identified. The following sections describe the process of assembling this database and conducting this analysis.

### *Serious Games Database*

The present classification system is based on a database of games that were self-proclaimed, by the game developers, or deemed by any other organization or website, as serious. The games in this database included English-language games, mostly developed in the United States with a minority from Asia or Europe, that were released between 1997 and 2007, though the number of games was skewed toward the latter half of the decade. They were collected via email lists for serious game developers, websites dedicated to serious games, and simple Internet searches. The unit of analysis was a single game.

In the first wave of data collection, serious game developers were contacted through various professional organizations, specifically, the Serious Games Initiative (<http://www.seriousgames.org>), which includes the Games for Health (<http://www.gamesforhealth.org>) and Games for Change (<http://www.gamesforchange.org>) communities, as well as the Games Studies section of the International Communication Association (<http://www.icahdq.org>). Emails were sent to these lists requesting that game developers enter information about their serious game into an online survey template. This survey included questions about the games' serious and narrative content, educational and entertainment methods, major purpose, and target demographics. The questions included both multiple choice and open-ended responses and were based on a preliminary analysis of a small sample of serious games identified through Internet searches.

A significant amount of descriptive information about serious games was gleaned from two websites dedicated to classifying digital games. The first was the official website for the ESRB (<http://www.esrb.org>). This website provides ratings and classifications of all types of digital games, including edutainment games. As discussed above, contrary to the common stereotype, not all serious games are edutainment games, but all edutainment games are serious games. Therefore, all of the 281 edutainment games from the ESRB list were included in the database.

The other aggregative website, dedicated entirely to games with a purpose beyond entertainment, their definition of serious games, was the Social Impact Games website (<http://www.socialimpactgames.com>), sponsored by the Games to Train organization (<http://www.games2train.com>). Social Impact Games provides an extensive list of serious games, categorized according to the content types of the games. These content types are similar to the Primary Educational Content dimension of the present classification system. 175 games were included in the database from this list.

The remainder of the information on serious games included in the database was collected through simple Internet searches. The Wikipedia entry on serious games ([http://en.wikipedia.org/wiki/Serious\\_game](http://en.wikipedia.org/wiki/Serious_game)) provided links that led to information on 50 additional serious games and 83 further games were identified using Internet search engines. In some cases, the information collected

on these games was similar to the information requested in the survey sent to the game developers, but the majority of these sources contained only basic descriptive information about the games.

In conclusion, 23 games were identified in the surveys filled out by game developers, 281 games and 175 games identified from the ESRB and the Social Impact Games websites, respectively, and 133 games identified through Internet searches. Hence, a total of 612 games are represented in the database and used to develop this classification system.

#### *Iterative Analysis and Category Development*

After the database was assembled, the classification system of serious games was developed by iteratively examining the information collected about the games from each of the sources. Two researchers consensually searched for natural groupings among the games based on characteristics of the game that related to the larger dimension in question. For example, researchers identified the different age groups that each game targeted and these groups eventually became the categories within the Target Age Group dimension. In order to refine these categories, the researchers classified all of the games according to the groupings and then redefined the groupings according to inconsistencies identified. This process was repeated numerous times until the groupings were as all-inclusive and as mutually exclusive as possible.



### Dimensions of Serious Games

The classification system of serious games includes these four dimensions within which the games were categorized: primary educational content, primary learning principle, target age group, and platform. The following sections define each dimension, present the proportions of games found within the categories of each dimension, and provide some examples of games within the categories.

#### *Primary Educational Content*

To define the primary educational content dimension of the games, we categorized the driving force that makes the game serious and not simply entertaining into the following areas: academic education, social change, occupation, health, military, and marketing. Since many of the games contained more than one type of educational content, we identified which content the developer intended to be most important, gleaned clues about this intent from descriptions of the games and their potential effects. Figure 1 shows the proportions of games based on their primary educational content.

**[INSERT FIGURE 1 HERE]**

Games with primarily *academic educational* content are by far the most prevalent (63%) within the dataset. These games, not surprisingly, are intentionally designed to teach material traditionally taught within an academic environment. This material is often curriculum-based content, including algebra

and biology, or extra-curricular content, such as nano-technology or religion. Examples of games in this category include *Kinetic City*, “A program of standards-based online science games and other activities for kids in grades 3-5” (The American Association for the Advancement of Science, 2005), *Londoner*, a game in which students experience life in 17th century London (Ramsbottom, Sidran, & Sharp, 2007), and *Electrocardiogram*, in which players practice “as an ECG [electro cardiogram] technician in a health clinic...and perform ECGs on patients” (Nobel Web AB, 2008).

Games in which the primary educational content is related to *social change* make up 14% of games in the dataset. These games espouse particular social agendas, such as political issues, like supporting particular political candidates, and social issues, such as fighting world poverty or protecting the environment. Examples of games in this category include *Darfur is Dying*, in which players assume the perspective of a displaced Darfurian, negotiating the forces that threaten survival in a refugee camp and learning about the crisis in Sudan (Ruis, Ruis, York, Stein, Keating, & Santiago, 2006), *Waterbusters*, in which players learn how to conserve water around the home (City of Seattle, 2006), and *Hate Comes Home*, in which players go back in time to prevent a school dance from ending in a hate crime (WILL Interactive, Inc., 2008c).

Games classified as having primarily *occupational* content are less prevalent, accounting for 9% of the games. These games give players knowledge

and skills that can be applied specifically to the players' occupation, such as training to perform specific actions or imparting knowledge and skills that are broadly applicable to the players' occupations. Examples of games in this category include *Objection*, a series of games to train lawyers in courtroom skills (TransMedia, Inc., 2008), *The Business Game*, in which players develop and market a new business product (PIXELearning Limited, 2008a), and *Stone City – Cold Stone Creamery, Inc.*, a game designed to train Cold Stone ice cream employees to serve ice cream with specific proportioning to accomplish desired profitability (Persuasive Games, 2008a).

Games with primarily *health-related* content make up 8% of the games. These games provide players with knowledge and habits that improve health, reduce risks, and/or enable coping with health problems in the player or others. The majority of the games in this category focus either on physical health, such as cancer or sexually transmitted diseases (STDs), mental health, such as dealing with depression, or on a combination of the two. An example of a game in this category is *Re-Mission*, a game for cancer patients in which players manage realistic, life-threatening side effects associated with cancer with the intent of better understanding and managing their physical disease (HopeLab, 2006). Other examples include *Grow Your Chi*, in which players grow their chi, thereby avoiding depression, by clicking on the appropriate clouds (Baldwin, 2004), and

*Shagland*, in which players collect condoms and avoid drinking alcohol in order to have safe sex (Rubberductions, 2008).

Games in which the primary educational content is related to the *military* made up 5% of games in the dataset. These games provide players with knowledge and skills that can be applied to military activities, such as air strikes and infantry missions. The lack of prevalence of military-related games is an indication of the sampling bias within this research. Many more military-related simulations and pieces of software that can be considered serious games are likely to exist than those presented in this sample, but such games are most likely used exclusively within the military and so it would have been impossible to collect them within this sample or estimate their prevalence. Examples of games in this category include *America's Army*, a first-person shooter game and recruitment device for the U.S. Army in which players go through basic training and develop their Army career (United States Army, 2002), and *Anti-Terrorism Force Protection*, which trains officers to make decisions related to their command's anti-terrorism posture (WILL Interactive, Inc., 2008b).

Games with *marketing*-related primary educational content were the least prevalent (<1%). These games reinforce brand awareness, promote products, or target players as potential customers. The lack of prevalence of such games is another indication of a sampling bias within this research. There are likely many more games that have a marketing intent, but such games have traditionally not

been classified as serious and so these games were not identifiable through the methods used to collect the sample. Whether marketing can be considered educational is open to debate. This category is listed here as an indication of the potential for such games to be considered serious games, although additional research should be conducted in order to develop a more nuanced understanding of such games. Examples of games that were found in this category include *The Arcade Wire: Xtreme Xmas Shopping* (Persuasive Games LLC, 2008b), in which players have a shopping list and must use whatever means necessary to purchase every item, and *Xtreme Errands* (Persuasive Games LLC, 2008c), in which players must utilize the features of the new 2006 Jeep Commander in order to prepare for 4 big weekend events.

#### *Primary Learning Principles*

This dimension of the classification system is based on an understanding that the unique advantage of digital games is not so much in their delivery of curricular content but in providing opportunities for exploration, experimentation, and problem solving (Jenkins, Camper, Chisholm, Grigsby, Klopfer, Osterweil, Perry, Tan, Weise & Guan, see Chapter 2, in this volume). Consistent with this notion, we identified the following four Primary Learning Principles through which serious games attempt to impart skills, knowledge or ideas to the players: practicing skills, knowledge gain through exploration, cognitive problem solving, or social problem solving. If a game utilized more than one learning principle, we

determined the primary principle embedded in the game based on descriptions of the game play. Figure 2 shows the proportion of games in each primary learning principle category.

**[INSERT FIGURE 2 HERE]**

About half (48%) of the games within the dataset are classified as having the primary learning principle of *practicing skills*. These games induce players to practice and solidify basic or advanced skills. These games often focus repetitively on a narrow scope of information and activity. Games in this category include *Math Blaster*, in which players use math skills to complete missions (Knowledge Adventure, Inc., 2006), *The Binary Game*, in which players create binary numbers to learn how the binary numeral system works (Cisco Systems, 2008), and *River City*, in which players use scientific inquiry and hypothesis testing to address 19<sup>th</sup>-century health problems (Dede, 2004).

Games using the primary learning principle of *cognitive problem solving* were less prevalent than games that focus on practicing skills, representing about a quarter (24%) of the games in the dataset. In these games, the player engages deeply, both cognitively and creatively, with material such as puzzles, brain teasers, or complex hypothetical situations. Games in this category include *Brain Booster*, in which players engage in exercises such as Sudoku, word scrambles and memory grids (Demand Entertainment, Inc., 2008), *Urban Science* (The

Epistemic Games Research Group, 2006), in which players learn about urban planning by developing a comprehensive, ecological plan for their community, and *Building Homes of Our Own* (National Association of Home Builders, 2002), in which players manage the issues of building and selling a home.

The primary learning principle of *knowledge gain through exploration* was similarly represented (21%) within the dataset. In these games, players acquire information, such as historical or biological facts, but not to engage deeply with such information. Contrary to practicing-skills games, these games focus on a broad scope of information with a small amount of repetition. Games in this category include *Paestum Gate*, in which players explore an archeological site in southern Italy (De Chiara, Erra, Scarano, 2008), and *Revolution*, in which players experience the daily social, economic, and political life of colonial Williamsburg on the eve of the American Revolution (The Education Arcade, 2005).

Games with the primary learning principle of *social problem solving* were by far the least prominent (7%). In these games, players solve small- or large-scale social problems by interacting in teams, collaborating, or taking responsibility as members of society. It should be noted that games that have a positive social message do not necessarily focus on social interactions and thus may not fall into this category. Games in this category include *Entertech*, in which players engage with co-workers and supervisors, learning about workplace

ethics, teams and company policies (The EnterTech Project, 1998), *Quest for Independence*, in which players engage in activities integral to living on their own, such as getting a job, using social services, getting food, and staying healthy (Kedzier & Quinn, 2008), and *Hate Comes Home*, in which players go back in time to prevent certain incidents from ending in a hate crime (WILL Interactive, Inc., 2008c).

#### *Target Age Group*

All games in the dataset were classified into the following four age groups: 1) preschool and below, 2) elementary school, 3) middle school and high school, and 4) college, adult and senior. Regarding this final group, it should be noted that although there are some games that seem more appropriate for college-age or senior players specifically, most serious games beyond the high school level do not target specific age ranges. Hence, it would not have been appropriate to split this group into smaller mutually exclusive groups. Figure 3 shows proportions of games within each target age group.

**[INSERT FIGURE 3 HERE]**

The most prevalent age groups were the elementary school and the middle and high school groups, with 39% of all the games targeting each age group, respectively. Less prevalent (16%) were games that targeted the college, adult and



senior age group, followed by the games in the preschool and below group (5%). Considering that the average commercial digital game player is 33 years old (Entertainment Software Association, 2006), this indicates that serious games target younger players than other games, which makes sense given the prevalence of serious games with primarily academic educational content. An example game in the preschool and below category is *Baby Felix Creativity Center* (Fox Interactive, 1997). An example game in the elementary school category is *Jump Start Advanced First Grade* (Knowledge Adventure, Inc., 2008). An example game in the middle school and high school category is *Revolution* (The Education Arcade, 2005). And an example game in the college, adult and senior category is *The Enterprise Game* (PIXELearning Limited, 2008b).

#### *Game Platform*

While the effectiveness of a serious game is certainly dependent on the game's content, the game's platform may also play a role, so games in the dataset were classified according to whether they were made for play on computers or other platforms. The vast majority of the serious games in the dataset (90%) were developed for a computer platform. The remaining non-computer-based games (10%) included games made for DVD, Nintendo Game Boy, Nintendo 64, Nintendo DS, Palm Pilot, Playstation, and Plug-and-Play. Although playing experience and accessibility differ vastly between these non-computer-based

platforms, the representation of each platform in the dataset was too small to categorize them separately.

According to Foehr (2006), computer-based digital games are among the most multitasked media in among U.S. youth, while non-computer-based digital games are the least multitasked media. This loosely implies that players may pay more attention to non-computer-based digital games, the least-represented faction within our dataset. Although current research does not explain this phenomenon, it may be easier to multitask with other computer programs while playing computer-based games simply because of the ease of accessibility on an Internet-linked computer or because the player does not need to turn to another screen. Another explanation may be that on average, non-computer-based games use more computing and video-processing resources than computer-based games, implying that these games have more engaging game play or graphics. Regardless, this discrepancy is important because it implies that the serious component of the game is likely to be more effective when players are not multitasking.

Aside from multitasking, platform differences may significantly impact the effectiveness of serious games based on various facets of the platforms. For instance, a computer's control interface, the keyboard and mouse, is quite different from typical non-computer control interfaces, such as gamepads and remotes. Perhaps different types of input devices facilitate learning in different

ways. Or perhaps screen size or potential mobility of a platform affects the ways that serious games are played. Although the present categorization does not provide a comparison of non-computer-based platforms, it should still be apparent that these are worthy questions for serious games researchers to pursue.

#### Interactions Between Educational Content and Learning Principles

By examining the interactions of the various categories of educational content and learning principles, we found that games with both the primary purpose of academic education and the educational goal of skills practice were by far the most prevalent. However, in all other content areas, skills practice does not play this superior role and knowledge gain through exploration and cognitive problem solving are applied at least as extensively. Figure 4 shows the distribution of games within each combination of categories.

#### **[INSERT FIGURE 4 HERE]**

That the majority of serious games attempt to teach the same subject matters taught in schools, using the same methods of repetition and practice, is not surprising. In this sense, the majority of serious games classify as “edutainment” according to the ESRB’s definition of the term. Unfortunately, most serious games do not go beyond this traditional role and are certainly not fulfilling the potential that serious games promise. Moreover, whether a game is the most suitable format for practicing skills is questionable. It can be argued that

skill practice remains boring and uninteresting even if it is attached to interactive graphics and embedded in a narrative context. In this situation, the enjoyability features that games add only serve for initial motivation (“this is a different way of practicing”) and more sophisticated, visualized gratification. In both cases, enjoyability and educational experiences remain detached and the promise of an entertainment-education link is not fulfilled. As a consequence, such serious games would not be played deliberately over a longer period of time and would require similar external prompts or gratification schedules as any other skill practice. As Ritterfeld and Weber (2006) argued earlier, a successful blending of entertainment and education in game play requires parallel experiences and is best realized in game simulation that invites exploration and requires complex reasoning. We believe that applying these learning principles to many areas of academic education would significantly enrich the quality and effectiveness of serious games.

### Final Remarks

The current research does not provide the basis for in-depth speculation about the future of serious games, but it does create a broad snapshot of the present state of serious games and a structure that could be utilized by future research in this area. Overall, the described trends indicate that serious games span a wide range of purposes and educational goals, with the Academic Education and Practicing Skills categories representing the vast majority of

games, validating the stereotype that serious games consist mostly of “edutainment” games. Yet, considering that the sample contained over 600 games, the other categories are still important members of the serious games family. It seems obvious that the number of serious games has been increasing and will continue to do so, and this is supported by the finding that there are more games in the present database produced during the latter half of this past decade. Given the various industries and organizations that are increasingly adopting serious games as a means of accomplishing their goals, other learning principles and educational content areas – besides Practicing Skills within the realm of Academic Education – should ostensibly grow in representation. Future research might examine which categories of serious games are growing fastest and perhaps identify other trends in the development of the various serious games categories.

The classification system described in this chapter should serve as a guide to understanding and interpreting serious games as a medium. Future research on serious games could use this framework to situate the games of interest within the larger landscape of serious games. For example, by noting that a specific health-oriented game focuses on social problem solving and targets players who are over high school age, a researcher could argue that this game is relatively unique within the body of serious games and perhaps this has some bearing on its effectiveness. Thus, the classification system presented here provides a new tool for the analysis of serious games.

However, one limitation of this tool should be mentioned. As discussed earlier, creating the classification system was an iterative process of classifying the games according to the groupings and defining the groupings according to the games, in an attempt to develop groupings that were both as all-inclusive and mutually exclusive as possible. While all-inclusiveness was generally easy to achieve, mutual exclusivity was difficult to attain while maintaining a relatively small number of groupings. Exacerbating this dilemma, in some cases it was difficult to ascertain whether a game's primary purpose or educational goal was in fact primary or only secondary. For example, in *Anatomy of Care* (WILL Interactive, Inc., 2008a), the player acts as one of five hospital-team members, learning about the impact of their actions on patient care. This game is clearly related to health, but is it occupation-related as well? The game developer's description does not specify whether the game is intended to be used by healthcare professionals or the general public, most likely implying that it is suitable for either type of player. Hence, Health- and Occupation-Related categories are not mutually exclusive. Despite this caveat, the classification system developed in this chapter is flexible enough to absorb future development trends in serious games and is a strong foundation for future research in the field.

The potential applications of the present classification system are too diverse to anticipate completely at this time, but it seems likely that nearly all types of research on serious games could benefit from this framework. An

important current question in the field is whether serious games fulfill their educational potential. The following two chapters address this question in 2 subsequent steps: first, by examining the factors that make a game enjoyable (Wang, Shen & Ritterfeld, chapter 5), and second, by asking whether these fun factors are sustained in games specifically developed for their serious content (Shen, Wang, & Ritterfeld, chapter 6). These chapters represent the first research to utilize the present classification system to explore a research question about serious games. Ideally, the findings from this and future research that employs this classification system will eventually be incorporated into serious game development, facilitating the creation of improved serious games that can accomplish their goals beyond entertainment as effectively as possible.

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