Michael VanDusen

Thesis

GAMES THAT CAN SAVE LIVES

Designing the next generation NYCAMH safety game
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1. Introduction

Farm safety has become an issue that many farms are struggling to deal with. The New York Center for Agricultural Medicine and Health (NYCAMH) created a board game with the purpose to teach farm safety. With the changes in information technology it would be beneficial to create a new application to meet the goals of the board game and safely provide education to both young and old. In order to address these issues I ask the following research question:

RQ: How can the application of design frameworks and tools of the video game industry increase the motivation of learning health and safety among the NYCAMH farmer population?

1.1 NYCAMH

The New York Center for Agricultural Medicine and Health makes it their sole mission to research safety and health issues among farmers (History of, 2011). In the beginning the organization was started by two pulmonologists, Drs. David Pratt and John May. These two doctors had an interest in helping out the farming occupation by promoting farm safety. Initially when this organization was created it was called the Bassett Farm Safety & Health Project (History of, 2011). In 1988 their work became officially recognized by New York State and became NYCAMH. In 1989 NYCAMH became one of the seven members of the NYS Occupational Health Clinic Network. This appointment allows NYCAMH to discuss and disseminate agricultural safety to other occupational specialists throughout the state. This was
a real milestone for NYCAMH because now they could work across the state to promote farm safety (History of, 2011).

From 1989 until present NYCAMH has been fortunate to secure grant funding from organizations such as the Department of Health and the Department of Labor. Some of their national grant funding has come from organizations such as NIOSH, NIH, CDC and the W.W. Kellogg Foundation (History of, 2011). This grant funding allows the NYCAMH center to carry out research; education and outreach activities promoting farm safety and healthier farm families in the Northeast (History of, 2011).

NYCAMH Primary mission focuses on farm safety and how it is implemented on the farm. Farm safety is a series of protocols to protect the well-being of farmers as they execute their vigorous work (History of, 2011). Farming is a very dangerous profession because of the animals and machinery that they handle (History of, 2011). Meyerhoff from NYCAMH states that you may think your farmers are safe because they are experienced, but that really is not the case at all (Meyerhoff, 2010, p. 1). Some of the warning signs of the need to refresh farm safety include workers not following farm safety rules, close calls, and improper use of equipment and tools. Meyerhoff also states that many times farmers are doing the same work and cutting corners, which leads to accidents and increases risk. Minimizing risks is the best way to promote farm safety. This includes using the right equipment and doing the jobs the right way all of the time (Meyerhoff, 2010, p. 1). While the need for farm safety is great and should be done at all times, how can NYCAMH make this training fun? With the integration of Information Technology products into everyone’s lives, a mobile application, or app, is the
perfect way to continue teaching farm safety. Having an application available to the farming community would provide for an easier training medium and make learning farm safety fun on technological devices. It would also make it easier for farmers who often don’t have a lot of time. One area of development which would be of great use in delivering this project is the video game industry in general, particularly serious gaming.

**1.2 Video Games**

Games in general are a very important part of human existence. Games require two components to be successful, a game and a player (Deterding et al, 2011, p. 4). The game designer is most concerned with the mechanics, dynamics, and aesthetics of a game and how successful the game will be. The final goal of the game designer is to entertain, capture and encapsulate the game players into the gaming world (Crawford, 1997, p. 15). Playing games started back as early as the creation of mankind (Deterding et al, 2011, p. 3). When games were first thought of, there was often only one objective to the game. A good example of a simple game can be found at the local zoo; two lion cubs playing with their environment. If they jump into the grass and try to catch butterflies it can be thought of as a game, teaching the cub valuable hunting skills. The games of today are really intense and sometimes the real objective of the game can be lost (Crawford, 1997, p. 13). A few of the other reasons for gaming in general are fantasy/exploration, proving oneself, exercise or the need for acknowledgement (Crawford, 1997, p. 16). In the farm safety application the objective will be clear and visible.
Gaming allows people to transport themselves into another realm and be anyone that they want to be while playing the game, without the regular worries of life. Nintendo and Microsoft have recently changed the sit down standard of gaming. The Nintendo Wii and Microsoft Kinect are full motion involved gaming experiences. These games satisfy the people who like to game, but at the same time need to exercise too. Many of the games that exist today allow people to enter a multiplayer gaming arena, providing people some acknowledgement in their lives. In that arena, gamers make friends and achieve high status by the skillset that they demonstrate.

Gaming design is another part the video game industry that is crucial to the success of games. For example, iPhone games are structured around the winnability trait. Everyone likes to play games, but people like to receive awards and achievements for doing well. The winnability of the game needs to cater to the beginners and experts of playing the games (Crawford, 1997, p. 73). This is difficult to maintain for beginners, but achieving winnability in a game is a key to maintaining engagement. One way to maintaining winnability in a game is to have a very clean user interface. A cluttered game may be hard for the beginner to play. Simple, easy games can help games players of all expertise be successful at the game.

Another trait of winnability is to look at the source of player failure. When designing the game it is important to see what triggers are in place that will cause failure. Are these easy to overcome? If the player starts to judge the game due to a flaw in the game or controls, the player will become angry that the game winnability is unachievable. Also, if the player believes that the failure comes from his own limitations, and requires superhuman performance the
player will consider the game unplayable. The most important aspect when designing a game is to portray the errors that a player is making is correctable. At this point the gamer believes that the games are winnable and the player can learn from his mistakes (Crawford, 1997, p. 73-74). Many of the existing iPhone apps strive for players to learn from mistakes and achieve rewards for their expert skill. Making and designing the game is one aspect, but serious gaming brings another level of creation to games.

The serious game market today is a 20 million dollar market. The biggest sellers in the gaming market are education and training (Backlund et al., 2007, p. 1). As of 2008, 40 percent of companies use serious gaming in their organization. When most people think of serious games, they think they are games you play, besides for the entertainment factor included in the game itself. The serious games can be fun and most of them teach or train someone efficiently. Serious games allow learners to experience things in the virtual world that they will not be able to achieve because of money, safety or time issues.

Serious games are associated with edutainment. Edutainment is education through entertainment. This, in conjunction with gaming, has been done with games such as America’s Army, which taught the skills necessary for being a sharpshooter in the army. Although when edutainment was introduced, the games were not as interesting as America’s Army which was introduced in 2002 (Backlund et al., 2007, p. 2). Since then serious games have developed tremendously and have become a tool for many organizations. Serious gaming usually extends past the boundary of edutainment because it revolves around teaching, learning and informing people of things they don’t know.
The end result of this study will be to take the research that is collected and develop an electronic application that teaches everyone about farm safety. Right now all that exists is a board game that is used by NYCAMH. Once the application has been developed farmers and farming families can easily use the application to refresh their awareness of farm safety. The actual design of the application will not take place until the qualitative research has been completed. This is because the interviews will contain questions about what elements people would like to see in the game. After implementing the game successfully the world will see that the design and tools of gaming can have a positive effect on farm safety.

Adding the electronic version of teaching farm safety will also allow for a more state of the art teaching method. Right now when teaching farm safety all that is available is hard copy material for review and understanding. In this ever changing fast paced world the need for a small, efficient, fun application can help promote farm safety.
2. Literature Review

Over the next several pages I am going to be presenting literature reviews from the topics of gaming design, educational and serious gaming, and also mobile gaming. These articles will provide the background on what already has been done in the field and justification for the need of a mobile farm safety application.

2.1 Gaming Design

There is a new concept in both game studies and video game industry referred to as gamification. Gamification refers to the elements of game design that are not tied to actual gaming systems. Although the ideas of gamification are not tied to a gaming system, they still have the ideas of gaming in them. In the article called Gamification: Using Game Design Elements in Non-Gaming Contexts, the idea of gamification is discussed in fine detail. When referring to the development of a farming safety application it is not going to exist on an actual gaming system, but the application will have aspects of gaming (Deterding et al, 2011, p. 1).

Gaming design has been integrated into many other mediums besides just the traditional gaming consoles. When presenting meetings or something that pertains to a large audience the gamified application is now being used. One of the most recent success stories of gamification is the application called Foursquare. Due to the success of Foursquare, the location based application; they are now making the same type of gamified applications for finance, health, news and user-generated content. Online social media companies (e.g., Facebook) also take advantage of these non-gaming applications. They integrate applications such as Foursquare to show friends where people are at a certain time (Deterding et al, 2011, p. 1).
In conjunction with making non-gaming ideas into game based applications, the current vendors have begun to offer recognition. When playing these games people need a reason to keep playing the game. Badges, titles and awards are given to players when they achieve certain levels in the games. As a result of the success of gamification in the current society it will be looked at for creating an engaging workplace. Gamified applications are typically intended for mass audiences and mass collaboration (Deterding et al, 2011, p. 1).

When studying gaming design the human relationship is always studied. The relationship being referred to is the human computer interaction (HCI) relationship. Designing games reaches back to the 1980s. Currently, gaming designers are more concerned with trying to use “funology,” which is explicitly drawing fun from game design.

The final topic of conversation in this article was making games of purpose more fun for people to play. The traditional way of teaching someone has gone by the wayside and now games are a great way to teach somebody and also incorporate fun. The article talks about what Facebook does that allows people to tag certain photographs attached to certain actions. Not only is this a fun way of interacting with someone, but also allows people to learn other data about people in the social arena (Deterding et al, 2011, p. 1).

Gamification plays an important role in introducing gaming in non-gaming roles. Effectively teaching something is usually an issue for people, but making it fun makes the learning process much better.

When trying to re-create complex situations in human life sometimes we must rely on simulations to really see all angles of what is going on in the situation. In the article, “Creating
Willy Kriz explains the importance of simulation and gaming design (Kriz, 2003, p. 3).

Kriz states that simulation games help to mimic process, networks and structures of existing systems. Additionally, simulation games assign players certain roles and they must interact with each other. These types of roles introduce a level of social status in the gaming arena. One of the good traits that help with gaming is that the personalities of humans are broadened. Also the technical and material processes that mirror the social system’s resources are strengthened (Kriz, 2003, p. 4). The main goal of simulation games is to stimulate the decision-making process and demonstrate the consequences within the social systems. Most of the time the social systems in this case would be the actual companies that the game was made for. When actors or players are assuming those roles researchers can study how well they interact with the specific goals that are setup in the game.

Some of the terms that are associated with simulation gaming are rigid rule and free form gaming. Rigid rule gaming is setup with a strict set of rules and all interactions between players are setup beforehand. In the rigid rule type of gaming, the entire game has been designed ahead of time and there is no deviation allowed from the master plan. In free form gaming, the environment, relationships, and rules are not a priority of the game. All of the priorities of the game are set by the actual players of the game. In this setup the players of the game become experts because they create their own destiny in the game (Kriz, 2003, p. 5).

When it comes to applying gaming simulation to an organization it can be used for understanding the culture, structure, processes, chances, and necessities of organizational
change (Kriz, 2003, p. 6). Organizations use this type of technology to simulate real life and to see how well people will interact with their surroundings. Not only does this type of technology make for better streamlined organizations, but it allows for an outside look into business processes.

Gaming simulation can be an amazing thing to bring to the table in an organization but what determines reality? There is a term in simulation gaming called debriefing, which refers to analyzing the simulation experience for real and simulated experiences. Having these debriefing sessions defines clearly what was real and simulated to eliminate confusion. Also, during the debriefing process the lessons learned can be analyzed and changes that need to take place going forward.

Gaming simulation is perfect for teaching farm safety because it will allow the farming community to transport themselves into the farm safety gaming application and learn about farm safety at the same time. The application will have awards and badges that will be given for a set amount of questions that are answered correctly.

Game design is a very intuitive talent and usually takes a great deal of time to master the art of designing a game. Who are the police when designing a game and can game designers take it too far? The article for the IT University of Copenhagen goes into this in detail. They did some research on abusive game design.

When designing a game it is possible to design the game in great detail, but how much is too much? In 2008, Copenhagen Game Collective prototyped a game called the “Dark Room Sex Game.” This game mimicked the motion of sexual acts using Wii remotes. Since it was
conducted as a classroom study and done in a controlled environment there were no outside issues from the game companies. Some of the people who played the game thought that it was quite interesting, while other people were quite embarrassed (Sicart&Wilson, p. 1).

The driving factor to abusive game design is attitude. The main purpose of attitude is designed to integrate between the designer and the player. When abusive game design has been executed the game player will wonder what the purpose of the game design was. The player might also question the motivation behind the game design.

In order to truly define abusive game design we'll take a brief look at general game design. The purpose of game design as a whole is to transport the player into a realm that is not possible. When playing games the player can be someone who they always wanted to be. When writing games for the general audience, they are usually written in a more family friendly way. Also, in conjunction with writing family friendly games they need to be made easy so player attention can remain constant (Sicart&Wilson, p. 2). It is when the acts of violence, sex and crimes are introduced that abusive game design takes place.

Let's now take a look at some the different aspects of abusive game design. The first aspect of abusive game design is that of physical abuse. Abusive game designers can make games where players need to fight each other and can cause pain to the players. A good example of this was the game called PainStation, which was a game similar to the game called Pong, but the players held onto a Pain Execution Unit. The unit would give pain to the players who made a mistake in the game. The pain would be given by electric shock, burn or lash. Another example of a physical abuse game was called Desert Bus, designed by the infamous
Penn & Teller. The point of this game was to drive a bus across the desert with no breaks. It took eight hours to complete the game and you could not take any breaks. One of the other objects was to stay on the road so that the bus did not crash (Sicart & Wilson, p. 3).

The second aspect in abusive game design is unfair design, which refers to games that are outlandishly hard and most of the time unplayable. Going back to the eight bit games they were very hard to complete the challenges in the games. With the newer games the designers will make the challenges so hard that it seems like it is a joke. An example of unfair design was a game called Kaizo Mario. This was a modification to Super Mario World, but it seemed impossible to complete the levels of this game. There was so much popularity with this game addition that it was commercially published. The issue was that the players got so frustrated with it that sales did not soar. Making games unfair and uneasy to play can throw the game playing ability in the game players face causing hostility.

When creating the farm safety game, abusive game design will be kept in mind to make sure that the game does not go down that path. The intent of the game is to be an easy game that everyone can play. Making the game abusive would only hinder the ability the farm safety game could add.

Another good aspect of game design is looking into game design from the narrative point of view. Henry Jones wrote an article called “Game Design as a Narrative Architecture.” In this article he claims how gaming can be narrative and rely on some of our experiences to actually play the game. Some of the key items that Jones points out in his article are:
• Not all games tell stories. Games may be an abstract, expressive or experimental form (Jones, 2004, p. 119).

• Many games have narrative aspirations. Many games want you to tap the other narrative experience that you have been through. It is safe to say that understanding the narrative idea in the game will further help enhance game design (Jones, 2004, p. 119).

• Narrative analysis in games does not need to be prescriptive. Games include narrative references, but do not include narrative forms (Jones, 2004, p. 120).

When referring to games in stories we are usually referring to games that enable players to witness narrative events (Jones, 2004, p. 124). A good example of this would be to grab a light saber and play as Darth Maul in a Star Wars game. In this situation you are playing in a story, Star Wars, which is already created. In this game, the games designer is counting on the game player having a small amount of Star Wars knowledge. Knowing about the Star Wars narrative would not only let you play the game better, but also let the gamer get into the game mindset a lot easier (Jones, 2004, p. 125). Many games that come out today mimic a narrative book or movie for their baseline. Using this method attracts the gamers who are fans of the medium and will aid in their gaming success.

I will try to integrate the narrative medium into the farm safety application. One of the benefits is that most of the people using the application will know the farming environment. To
help people understand the lessons in the application it will contain farming icons, such as tractors, barns, cows and manure spreaders. Keeping the audience entertained will be the biggest hardship of the farm safety application. I think using the farm safety icons in the game will help with the learning curve of the application.

### 2.2 Educational Gaming

Gaming is a good way to transport someone into an alternate reality, but there are many other needs for gaming. One of the other needs for gaming is in the educational arena. These games are meant to teach something to someone or they have a goal from the beginning of the game.

In the article, “Towards a Framework for Understanding Electronic Educational Gaming,” there is a lot of discussion in regards to what effects educational gaming will have. The authors start out saying that games have had an interest in the educational world for a long time. With all of the studies that have been done in the past concluding positive outcomes when using games in the classroom, games surely should be used (Black et al., 2007, p. 2). Ancient communities used games as ways to achieve strategies to win wars. The military uses games to simulate war and provide battle like training without the loss of lives.

The use of gaming in the classroom should be considered the same way other technologies are considered for use. The games impact on learning in the classroom depends on the pedagogical strategies that are used to frame their use (Black et al., 2007, p. 6). The most important consideration teachers need to consider with gaming in the classroom is the
benefit in terms of the content in the game. Also, the classroom environment and the needs of the students have a role in the efficiency of the game. When using a game the teacher needs to have a wide range of knowledge into the hardware technologies of the game and the gaming experiences that the game will provide.

The pedagogical strategies that teachers use must provide support for the student when playing the game and also reinforce learning opportunities when not playing the game. A good way to achieve this goal is to have students engage in game style learning in small groups. This way the students can interact with each other and enjoy the experience from a multi-person point of view. To make sure the students learn outside of the game some sessions will have to take place after the game has been played. This will form as whole group discussion sessions to see what they have learned from the game. With using the group learning method students can feed off each other and participate in the group discussion after the game has ended (Black et al., 2007, p. 6). The fact that students are playing these games collaboratively has the added benefit of enjoyment and motivation, most of all for girls (Black et al., 2007, p. 7). The portability of the gaming hardware also adds to the benefit of use because students can take the game home to continue on with their learning experience. The portability increases the time spent on the games for the students to maximize their learning experience.

Consideration plays an important role when using electronic games in the classroom. One of the most important considerations to think about is whether the game is providing maximum opportunities for student learning. This might include simple game play or more advanced game play for students who are advanced game players. After selecting the
electronic game, the question of how the game will be used must be addressed. Students must be able to re-engage in the game content when the game is over. By re-engaging the content the students can get a deeper meaning of the concepts that were encountered by making connections to the bigger picture of the content (Black et al., 2007, p. 7). In conjunction with re-engaging the students into the content, using collaborative sessions after the game also provides great learning sessions. As previously stated, when students are learning together and talk about the experiences together they tend to grasp the ideas of the game a lot more. If there are any difficulties with playing the game, other students in the group can provide the support that they need to finish the game. Also, since these students are usually close friends, they will continue to talk about the game and apply what they learned in the game to the real world (Black, et al., 2007, p. 9).

The current state of educational gaming from an article, “Unpacking the potential for educational gaming: A new tool for gaming research,” suggests that a lot of game style training exists right now in the medical and business education field (Brown et al., 2007, p. 6). The games in these fields are used for teaching medical diagnosis and business strategy. K-12 level games, such as SimCity, have been growing. Up to this point there has been a lack in educational game design. The poor state of educational games used in schools today, Leddo (1996) noted that the most extant K-12 educational games would never be played outside of the school. The current educational games lack the qualities that contribute to user immersion. The graphics and sound have been lacking and the user interfaces need some more polishing so students and teachers don’t become frustrated with the game. The other part of the design that is not intriguing to the student is that the game employs drill like activities that
become very boring (Brown et al., 2007, p. 6). In addition the tasks in the current games seem to be poorly designed; they focus on the lower-level zones of learning and fail to support progressive learning.

Presently there is not much besides incidental reporting to conclude that educational games should be used in the classroom. Most of the educational games of today have not been grounded in any coherent theory of learning and they are not supported by any body of research (Brown et al., 2007, p. 7). Brown and others in this article conclude that there are wide gaps in gaming research. There also is skepticism that gaming will relate to education, which can be addressed in the research, experiments and successful demonstrations of projects. These projects need to be vigorously evaluated and see what type of benefits that these games can provide the educational community (Brown et al., 2007, p. 7).

The significant bodies of research in educational gaming only exist in two areas, medical studies and business management studies. These study areas have most inclusive studies that were performed. The only area where the studies provided to be successful was in the business management arena (Brown et al., 2007, p. 7). This is because the current gaming structure applied to the business arena where business people could easily apply learning in the game to real life.

Most of the investigations of using games in grades K-12 have been using case studies. There has been some conclusive evidence for games enhancing learning and understanding complex subject matter. Games have been successful in raising levels in mathematics and language arts. Games also tend to promote more student motivations to get things done and
learn more (Brown et al., 2007, p. 8). An example of games building motivation is the use of the game CIVILIZATION III. This game was used by two schools to help build social science skills. After students finished playing the game they had a better understanding of social science concepts and a deeper appreciation of geographical features. Although educational gaming has its downfalls, it still proves in some ways that games add value to the classroom. Now I will take a look into serious gaming which works in conjunction with educational gaming. Serious games are the type of game that will be developed for NYCAMH.

2.3 Serious Games

In an article titled, “Gaming 2.0,” the authors define serious gaming as games that do not have entertainment, enjoyment or fun as the primary purpose (Alvarez et al., 2010, p. 3). Since 2002 the field of serious games has been growing and these games have been used in many different domains. Some of these domains are healthcare, education, corporate defense and advertising (Alvarez et al., 2010, p. 1). When making these type of games, designers must possess a wide area of knowledge in each of the specialty areas. When making a serious game, game designers will usually need a specialist to help them design the game to ensure nothing is left out. Sometimes it may be more beneficial for the game designer to let the specialist make the prototype of the game and then the actual designer will take over (Alvarez et al., 2010, p. 3).
1) When applying serious games to education, the serious game is typically used to teach serious matters. Teachers in this case will ask students to make a game instead of doing a presentation about the serious matter. This gives students the motivation to do a lot of research on the subject. In order to make a game about a subject the students need to have done a lot of research. This is a good benefit for the teacher because the students are well immersed in the subject. The students will make games to help them learn difficult topics, but also teachers may want to design games for their classrooms. Teachers witness how well this works for their students and they take advantage of it for future lessons.

There is a big demand for people who want to design serious games, but they do not have the skills or tools to do it (Alvarez et al., 2010, p. 1). There are some research projects that are focusing on simple game design tools for teachers. Most teachers do not have advanced game design tool expertise; therefore letting some try using beta tools would be good for the future of serious gaming.

It may be beneficial for game designers to take a look at designing tools that already exist out in the field right now. Many of the game designers in the entertainment industry are currently exploring the player-generated content (Alvarez et al., 2010, p. 5). With the creation of the Web 2.0 concept players can now create and share their own content when playing the games. The new games that have player created content are referred to as Gaming 2.0. However, in computer based games this is far from being a new concept. For many years computer based game players have been making modifications to their games and creating new levels. Most of the player created content now applies to the console based games.
One of the benefits of Gaming 2.0 is that people without gaming skills can create their own gaming content. Since serious games are designed to address some critical items, Gaming 2.0 might allow the beginning designers to create serious games (Alvarez et al., 2010, p. 8).

Chan from the “Constructionist Learning” article states that gaming proves to be a great communication method. He states that sooner or later an interactive education or simulation will soon replace the print based materials that are out there now (Chan, 2011, p. 1). Serious gaming has an advantage of simulation over traditional education. Serious gaming highlights the dialogue of play and learning through gaming. Serious gaming in this case uses the constructionist style framework. The constructionist framework from a simple point of view is just “learning through doing.”

Children playing serious games get to participate in the interactive learning environment. An example of this is when children engage in interactive visualization of abstract conditions. Using this method allows children to assign their own meanings as they pull down the narrative at their preferred pace. Children sometimes learn slowly and using this method allows children to build upon their existing internal knowledge and build understanding of new material (Chan, 2011, p. 2). In this method children become fully encompassed in the game, and their learning expands tremendously.

Not only is the type of game important when creating the farm safety application, but the type of medium that the game can be used on is important too. Mobile gaming has become a high requested technology which we will discuss next.
2.4 Mobile Gaming

In the last five years the gaming market and the mobile communication market has grown tremendously. Currently, the revenue of the gaming industry far exceeds the film industry. The overall revenue of the mobile phone increased from 3 million in 2000 to 6.7 million in 2006 (Fritsch et al., 2006, p. 1). In conjunction with this, the demand for more mobile multiplayer games has risen. The demand for mobile gaming has led to a list of problems. One of the first problems is developing a user interface for the mobile game. Also, now that those games have become more relevant in handheld devices the design might need to change in the devices.

In conjunction with the growing demand for mobile games, the sale of mobile phones has risen dramatically. Forrester research claims that ninety percent of all teenagers in the United States and Canada own mobile phones (Fritsch et al., 2006, p. 1). The sales of mobile phones triggered a high demand for mobile applications. The problem is that the technology and games that exist need to keep up with revolution of mobile games in today’s mobile market.

Chen and company state in a different article that mobile phones of today are more than just a communication device. They are packed with games and many other applications. Mobile phone applications have some limitations for game play, such as small screen size and limited buttons. When making games for these small devices games developers take into consideration the shortfalls of mobile gaming (Chan et al., 2008, p. 1).
Sports, Racing and Adventure games have shown to be the best mobile games to play. When designing these games the things that come to mind for designers are the ease of control and level of difficulty (Chan et al., 2008, p. 3). If the game is too difficult than many game players will not take part in the game. Gamers for the most part will not enjoy games that have complicated controls. When making mobile applications an effort needs to be made to think about how easily it will be to play on a mobile device. When making the farm safety application, it will be simple and will require few buttons for operation. Now that we have talked about the literature about gaming, let’s take a look at how the study will be conducted.

3. Research Design

The research question on this study focuses on determining if developing a more interesting electronic form of a farm safety game will motivate the learning of health and safety on farms. The focus of the question is based upon the importance of farm safety and that an adequate training medium needs to be developed. This research question needs to take into account what is available now and where I want to go with the farm safety application.

Research Question: How can the application of design frameworks and tools of the video game industry increase the motivation of learning health and safety among the NYCAMH farmer population?

The definitions for NYCAMH were explained in the introduction of my paper. The other terms from the question are clarified here to refine the scope of the study and goal.
**Design Frameworks:** Enforces the adherence to a consistent design approach, and is re-usable regardless of design approach.

**Tools of Video Game Industry:** Understanding what it takes and what you need to make video games. Some of the tools that are used to make video games are Flash, HTML, Animation, designer.

### 3.1 Methodology

When researching the best methodology that would work best in the study, I found that the grounded theory method would suit the situation best.

The grounded theory is a specific research methodology that was introduced by Glaser and Strauss. As in other qualitative studies the researcher is the primary instrument of data collection and analysis (Merriam, 2009, p. 28). The researcher in this case assumes most of the responsibility for data collection and analysis. After analyzing the data the researcher will also assume prime responsibility for grabbing meaning from the data. The main difference in this type of study is that a theory emerges or is “grounded” in the data (Merriam, 2009, p. 29).

In the case of the grounded theory, I will use the Glaser and Strauss method. Their method uses data that comes from interviews, observations and a wide variety of documentary materials. Most types of studies have terminology associated with them and so does the grounded theory. Glaser and Strauss comment that the first term associated with grounded
theory is theoretical sampling. This is where the analyst collects, codes and analyzes the data. After analyzing the data the researcher will decide if there is enough data or if more data is necessary to complete the study (Merriam, 2009, p. 30). In conclusion, there is an ongoing idea to keep comparing data to see if any more ideas can be pulled out. Glaser and Strauss said that when completing a study, having the appropriate amount of data is really important. Since the researcher is the most important person in this study that can decide if they have enough data or not.

3.2 Analysis Tool

The tool that I plan to use for analyzing my research is a tool called Weft QDA. I think this tool will work well for analyzing qualitative data. I will use some coding schemes to make the most out of the data that I have collected. From this data I will be able to make the appropriate Farm Safety Application that works hand in hand with the board game that currently exists.

Weft is a qualitative data analysis tool. The vendor for this tool claims that this is the premier tool for analyzing qualitative data. I used this tool on other projects and experienced positive results.

3.3 Analysis Plan

The following is the analysis plan that I will use to gather, collect, store and analyze the data.

Farm Safety Analysis Plan

Contact Todd at NYCAMH for a list of farmers that I will use to communicate with.

a. After collecting the names I will reach out to all of the farmers and schedule interview times with them.

b. I will then go to each of their residences to complete the interview.
After completing the interviews, I will store all of the data on a password protected computer.

Sample Interview Questionnaire (Before Prototype Design Questions)

Summary

Masters student Michael VanDusen is conducting some research of local farmers to see if an electronic application will help to promote farm safety. Currently there is a board game that addresses the needs of teaching farm safety produced by NYCAMH. NYCAMH is an organization that helps farmers with all of their needs throughout everyday life.

Questions

1. How do you get motivated for the day?
2. What has been your motivation for safety training, if any, in the past?
3. Can you identify any risks associated with farming?
4. Have you had any safety incidents?
5. Were you aware of safety procedures for the task before the incident?
6. Did you seek additional training after the incident?
7. How many hours of labor have been lost due to lack of farm safety training?
8. Have you had any formal training on farm safety and if so what?
9. What do you see as benefits of farm safety training?
10. Are their disadvantages to this training?
11. Do you own a mobile phone? Is it a “smart” phone?
12. Do you own a computer? If yes, how recently was it bought? Is it a desktop or laptop?
13. Do you have access to the Internet at home?
14. Do you have access to the Internet during the workday?
15. If an electronic version of a farm safety application was to exist please explain your views on the impact to the farming community?
16. Who do you think is in the most need for electronic safety training?
17. Describe your family. Do they participate on the farm?
18. Does anyone in your household use computers or electronic devices?
19. Can you name any video game products (devices or games) that members of your household play?
20. Do you use any social media such as Facebook?
21. Do you feel anyone in your household needs additional safety training for farm work?
22. Do you feel a game on farm safety would appeal to anyone in your household? Do you feel a video game would be more motivational than a traditional board game?

(Questions before they see the design)

Please rate the statements from one to ten
1=Not True at all...5=No opinion.....10=Very True

(Before Questions) 1st Interview

1. I feel that I have all the information to be safe on the farm.
   1 2 3 4 5 6 7 8 9 10
2. I am currently practicing farm safety.
   1 2 3 4 5 6 7 8 9 10
3. Farm Safety is an important aspect of farming.
   1 2 3 4 5 6 7 8 9 10
4. I feel the level of farm safety training right now is adequate.
   1 2 3 4 5 6 7 8 9 10
5. I feel introducing a new electronic farm safety application will improve safety.
   1 2 3 4 5 6 7 8 9 10
6. The electronic safety application will be more appealing as a video game.
   1 2 3 4 5 6 7 8 9 10
7. If this application is successful I will tell my friends about it
   1 2 3 4 5 6 7 8 9 10

2. After electronically converting the data to the pc, I will input it into the Weft tool for coding.
   a. It should take approximately one month to code all of the data.

3. Using the coding results, I will decide which data that I collected is important.
   a. A few items I will be coding for are:
      - Change
b. It will take a few months to determine what I need to make the right type of application that will be beneficial to all of the farmers based on the most common requests from the farmers as well as what level of technology each farming family has.

4. Data Analysis

When addressing this research question I think most farmers will be interested in a more advanced way of learning farm safety. Due to the importance of farm safety, developing an application that will make things easier will be a great tool.

The only item that may be a challenge is teaching people how to use the application once it is developed. Going from a board game to an electronic version of the game will be a big learning curve for the farming community. Many farmers currently have mobile phones and computers, but actually using an application can be difficult. The application I will develop will be very user friendly. Below is a graph showing the before and after of farmers learning farm safety:
As you can see from the graph it is anticipated that farmers will be very interested in learning about farm safety after the application has come out. The existing board game, “Play it Safe,” has its benefits, but having an updated application is the best solution.

Figure 1: Farmers Learning Farm Safety Anticipation

5.0 Data Collection

After designing the survey template noted above research began on the farm safety game. In order to stay in line with the research structure chosen the survey templates were
sent to the Institutional Review Board at SUNYIT. Approval was granted by the board before
the survey was executed.

The method of collecting data in this study was to submit a survey prior to seeing the
game prototype and then submitting the same survey after seeing the game prototype. The
hope was that the interviewee’s views would change on farm safety after seeing the new game.
I used the likert scale to measure how the interviewee felt about farm safety before seeing the
new prototype. This survey was administered in person and the interviewee was given
adequate time to fill out and complete the survey. Since I planned on using the Glaser and
Strauss method of Grounded Theory for this study, surveys were the best way to obtain the
data I needed (Merriam, 2009, p. 30). Below is a completed survey from the first round of
surveys. Names of the actual people who participated in the survey will not be used to protect
their identity. Incidents happen all the time on the farm and I have compiled a list of items that
were answered on the surveys given
<table>
<thead>
<tr>
<th>Farm Safety Incidents</th>
<th>Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Haybine collapsed on hand</td>
<td>1</td>
</tr>
<tr>
<td>Rollover animal Crushing</td>
<td>2</td>
</tr>
<tr>
<td>Animal related injuries to workers</td>
<td>3</td>
</tr>
<tr>
<td>Tractor came out of gear on a hill</td>
<td>1</td>
</tr>
<tr>
<td>Silo Gas exposure</td>
<td>2</td>
</tr>
</tbody>
</table>
Michael VanDusen
Information Design and Technology
Thesis Interview Questions

1. Summary

Masters student Michael VanDusen is conducting some research of local farmers to see if an electronic application will help to promote farm safety. Currently there is a board game that addresses the needs of teaching farm safety produced by NYCAMH. NYCAMH is an organization that helps farmers with all of their needs throughout everyday life.

2. Questions

1. How do you get motivated for the day?
   I work in farm safety, so my work can actually save lives.

2. What has been your motivation for safety training, if any, in the past?
   I have seen a lot of farmers injured.

3. Can you identify any risks associated with farming?
   PTO Entanglement

4. Have you had any safety incidents?
   Yes, a haybine collapsed on my hand.

5. Where you aware of safety procedures for the task before the incident?
   No

6. Did you seek additional training after incident?
7. How many hours of labor have been lost due to lack of farm safety training?
   At least 100 hours

8. Have you had any formal training on farm safety and if so what?
   Yes. CPR, First Aid, and Emergency Response Planning

9. What do you see as benefits of farm safety training?
   Lower costs, higher profits

10. Are there any disadvantages to this training?
    Time consuming

11. Do you own a mobile phone? Is it a “smart” phone?
    No

12. Do you own a computer? If yes, how recently was it bought? Is it a desktop or laptop?
    Yes, Desktop 5 years old.

13. Do you have access to the Internet at home?
    Yes

14. Do you have access to the Internet during the workday?
    Yes

15. If an electronic version of a farm safety application was to exist please explain your
    views on the impact to the farming community?
    Helpful, we need to reach youth before they develop bad habits

16. Who do you think is in the most need for electronic safety training?
    Tractor Rollover, animal handling.
17. Describe your family? Do they participate on the farm?
   Me and my girlfriend: yes

18. Does anyone in your household use computers or electronic devices?
   Both of us.

19. Can you name any Video Game products (devices or games) that members of your household play?
   Age of Empires, Scrabble

20. Do you use any social media like facebook?
   No

21. Do you feel anyone in your household needs additional safety training for farm work?
   Yes

22. Do you feel a game on farm safety would appeal to anyone in your household? Do you feel a video game would be more motivational than a traditional board game?
   Yes and yes

(Questions before they see the design)

**Please rate the statements from one to ten**

1=Not True at all...5=No opinion.....10=Very True

**(Before Questions) 1st Interview**

1. I feel that I have all the information to be safe on the farm.
   2 3 4 5 6 7 8 9 10

2. I am currently to practicing farm safety.
   2 3 4 5 6 7 8 9 10

3. Farm Safety is an important aspect of farming
   1 2 3 4 5 6 7 8 9 10
In this survey you can see that the interviewee is kind of happy with the way that the farm safety training is being conducted. “Mark” does not feel that the level of farm safety is adequate and hopes that the new gaming prototype will help to achieve a higher level of farm safety education. The current board game takes a lot of time to prepare and play. The new gaming prototype will address the time issues and make it easier to execute the farm safety application.

Below is an example from the same user, “Mark”, after seeing the new gaming prototype. Note: This game is a big change from what they had before, therefore they will need time to adapt to the new game.
Interviewee Survey after seeing new gaming prototype

Michael VanDusen
Information Design and Technology
Thesis Interview Questions

Summary

Masters student Michael VanDusen is conducting some research of local farmers to see if an electronic Application will help to promote farm safety. Currently there is a board game that addresses the needs of teaching farm safety produced by NYCAMH. NYCAMH is an organization that helps farmers with all of their needs throughout everyday life.

Questions

23. Tell me what you thought of my gaming prototype?
   I think it is a good start, but it needs a lot of revision. I don’t think it will be well received in its current form.

24. Has your opinion changed after viewing the prototype of the new farm game?
   Yes, I see a lot of potential here.

25. What things were done well in the prototype of the new farm game?
   Very concise, easy to read.

26. What kind of things do you think should be changed on the farm game?
   - The farmer is very stereotypical; should stress all forms of diversity.
   - Images and content don’t match; tractor question-cow picture.
   - Needs extensive editing for spelling and grammar.
   - Reward system seems geared to only Facebook-point system of old game was important. May limit classroom use.
   - The concept of “unlock” may be too advanced for young children.
   - Appearance needs to look less cut and paste, more cohesive.

27. Do you think you would have fun playing this new game?
   Not in its present form.

28. How do you think this new farm game prototype is going to affect the farming community?
   I think it will both educate and increase interest in safety.
29. Does this type of game stimulate you enough to tell people about it?
   Not in its present form.
30. Do you think this game should be linked to social networking sites?
   Yes I think this will help raise awareness.
31. Would you enjoy playing this game to learn farm safety better than the traditional book or presentation method?
   The competition of playing within a group was the most fun for me.
32. What do you see in the future for this farm safety prototype?
   Hopefully it will be easier to get more people access to it.

(Questions before they see the design)

Please rate the statements from one to ten

1=Not True at all...5=No opinion.....10=Very True

(After Questions) 2nd Interview

1. I feel that I have all the information to be safe on the farm.
   1 2 3 4 5 6 7 8 9 10 answer 1

2. I am currently to practicing farm safety.
   1 2 3 4 5 6 7 8 9 10 answer 1

3. Farm Safety is an important aspect of farming
   1 2 3 4 5 6 7 8 9 10 answer 10

4. I feel of level of farm safety training right now is adequate
   1 2 3 4 5 6 7 8 9 10 answer 1

5. I feel introducing a new electronic farm safety application will improve safety
   1 2 3 4 5 6 7 8 9 10 answer 10

6. The electronic safety application will be more appealing as a video game
   1 2 3 4 5 6 7 8 9 10 answer 10

7. If this application is successful I will tell my friends about it
   1 2 3 4 5 6 7 8 9 10 answer 10

Figure 4: Interviewee Survey after viewing the new gaming prototype
In this survey you can see that Mark is happy with the new form of the game and is excited about what changes the new game will make. Mark answered that this will improve farm safety as a ten on the likert scale. Also Mark answered a ten on the likert scale about telling his friends about it. Not only is using the game important but also getting the game out there for people to use is also as important as people actually using the game.

These surveys were taken by 25 random interviewees related to the farming community. The first twenty five were given the survey related to figure 3 in this paper. Only about ten interviewees were selected for the follow up survey. The follow up survey can be seen in figure 4 in this paper.

The next step to this process was to execute data analysis on the survey data that I collected. The tools that I used were Weft Qualitative Data Analysis and Microsoft Excel utilizing T-test's on my actual data. In the next section we will address the data analysis techniques.

6.0 Data Analysis

6.1 QDA Tool Analysis

The tool that I selected to do the first part of my qualitative data analysis is called Weft QDA.

The qualitative data analysis tool is used to analyze the research data that you have and look for similarities in the actual data. Also the researcher can look for patterns of words and see what direction they need to go with their study.

In my research some of the key words I was looking for in the study were:
-Safety

-Time

-Gaming

-Fun

-Electronic

I picked safety because I wanted to see how many occurrences there were of that word in the surveys. I felt it was important to know how the farming community felt about farming safety in order to gear my new prototype towards some of the safety concerns. Anne, one of the interviewees stated “There are risks everywhere with farming: Animals, Chemicals, tired operators, just to name a few.” In the data I collected, there were 77 passages that contained the word safety.

The word time to a farmer or someone involved with farming is really important. I wanted to see how much of an issue time was for farmers. In the data I collected I found 15 passages that contained the word time. I knew that time was an issue for the farming community and my gaming prototype really had to adhere to that. My game is simple and addresses the baseline of learning farm safety without taking a lot of time to do it.

Gaming and fun were co-related and I wanted to see where they existed together. Most of the families and farmers I interviewed have gaming systems. Some of them actually enjoyed playing board games such as, Scrabble. The reason I was searching for fun is because the new prototype is supposed to be exciting and wanted to see what the interviewee’s thought was
fun. The overall reoccurring idea was that everyone wanted to see an electronic form of the
game. “Mary”, another interviewee states “the electronic game will beneficial to exposing
farming workers to farm safety.”

Finally, I was looking for the word electronic in all the data I collected. It showed 81
instances of the word electronic. From this data I was able to determine that electronics exist
in a good number of households. Since the game will probably be hosted on the NYCAMH web
server having computers would be a very good thing. Maybe in the future the game could be
passed down to the gaming consoles. Many of the interviewees own a Nintendo Wii or
Microsoft Xbox.

Searching and coding for certain terms in research showed me what I had and prepared
me to build the right product. I think the qualitative data analysis tools help keep the
researcher organized.

6.2 Statistical Analysis
A Paired T-test used to show statistically significant change in the perception of a game
learning tool for farm safety. (Alverno, 2002). The statistical T-test has been executed on the
data I collected and a screenshot is located below:
Figure 5: Electronic Game Prototype T-test

In the above chart you can see that my T-Test value was below 0.05. Any time that you get a result from a T-test that is below .05 the change is statistically significant (Alverno, 2007).

To compute the T-test I used the built in function in Microsoft Excel. Once you launch the function tool in Excel you need to complete the right data in order to complete the T-test correctly. Some of the information it asks for are the data sets. In my case, the survey 1 and survey 2 columns. After the data has been entered, the program needs to know how many tails you are looking for in the T-test. Since I am looking for survey 2 to be an increase from survey 1, I would choose a one tail. If I was thinking the survey 1 would be higher than survey 2, I
would have chosen a 2 tail. The last bit of information that I needed to enter is what type of test to run. Since I wanted to use standard deviation I choose the test type 3.

The data that I have presented shows that the survey 2 is statistically significant and different from the data in survey 1. Survey 2 was given after looking at the electronic game prototype that will be explained below.

In addition there were some questions that played an important role in the study that I executed. Also the five areas that were the most significant in my study are listed below:

- Safety
- Time
- Gaming
- Fun
- Electronic

The above areas played a huge role in the creation of the video game prototype that I developed. Safety is the main reason what I created the gaming prototype. Time was a factor for many of the farmers. I needed to create a video game that was quick but achieved the end goal of farm safety education. I also needed to know how much video game experience the farming community had so that can would not be hard to integrate. Also in the electronic world computers or gaming consoles have to be owned to take advantage of this gaming prototype.
Below I have created an excel chart that shows the significance and how many of the questions were important to the study.

### Five Question Analysis

#### Questions Most Relevant to Study

1. Do you think this game should be linked to social networking sites?
2. Does this game stimulate you enough to tell people about it?
3. How do you think this new farm game prototype is going to affect the farming community?
4. Tell me what you think of the gaming prototype?
5. What things were done well in the prototype of the new game?

#### Data Analysis

<table>
<thead>
<tr>
<th>Question</th>
<th>Percentage Relevant</th>
<th>Users Relevant</th>
<th>Total Users</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>57%</td>
<td>15</td>
<td>26</td>
</tr>
<tr>
<td>2</td>
<td>76%</td>
<td>20</td>
<td>26</td>
</tr>
<tr>
<td>3</td>
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<td>8</td>
<td>10</td>
</tr>
<tr>
<td>5</td>
<td>90%</td>
<td>9</td>
<td>10</td>
</tr>
</tbody>
</table>

**Formula Used**

Users Relevant/Total Users

**Figure 6: Five Question Analysis**

### 7.0 Results

Please refer to figure 5 to analyze data that is being referred to in this section. Now that all of the data has been collected and the survey has been given there are some conclusions I can make. The first conclusion is that change in data from survey 1 to survey 2 is statistically significant. Also, I can conclude that the electronic prototype that my interviewees looked at before completing survey 2 is going to beneficial in stimulating farm safety training. Since most
of the numbers increased from survey 1 to survey 2 and showed a successful T-test, my gaming stimulated the interviewees to be more excited about farm safety and its future possibilities using the farm safety application. Next, figures 7-17 are some screenshots of my electronic prototype to see what stimulated the interviewee.
Figure 7: Opening Screen

Figure 8: Instructions Screen

I need to unlock the farm so I can work. You will be presented with questions that will unlock my farm.
Every time you unlock a piece of equipment, let your friends know via Facebook.

Figure 9: Instructions Screen Two
**Question 1**

Farm Tractors, when on public roads must obey traffic laws

True or False

*Figure 10: Question One*
Figure 11: Question One Answer
QUESTION 2

Name two items of personal protective equipment that should be worn if you are going to be injecting anhydrous ammonia into the soil.

Stop and make sure you are using protective equipment.

Figure 12: Question Two
Figure 13: Question Two Answer

**Answers**

Chemical Safety Goggles, Face Shield, A Respirator (since outside not huge issue)

Correct You Unlocked - A Farm Silo and Barn

Click to Upload to Facebook
Question 3

What is wrong with using a regular drinking glass or cup to measure chemicals in the milkhouse?
Answer
It can easily be mistaken for a kitchen glass. It is possible for a child or adult to drink from it. It can be tempting for a child to drink from this glass if they are hungry or thirsty.

Correct You Unlocked - A horse for the farm

Figure 15: Question Three Answer
Congrats!!

You unlocked the farm

Figure 16: Final/Status Screen
Figure 17: Incorrect Answer Screen
Electronic Farm Safety Application/Flow Diagram

Welcome Screen

Instructions

Question 1 - Unlock Farm

Question 2 - Unlock Farm

Question 3 - Unlock Farm

Entire Farm is unlocked when enough questions are answered correctly

Incorrect Screen triggered when answer does not match

Question database will cycle through different question to unlock farm components

Back to top to start the game over again
Features that were added to the game were the role playing and prizes. The role playing in the game was playing as a farmer trying to unlock the farm so the farmer could go back to work. The prize was unlocking a piece of the farm. Another element that was added to the game was social networking. Facebook was integrated into this game so players could upload their results to Facebook when they unlocked a piece of the farm.

**8.0 Summary**

I think the data and prototype I developed addresses the question that I have proposed for my thesis. Please see my research question below:

**RQ:** How can the application of design frameworks and tools of the video game industry increase the motivation of learning health and safety among the NYCAMH farmer population?

The study had the following findings:

- Two surveys were executed (one as a control) to see change in motivation for farm safety. One survey was done before the electronic prototype was developed; the other survey was given after the gaming prototype was developed.
- Keywords were found in the surveys (electronic, safety, fun, gaming and time).
- The data from the survey was also given a statistical analysis. This test showed a significant change in the attitudes of the farmers.
The surveys were done to see if there would be a difference with the survey group after seeing the electronic prototype. If the data proved to be significant then we could show a statistical difference between the two sets of data using the Weft qualitative data analysis tool I was able to determine that the keywords mentioned above were in the surveys a lot. I used some coding to tell how many times these words existed. Also discovering what keywords were used together was important for data analysis.

After completing the T-test it showed that the second set of data was statistically significant from the first set of data. The value that was achieved on the T-test was 5.29346E-11. Since that was below the threshold of .05 it was considered significant change (Alverno, 2007). An implication from the survey shows that seeing the electronic prototype stimulated some greater responses on the same questions. In this case the electronic application was used as a stimulant to increase learning farm safety. The T-test was evidence that this electronic application was successful.

The tools from the design frameworks and video game industry were integrated in the prototype that was presented to NYCAMH. A survey was designed that integrated a likert scale that measured changes from one mindset to another. Using the T-test I was able to determine that T-test results were statistically significant. This shows there was a significant change and the electronic prototype stimulates motivation from the interviewees chosen from the farming community.

9.0 Future Work and Research
In the future I think that more research can be done to see if another type of game can be made to make teaching farm safety a little easier. Some of the types of games that could be looked into are 3D type games or virtual reality type games. Putting the farmer or game player closer to the game is going to increase the game experience.

Also the next thing that needs to be done with this game is it needs to be given to a programmer. The programmer needs to take the game design that has already been developed and code it into a fully functional game. At this time the game can be given to NYCAMH to be hosted on their web servers and NYCAMH can distribute this game to any client without internet access.

Another thing that I think will happen is adaptation into the commercial world. Companies such as John Deere or International might see this game useful and adapt the current game or a future version of this game into their company.
10.0 Bibliography


