DEVELOPMENT OF A DIGITAL GAME-BASED LEARNING BEST PRACTICES CHECKLIST

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ABSTRACT

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The problem of the study was to evaluate current distracted driving video games for teen drivers based on a best practice checklist of effective strategies. The best practice checklist was generated from game metrics, game models, and theorists that specialize in digital game-based learning (DGBL) games. The DGBL model was designed to help teach teen drivers all the distracted driving challenges teens presently face that the driver’s education program does not hit on. The DGBL game model was designed from all the evaluated distracted driving video games.

All the current distracted driving video games were evaluated with the best practice checklist. After all the current distracted driving video games had been evaluated, they were ranked and put into a list. If a driving game has a certain criteria from the checklist it would get a check mark for that game criteria. Whichever game got the most check marks would be first and thus down the line of games. Once the list was completed all the games were be reviewed to see if there was one game that fits all the criteria for a complete DGBL game model. If one game happens to fit the criteria it would be used for the DGBL model.

The results from objective two were analyzed and ranked. They were ranked based on how many of the criteria they met. At the end of the ranking process, there were two games that not only had the same amount of game metrics, but also had the same game metrics as well. Both of them had all of the game metrics, except rewards. Both of the top two ranked distracted driving games were especially well done and had in-depth story lines, many challenges, and immediate feedback, and were motivating, engaging, and interactive. The researcher’s game model was based off of the Distractology game model with rewards being added to make it a true well-rounded DGBL game model.
In dedication to my lovely wife Brandi and son Leonidas, who support me in everything I do no matter what, with unconditional love and kindness.
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I would like to thank Dr. Terry Herman for keeping me on track and for putting the wind back in my sails whenever I would get frustrated and want to give up.
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CHAPTER I: INTRODUCTION

Context of the Problem

Getting a driver’s license is an important moment in any teen’s life. Getting their driver’s license means that they are becoming responsible young adults. At least that is how society views this event. However, getting your license is much more than a simple rite of passage for any teenager. The Department of Motor Vehicles (DMV) Answers, 2010, paragraph one states:

While earning your driver’s license may seem like a natural rite of passage, keep in mind that driving is a privilege and not an entitlement. To earn your license, you must meet your state's requirements. In most cases, this includes passing driver's education.

A possible issue with today’s teenagers is that they view getting a driver’s license like getting their first cell phone; they just expect to get it like every other teen their age.

General Motors Acceptance Corporation (GMAC) Insurance did a national driver’s test to test each driver’s driving knowledge. The test showed that 1 in 10 licensed United States drivers would fail a state driver’s test if they had to take one today and don’t know the basic rules of the road. Over 5,000 drivers were given a 20-question survey designed to measure their basic knowledge of the road and their driving habits. Drivers lacked basic road knowledge and displayed dangerous driving habits, which included speeding. Younger drivers are the most likely to fail a written driving test (“Survey Ranks States,” 2005).

Crash rates among young drivers are high largely because of their immaturity combined with their driving inexperience. The immaturity is apparent in young drivers' risky driving practices such as speeding and tailgating. At the same time, teenagers' lack of experience behind the wheel makes it difficult for them to recognize and respond to hazards. Fatal crashes involving young drivers typically
are single-vehicle crashes and often involve driver error and/or speeding.

(Fatality Facts 2008, 2009, para. 4)

Teen drivers don’t always pay attention to the road, and they don’t always observe the rules of the road. In some cases they are too busy calling and text messaging their friends on their cell phones or using their iPods to change to the next song. “While driving teens from the age of 16 and 17 admitted that 52% of the study group made and answered their cell phones, while 34% of them send and responded to text messages while driving,” according to Teen Driver Car Crash Statistics. It goes on to say, “that the highest degree of distracted driving takes place in the age group below 20 years old” (“Teen Driver Car Crash Statistics,” 2010, para. 2).

Historically, driver’s education programs did not have to consider the many technological threats among teenage drivers, but these are just a few of the many distractions that take priority over actually driving down the road to get from their beginning to ending destination. Teen drivers need to understand how serious their actions are and what the consequences are for their driving choices. There are many helpful websites and materials to help teens learn the ways of the road, but none of them really take into consideration the growing trends of multitasking while driving. Current programs, along with online courses and online games, only teach teens the basics to get them started. The American Automobile Association (AAA) Foundation for Traffic Safety just released a study that captured teenage drivers and their parents with in-car cameras during their supervised driving phase. The study found that half of parents reported they still were not comfortable letting their teens drive in at least one driving condition, and one-third of these parents allowed their teens to obtain their license but restricted their teen’s ability to drive in certain scenarios, (Mahlum, 2010). The study goes on to say that 68% of parents reported that driving times together were limited by busy schedules by both the parents and their teens. Even
after a full year of driving together, parents still didn’t consider their teen drivers ready to drive unsupervised in traffic, in the rain, or on the highway. This study furthers the evidence that teen, inexperienced drivers are not even close to being ready to drive out on the open road unsupervised, even after passing driver’s education.

It is also possible to fail driver’s education.

The most common reasons for not completing a driver education course are not showing up for required behind-the-wheel practice times and failing to complete the written tests at the end of each unit. Obviously, these are issues that can be avoided simply by treating the program with the same level of commitment that you would give to any academic course taken during the school year (DMV Answers, 2010, para. 3).

Driver’s education programs need to make sure that teens can not only remember everything that was covered, but also when and how to use that knowledge in certain circumstances and real-time situations. “Driving in a variety of settings is the best way to build competence; starting early and practicing often can make the crucial difference between being a tentative novice driver or one capable of handling challenging and unavoidable driving scenarios,” said AAA Foundation President and CEO Peter Kissinger (Mahlum, 2010, para. 3).

In the driver’s education courses that are done locally, not online, teens practice driving in actual vehicles along side a driving instructor and are required to drive with parents outside of class for added practice. The AAA Foundation for Traffic Safety study also found that teens only averaged an hour and a half of supervised driving per week. During this time the trips were mostly routine along the same routes each time. “Few teens gained significant experience in more challenging situations, such as driving in inclement weather or in heavy traffic” (Mahlum,
2010, para. 2). While these strategies are all very good practice, they do not consider everything that teens need to know to start driving unsupervised.

Part of the problem that this study will address is the lack of a concrete checklist for best practices. There is no checklist that one can use to make sure their game model has all the right pieces. The best practice checklist would be able to be used on any type of game model regardless of genre, audience, and target market. As of right now, there are many game metrics that different theorists suggest should be included in one’s game model, but nothing in the way of a checklist.

**Statement of the Problem**

The problem of the study was to evaluate current distracted driving video games for teen drivers based on a best practice checklist of effective strategies. The best practice checklist was generated from game metrics, game models, and theorists that specialize in DGBL games.

**Objectives of the Study**

1. Create a best practices checklist from game metrics, game models, and a review of DGBL theorist literature.
2. Evaluate current distracted driving video games using the best practices checklist.
3. Analyze the results to identify exemplary components and develop a game model based on those best practices and exemplars.

**Significance of the Study**

A DGBL driving game designed from the DGBL model from this thesis study would function as part of the driver’s education program or could be a stand-alone piece. This DGBL game would be provided to teen drivers that enter into the driving program. The significance of the video game is that young teens spend countless hours everyday playing video games for fun.
Young teens respond positively to playing video games and focus better while doing so compared to being lectured at in a typical classroom scenario. A DGBL game, along with being fun and motivational, will also be educational for our intended targeted audience of young teens.

Another significance of the study is that the model will fill in the gaps of conventional driver’s educational programs. Most driver’s educational programs do not cater to every type of driving situation that teens may come across while driving. If students take driver’s education during the summer, they don’t get the experience of driving in the snow. Other driving scenarios that young teens might never be exposed to are driving in rain, during rush hour traffic, on dirt roads, and many other variants. The driving video game model would cover every type of driving scenario possible.

Many resources explain that lack of experience causes young teen drivers to have so many accidents and be killed every year. But the same resources don’t have practical solutions to this problem other than adding more driving hours as a requirement for young teens before they can receive their license. Practice makes perfect, but if young teens are driving the same routes over and over again in the same environments with the same variables, then they aren’t really learning as much as they should be. The driving video game model is another possible solution to help prevent these deaths from ever happening by giving young drivers the much-needed experience they need before getting behind the wheel of a motor vehicle.

Assumptions/Limitations

This study assumed that when referring to young drivers and teens we are talking about the age group of 16 to 19 years of age. It was also assumed that all facts and statistics from the studies resources about the subject matter provide accurate information.
Definition of Terms

DGBL – Digital game-based learning (DGBL) is an instructional method that incorporates educational content or learning principles into video games with the goal of engaging learners. Applications of digital game-based learning draw upon the constructivist theory of education. Drawing from the constructivist theory of education, digital game-based learning (DGBL) connects educational content with computer or video games and can be used in almost all subjects and skill levels. Proponents of digital game-based learning contend that it provides learning opportunities that engage students in interactive instruction and helps prepare them to participate in the globalized, technological society of the 21st century (Coffey, 2009).

Teen – Adolescence, teen, or teenager is a transitional stage of physical and mental human development generally occurring between puberty and legal adulthood (age of majority), but may also be defined as ending with the teenage stage. According to Erik Erikson's stages of human development, for example, a young adult is generally a person between the ages of 20 and 40, whereas an adolescent is a person between the ages of 13 and 19. Historically, puberty has been heavily associated with teenagers and the onset of adolescent development (“Adolescence,” 2010).

Video Game – A video game is an electronic game that involves interaction with a user interface to generate visual feedback on a video device. The word “video” in “video game” traditionally referred to a raster display device. However, with the popular use of the term video game, it now implies any type of display device. The electronic systems used to play video games are known as platforms; examples of these are personal computers and video game consoles. These platforms range from large mainframe computers to small handheld devices.
Specialized video games such as arcade games, while previously common, have gradually declined in use (“Video game,” 2010).

iPod – An iPod is a portable device for storing and playing audio files encoded by MP3 or AAC compression algorithms. Designed by Apple Computer, iPods have distinctive styling and can hold anywhere from a few hundred to ten thousand songs (Wallener, 2003).

Interactivity – Interactivity/interaction is the relationship when the game changes in response to something the end user does or doesn’t do. It refers to when software accepts and responds to inputs from the end users, such as data or commands, (Prensky, 2001).

Engagement – Engagement, engaging, or engage is to occupy the attention or efforts of a person or persons (“Engagement,” 2010).

Feedback – For this study, feedback is being used in the form of educational reinforcement, both as confirmation (positive feedback) and corrective (negative feedback) reinforcement (Fleming and Levie, 1993).

Rewards – Rewards are an incentive to go on. Finishing a level is one reward, but there are often many small rewards, such as things to find and collect, along the way (Prensky, 2001).

Introduction Summary

The goal of this study was to analyze the results from evaluating current distracted driving video games for teen drivers based on a best practice checklist of effective strategies by identifying exemplary components and then develop a game model based on those best practices and exemplars. The best practice checklist was generated from game metrics, game models, and theorists that specialize in DGBL games. Many teen drivers are falling into bad habits while driving because of every day distractions behind the wheel. They need to know and realize that these bad habits could be detrimental to not only themselves, but also to other drivers as well.
CHAPTER II: LITERATURE REVIEW

Overview of the Literature Review

The effective design and development of a driving game model requires that a literature review be completed to research digital game-based learning. Are games an effective learning tool? If DGBL is a credible and feasible learning methodology, does the target audience, teen drivers, fall into the DGBL audience base? The video games market needs to be reviewed to see if this is a new idea or if it has already been done before and has succeeded or failed. Another aspect that needs to be addressed is the technology for such a video game model. Is the technology available, does it need to be designed, developed, or just manipulated? Also an exploration of future video game platforms for driving education will be included in this literature review.

Digital Game-Based Learning

Video games, when designed properly, can be an effective learning tool (Prensky, 2001). In 2008 alone, video game sales topped 21 billion dollars in the United States. The main purpose of video games is to entertain, but some go far beyond that concept. Some teach us how to create cities, build empires, solve complex problems and puzzles, learn to work in teams, communicate strategies, and plan accordingly, and some teach us about actual historical events that happened in time from different points of view (Gee, 2003). Many adults think that video games are violent. They would rather have kids playing outside with other kids, riding bikes, Frisbee golf, or playing sports. Some parents would rather have their children doing anything else rather than spending countless hours in front of the television playing video games. What parents don’t know is that their kids are learning while they play video games. They are not just wasting their time for strictly entertainment purposes; they are learning (Prensky, 2006).
Marc Prensky writes how video games are actually engaging the user and teaching them vital learning lessons that kids will need for the 21st century. Prensky (2001) talks about how video games engage kids because they are fun to play. “Computer and video games are potentially the most engaging pastime in the history of mankind” (Prensky, 2001, p. 106). Prensky believes that there is a combination of twelve elements that explain why games engage us. Below is his list as to why games engage us and are listed in Figure 1.

<table>
<thead>
<tr>
<th>WHY GAMES ENGAGE US</th>
</tr>
</thead>
<tbody>
<tr>
<td>Games are a form of <strong>fun</strong>. That gives us <em>enjoyment and pleasure</em>.</td>
</tr>
<tr>
<td>Games are a form of <strong>play</strong>. That gives us <em>intense and passionate involvement</em>.</td>
</tr>
<tr>
<td>Games have <strong>rules</strong>. That gives us <em>structure</em>.</td>
</tr>
<tr>
<td>Games have <strong>goals</strong>. That gives us <em>motivation</em>.</td>
</tr>
<tr>
<td>Games are <strong>interactive</strong>. That gives us <em>doing</em>.</td>
</tr>
<tr>
<td>Games have <strong>outcomes and feedback</strong>. That gives us <em>learning</em>.</td>
</tr>
<tr>
<td>Games are <strong>adaptive</strong>. That gives us <em>flow</em>.</td>
</tr>
<tr>
<td>Games have <strong>win states</strong>. That gives us <em>ego gratification</em>.</td>
</tr>
<tr>
<td>Games have <strong>problem solving</strong>. That sparks our <em>creativity</em>.</td>
</tr>
<tr>
<td>Games have <strong>interaction</strong>. That gives us <em>social groups</em>.</td>
</tr>
<tr>
<td>Games have <strong>representation and story</strong>. That gives us <em>emotion</em>.</td>
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Figure 1. Why Games Engage Us. Adapted from Prensky (2001, p.106).

Games have rules and structure and goals that inspire motivation. Games are interactive and provide outcomes and feedback. Most games also have problem solving situations that spark creativity. Finally, games tell stories that elicit emotional responses. Kids play video games for hours because they are having fun and are engaged into what they are doing. Video games keep their attention, unlike textbooks and homework. Kids can’t wait to get done with homework. Kids can’t wait to play video games and spend countless hours doing so. Shouldn’t it be the other way around? Playing video games are our brains’ way of learning in its favorites form, (Prensky, 2001).
Video games are designed to keep the user’s attention by constantly challenging their abilities but not being so hard they cause the player to give up. Prensky says that is what keeps kids playing video games. Kids are motivated to play video games for long periods of time. They feel like they are getting better and better the longer they play them (Prensky, 2006). Game developers do this by letting the player know their character is leveling up by getting to the end of one level and then starting the next and so on into the game. Players need to do certain tasks over and over again or multiple tasks to get better at them and level their skills up to reach the next level. Also with leveling up, game developers include adaptation strategies so the game gets harder with every level you go up. To keep the player motivated to reach the next level and keep playing, the game needs to adapt to the player’s skill. The game can’t be too easy or too hard depending on the player’s skill or the player will simply just stop playing the game. Prensky puts it best when he says, “as long as a game remains constantly just hard enough to make the player feel challenged while also providing the feeling of ‘I can do this if I really try,’ people will want to continue to play” (Prensky, 2006, p. 59). As long as the video game keeps the user’s attention and keeps challenging his or her abilities, the player will keep playing. Prensky adds that practice and feedback, learning by doing, learning from mistakes, goal-oriented learning, task-based learning, and others are applicable interactive learning techniques, when players are learning through games (Prensky, 2006).

Games have to be more than fun and entertaining to play to be an effective learning tool for education. Hertel and Millis (2002) discuss how motivation and active participation go hand in hand and equal active learning, which is the ultimate goal. We want students to play video games to have fun but also to actively learn what we have put in front of them. Hertel and Millis explain that all the research that has explored motivation agree that it cannot be imposed on
students. Motivation only comes when they get fired up about the topic of the video game to really become an active participant in the environment. The authors explain that there must be motivation by the students before any information is given. Active participation is a result from motivation and active learning is a result from active participation (Hertel & Millis, 2002).

The game has to motivate the player so that the player is actively participating while playing the game and that the player is actively learning the content in the game. A driving video game puts the player in the driver’s seat and has them actively participating, but how to motivate them to continue playing would be a key factor to problem solve to make the game a success. Just presenting the information is not enough. The video game needs to make the player feel a need to know more about the content so that they will feel motivated to learn.

Games motivate learners to take responsibility for their own learning which leads to intrinsic motivation contained by the method itself (Gibson, Aldrich, & Prensky, 2007). Fantasy, control, curiosity, and challenge are four characteristics of a game that increase motivation and eagerness for learning (Gibson, Aldrich, & Prensky, 2007). Gibson goes into further detail of other characteristics that ensure the effectiveness of game-based learning tools (Gibson, Aldrich, & Prensky, 2007). Gibson, Aldrich, and Prensky also explore motivation, engagement, interactivity, and active participation as components of a highly effective learning game. Games provide highly interactive feedback that is crucial to learning (Gibson, Aldrich, & Prensky, 2007). High motivation and engagement are linked to student success (Gibson, Aldrich, & Prensky, 2007).

While gamers may not always be having fun, video game players generally enjoy what they do and that is why they keep doing it (Prensky, 2007). Sometimes video gamers do get upset at the game or frustrated and it might seem like they are not having fun, but it is all part of
the gaming process. Games need to be challenging and have an inherent fairness to them. They are just like real life in that not everything is a bed of roses, there are risks depending on what you do or don’t do (Gibson, 2007). Generally speaking, people enjoy games and learning when they can achieve the specified goals. The task must be perceived to be fair which means that everyone who plays the game has a chance to win, the risk for failure is present but not too high, there is positive feedback or rewards during the process and in context to measure progress towards goals, negative feedback is present to be fair, and some element of chance to motivate players to keep on trying (Gibson, Aldrich, & Prensky, 2007).

**Audience and Market**

For a game to be successful it must be accepted into the market and be able to be understood by the appropriate age category. Pew Internet & American Life Project, an initiative of the Pew Research Center, did a survey that examines teens playing video games, the games and equipment they are using, the social context of their play, and the role of parental monitoring that goes on while their teens are playing video games (Lenhart et al, 2008). The Pew Research Center found that 97% of the teens that they surveyed used the computer, web, portable device, or a gaming console to play video games. Those who played video games on the computer, web, portable device, or gaming console were between the ages of 12 to 17 years old. They also found that 50% of teens played the previous day of the day they were surveyed; 86% played on consoles like the Xbox 360, PlayStation, and the Wii; and only 73% played on their desktop or laptop computer (Lenhart et al, 2008). A section in the survey revealed that teens play many different genres of games over a wide variety of consoles, with 60% of the teens owning three to four of the devices mentioned earlier, while only 14% owned zero to one device. They listed 14 different genres in their survey and out of the 14 the racing genre came out on top with 74% of
teens reporting playing games in this genre, such as NASCAR, Mario Kart, and Burnout (Lenhart et al, 2008). Teens play video games on multiple systems, play for long periods of time, and play video games in the racing genre.

**Gaming Technology**

Multiple Flash games are available to teach driver’s education and safety. However, they are very short and are not detailed enough to really help novice drivers. Many of these Flash-based games can be found on driversed.com in the games zone (Game Zone, 2009). Another computer game called Driver’s Education 98 and 99 for the PC was found. This computer game is similar to the Flash games reviewed. Driver’s Education 98 and 99 were not very fun and lacked the entertainment characteristic that keeps kids playing video games for countless hours. Many vehicle simulators are also available such as the DrivingMBA in Arizona. They currently are using two vehicle simulators. One is for learning the basic maneuvering and one is for the advanced driver training simulation. Both are in conjunction with in-class lectures and on the road driving sessions (Wilson, 2009).

Finding these types of training tools for driver’s education is promising because other people and organizations want to help educate teen drivers on how to drive safely. There is an acknowledgement of how terrifying driving can be for the first time in teen drivers. A full-blown video game that can be played on any console or computer platform as well as a vehicle simulator would be a valuable learning tool for novice drivers. This game model would be different from Driver’s Education 98 and 99 and other simulators because it will be fun and entertaining along with being engaging and informative. For the model to be effective, it must represent a game that teens will want to sit down and play for hours on end learning how to carefully and safely drive. The technology already exists, it just needs a well-designed model to
create the type of game that helps new drivers understand and avoid distracted driving. Through the research and development of a DGBL model, a successful learning game combined with stellar 3D graphics and out of this world sound in conjunction with realistic situations and experiences can be created. The research has shown the creation of such a video game that can be played on any console available to the students is possible. It is also important to make sure the video game is compatible with the various existing console controllers including their ability to have a wheel, pedals, and shifter hookups. The students should have the most realistic experience imaginable without actually being inside a real moving vehicle.

**Driver’s Education Platform**

A head-up, or heads-up, display (HUD) is any transparent display that presents data without requiring the user to look away from his or her usual viewpoint (“Head-up display,” 2009). Some car manufacturers are currently installing them into their automobiles, such as Nissan, Honda, Toyota, Lexus, BMW, and General Motors. Currently these systems are becoming increasingly popular in production cars and usually offer the speedometer, tachometer, and navigation system displays, (“Head-up display,” 2009). The site also presents information about aftermarket systems that can be bought to mount into vehicles that do not come with HUD systems from the factory. The proposed video game model could evolve and be put into actual vehicles in the way of a HUD system. Once teens or novices feel comfortable driving in the video game, they could then step up to the actual vehicle. Once they get to this step, their vehicle could be equipped with a HUD system that projects different attributes onto the windshield like their speedometer, tachometer, and other aspects that would help them drive without ever looking down. Also the HUD system could track how fast they are going and let them know what the speed limit is by way of GPS. It could also let them know when they are following the
car in front of them too closely. This system would be an effective model for teens to learn from. The hardware for something like this is available; the software end needs some re-designing. Something like this would definitely be a future platform for the driver’s education video game and could become a reality in the future.

**Literature Review Summary**

The literature review has shown that there was extensive evidence from the research that video games can be effective learning tools. The research shows that video games are an effective medium in creating a rich learning, motivational, engaging, and interactive environment. Not all video games are effective learning tools, the importance of game design and development to not only showcase everything that the end user will need to learn, but also how the game will keep them entertained for hours on end must be present. To be an effective game it needs to be not only fun, but also educational at the same time. It must be a hybrid between conventional blockbuster games and educational models. Without each part being equally represented the game will not be accepted into the market. Each component and the assembly of each piece will be looked at in the next section where we will combine entertainment, technology, and education to create an effective learning video game design.
CHAPTER III: METHODOLOGY

Overview of the Methodology

In this section of the study we will discuss the methodology used. Descriptive research is used as the methodology for this thesis study. Current distracted driving games are discussed and how the researcher narrowed down his search to just seven games to evaluate. These games will be evaluated using a best practices checklist that the researcher creates. The checklist is discussed in further detail in this section.

Restatement of the Problem

The problem of the study was to evaluate current distracted driving video games for teen drivers based on a best practice checklist of effective strategies. The best practice checklist was generated from game metrics, game models, and theorists that specialize in DGBL games.

Restatement of the Objectives

1. Create a best practices checklist from game metrics, game models, and a review of DBGL theorist literature.
2. Evaluate current distracted driving video games using the best practices checklist.
3. Analyze the results to identify exemplary components and develop a game model based on those best practices and exemplars.

Descriptive Research

The methodology used for this study is called descriptive research. Descriptive research answers the questions who, what, where, when, and how. Descriptive research describes data and characteristics about the population or phenomenon being studied.

Descriptive research is also known as statistical research. Although the data description is factual, accurate, and systematic, the research cannot describe what caused a situation.
Thus, descriptive research cannot be used to create a causal relationship, where one variable affects another. In other words, descriptive research can be said to have a low requirement for internal validity. The description is used for frequencies, averages, and other statistical calculations. Often the best approach, prior to writing descriptive research, is to conduct a survey investigation. Qualitative research often has the aim of description and researchers may follow up with examinations of why the observations exist and what the implications of the findings are. In short, descriptive research deals with everything that can be counted and studied. But there are always restrictions to that. Your research must have an impact to the lives of the people around you (“Descriptive research,” 2011).

**Current Distracted Driving Video Games**

There are multiple distracted driving video games currently operating out on the World Wide Web for people to play and interact with. The researcher found over 15 online video games that could be played over the Internet on any computer platform. All of the games that were found did not meet certain basic criteria to be included in this study. The basic criteria that were taken into consideration for the elimination of video games that were not included in the study were they had to deal with distracted driving topics, they had to showcase the negatives of distracted driving, and they had to be recent, within the last 5 years of creation.

**Selected Distracted Driving Video Games**

The researcher identified seven distracted driving video games that fulfilled the criteria for inclusion of the over 15 games that were explored and deconstructed. The seven games that were chosen and evaluated in this thesis study were:
1. Department for Transport Driving Challenge -
   http://www.dft.gov.uk/drivingchallenge/

**Best Practices Checklist**

A best practices checklist was developed to evaluate the seven distracted driving video games identified in the previous section. This checklist came from different readings, articles, and videos all based on game criteria, game models, simulations in online learning, engaging learning, motivation, and anything else related to digital game-based learning. The checklist consisted of five to seven different game metrics that were required for a digital game-based learning game model. These items included, but were not limited to, things such as story line, interactivity, motivation, challenges, feedback, risk, rules, and choices. After the checklist was created, each game was evaluated and ranked. If a driving game had a certain criteria from the checklist it got a check mark for that game criteria.

**Methodology Summary**

The problem of the study was to evaluate current distracted driving video games for teen drivers based on a best practice checklist of effective strategies. The best practice checklist was generated from game metrics, game models, and theorists that specialize in DGBL games. The
objectives of the model were to evaluate current distracted driving video games with the best practices checklist.

**Schedule of Events**

- Proposal Defense: December 2010
- Evaluate Driving Games: January – February 2011
- Create Best Practices Checklist: February 2011
- Finalize Draft: April 2011
- Document Complete Defense: April 2011
CHAPTER IV: FINDINGS

Overview of the Findings

All of the findings from this thesis study are found in this section. This section discusses how the checklist was created with help from creating a game matrix analysis as well as theorists books and articles. The actual checklist is listed and gone over in detail. In this section the checklist is used to evaluate the selected distracted driving video games and is shown in Table 2. Further analysis is taken into consideration with regards to adapting the checklist into many different scenarios.

Best Practices Checklist Readings

A checklist was created by completing a game matrix analysis based on literature by experts such as Prensky (2001), Beck (2004), Beck, J. C., & Wade, M. (2004), Quinn (2005), Gee (2003), and Aldrich (2004) were used to identify the necessary game metrics required for a true digital game-based learning model. Books like The Ecology of Games: Connecting Youth, Games, and Learning (edited by Salen, 2008) and Games and Simulations in Online Learning by Gibson, Aldrich, and Prensky (2007) indicated that for a model to work correctly it has to have all of the required elements in one cohesive package. Salen (2008), Gibson, Aldrich, and Prensky (2007) stressed that challenges need to be present in the story line. The challenges also need to be numerous, in depth, and specific. Prensky (2001) and Quinn (2005) both had game metrics that overlapped other works highlighting elements that needed to be included in a successful game model. These elements were positive and negative feedback, motivation, rewards, engagement, story, challenges, objectives, risk, learning and problem solving, and practice.

Table 1
**Game Matrix Analysis**

<table>
<thead>
<tr>
<th>Name</th>
<th>Story Line</th>
<th>Challenges</th>
<th>Rewards</th>
<th>Motivation</th>
<th>Interactivity &amp; Engagement</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aldrich</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Beck</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Gee</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Gibson</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Hertel</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Prensky</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Millis</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Quinn</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Salen</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Wade</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Table 1, shown above, is the game matrix analysis that was used to help create the best practices checklist. After reading articles and books and watching videos from each expert, the findings were put into a table. If an expert included a certain game metric and noted it was
relevant, then a checkmark was added in that category. However, not all of the game metrics were relevant. Only the top metrics that emerged were included in the game matrix analysis and the best practices checklist. Below is the final best practices checklist:

**Best Practices Checklist**

1. Story Line
   a. Specific problem
   b. Rules
   c. Clear objectives

2. Challenges
   a. Reachable, but not too easy or too hard to obtain
   b. Risk and uncertainty
   c. Appropriate skill level or difficulty depending on the audience

3. Rewards
   a. Emotional, need/like
   b. Positive rewards foster motivation

4. Motivation
   a. Experience bar or tracking device
   b. Experience points
   c. Measures progress through story

5. Interactivity and Engagement
   a. Action choices
   b. Multiple aims both long and short
   c. Engaging theme
d. Clear goals

6. Feedback
   a. Positive and negative
   b. Leads to engagement
   c. Choices and consequences
   d. Learn a lesson

The final draft of the best practices checklist consisted of six game metrics that were mentioned by at least three theorists either in their books, articles, or videos. Each theorist mentioned the way in which each game metric was a key component for successful educational and serious game play. The basic criteria for a game metric to be included in the best practices checklist was that it had to be mentioned by no less than three theorists, and it could not have anything to do with the aesthetics of the game.

**Evaluation of Selected Distracted Driving Video Games**

After evaluating the seven selected distracted driving video games, two games were identified that had almost all of the game metrics listed in the best practices checklist. Distractology 101 Learning Challenge and One Simple Decision had all of the game metrics, except rewards. They had the most comprehensive story line, contained the most information and challenges, and gave prompt feedback. None of the games that were evaluated had any type of rewards built into them. The research from which the best practices checklist was developed stressed that rewards are a motivating factor for most game players. Rewards are the incentives for players taking the time and effort to play a game. However, other factors foster motivation, which is why it is a separate entry in the checklist. Rewards can be something simple like points
for doing good or leveling up, depending on how many points they receive, or more elaborate like actual physical rewards like a gift certificate for completing the survey or game.

To be a DGBL game model, rewards needed to be included in the final model. None of the current models that these distracted driving video games follow have all of the necessary game metrics to be considered a DGBL game model. Bits and pieces from these games can be taken into consideration for the final model that would be designed and put into place for future games to use and adapt. The top two games could easily be taken and have the game metric rewards added to them throughout their story line. There are many possibilities and they would all have to be taken into consideration and played out to see which combination would work best when rewards are added to them. All of the games that were evaluated could be looked over again and see which ones did better in each category and then a totally new game model could be made from all of the games, instead of just the top one or two. The possibilities are endless.

Table 2

*Evaluation of Selected Distracted Driving Video Games*

<table>
<thead>
<tr>
<th>Name of Game</th>
<th>Story Line</th>
<th>Challenges</th>
<th>Rewards</th>
<th>Motivation</th>
<th>Interactivity &amp; Engagement</th>
<th>Feedback</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distractology 101 Learning Challenge</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>One Simple Decision</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department for Transport Driving Challenge</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gauging Your Distraction</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
An actual ranking of each game metric was not undertaken in this study. The intent of the study was to make sure each game metric was included in each game and not for any evaluative purposes within each game.

**Further Analysis**

To make Distractology a complete DGBL game model, rewards needed to be added to their game model. Distractology has a start-to-finish meter, but to help better integrate rewards into the game module the meter would be turned into an experience progress bar with experience points being what builds the progress bar to completion.

The best practice checklist can be adapted to many things. It can be implemented here in the Purdue University game development model to create the DGBL game model.

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**Figure 2. DGBL Game Model. Adapted from Purdue University: Game Development Model.**
CHAPTER V: CONCLUSIONS, SUMMARY, AND RECOMMENDATIONS

Conclusions

This section contains conclusions based on the findings and results from the study and the evaluations of the distracted driving video games. The first objective of this study was to create a best practices checklist from game metrics, game models, and a review of DGBL theorist literature. The checklist was developed based on an extensive review of the literature. “Good game design has a lot to teach us about good learning,” wrote Gee (2003). After all the material collected was reviewed, every single game metric that was mentioned in the material was written down in a list. The theorist who spoke about each certain game metric was also listed next to each game metric. After the list was complete, it was discovered that some game metrics were not as important as others, because very few theorists included them. These game metrics were not included in the best practices checklist. Game metrics that the majority of the theorists highlighted were included. Each section of the final checklist included sub-criteria to further define and explain that criteria. The sub-criteria also helped define each category to help future researchers adapt it for their research.

The second objective of the study was to evaluate current distracted driving video games using the best practices checklist. The researcher searched the World Wide Web for current distracted driving video games. The researcher had basic criteria on which to judge the video games with. Not all the current video games were included because some of them were just too short or lacked content. After the distracted driving video games were selected they were then reviewed and put against the best practice checklist to see which game metrics they either had or were missing. The findings were collected and recorded.
The third and last objective of the study was to analyze the results to identify exemplary components and develop a game model based on those best practices and exemplars. The results from objective two were analyzed and ranked. They were ranked based on how many of the criteria they met. At the end of the ranking process, there were two games that not only had the same amount of game metrics, but also had the same game metrics as well. Both of them had all of the game metrics, except rewards. Both of the top two ranked distracted driving games were especially well done and had in-depth story lines, many challenges, and immediate feedback, and were motivating, engaging, and interactive. The researcher’s game model was based off of the Purdue University game development model with rewards being added to make it a true well-rounded DGBL game.

**Summary**

In summary, the problem of the study was to evaluate current distracted driving video games for teen drivers based on a best practice checklist of effective strategies. The best practice checklist was generated from game metrics, game models, and theorists that specialize in DGBL games. The study began with identifying current distracted driving video games that were readily available to the public. After reviewing selected distracted video games, seven of the video games were chosen to be evaluated further with the best practices checklist. These seven were chosen over the others because they had in-depth story lines and had sufficient content. The best practices checklist allowed each game to be evaluated with different game metrics in mind. These game metrics consisted of story line, challenges, rewards, motivation, interactivity and engagement, and feedback.

The best practices checklist enabled the researcher to identify two games that met most of the game metrics. Both games had five of the six game metrics, but were missing the rewards
game metric. Rewards give people a reason to play and help foster motivation. Rewards can be simple to elaborate physical items. To be a DGBL game module, rewards need to be added to the game model.

**Proposed Action Research Scenario**

The DGBL model was designed to help inform teen drivers about the distracted driving challenges teens presently face. The current Ohio motor vehicle laws needed to be researched and assessed to make sure the model coordinated with all the written material one would obtain in a driver’s education program. The current Ohio motor vehicle laws were also researched and assessed to see if they need to be revised or amended for the current growing trends of multitasking while driving to be included into the model. The DGBL game, created from the model, would be cross platform and be playable on any gaming console or any computer with access to the Internet. Once teen drivers signed up for the driver’s education program, they would receive the DGBL game along with all their other materials. They could take the DGBL game home with them and play it for additional practice. Some parents work nights and weekends and might not be able to help their teen drivers practice driving as much as possible. This DGBL game would be as close as possible to driving in the real world. The DGBL game would also be playable with many console and computer racing steering wheels and pedal kits if the teen drivers have them for a more realistic feel. The DGBL game model would also be set up in DMV and driver’s education buildings wherever they might be located and be playable by appointment. They would be set up in driving simulators for students whom might not have a computer or a console gaming system, or those who want a more realistic driving experience. The DGBL game model was designed from all the evaluated distracted driving video games.
All the selected distracted driving video games were evaluated with the best practice checklist. The current distracted driving video games were evaluated, ranked, and listed in rank order. If a driving game met a certain criteria from the checklist, it was given a check mark for that game criteria. The game meeting the most criteria would be ranked first. Once the list was completed, all the games were reviewed to see if there was one game that fit all the criteria for a complete DGBL game model. If a certain video game did fit all of the game metrics, it would be used for the DGBL model. If no game fully fit all the game metrics then aspects of multiple games would be considered to make one overall game that fit the identified criteria. For a DGBL game made from the model to be adaptable into the target market, the model would have to be entertaining and motivating, but also educational. Several educational gaming or serious gaming models were researched to see how to include different game metrics into the prototype. One particular educational game development model that was researched was the model from Purdue University. The hybrid model incorporates pedagogical research elements and an iterative game design process.

Figure 3. Purdue University: Game Development Process. Adapted from (Mobile 3D Presentation at TLT 2009). From http://www.e-games.tech.purdue.edu/GameDevProcess.asp
Recommendations

The following is a list of recommendations for further research that are related to this study:

- Further research could be conducted on the development challenges of DGBL games with regards to personnel, costs, time, and profits to create a DGBL game.
- Conduct further research on user interfaces, controls, graphics, movie clips, and game physics and their abilities to engage the end user.
- Conduct further research on the driver’s education program and distracted driving to see if more content, questions, and challenges could be added to the game model.
- Research games for console and mobile access for possible game adaption.
- Actual rating scale (0 through 5) for each game metric of the best practices checklist for evaluative purposes.
REFERENCES


Cambridge, MA: The MIT Press.


