MAKING IT FUN:
UNCOVERING A DESIGN RESEARCH MODEL FOR EDUCATIONAL BOARD GAME DESIGN

A Thesis
Presented in Partial Fulfillment of the Requirements for
The Degree Master of Fine Arts in the Graduate School of The Ohio State University

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* * * *

The Ohio State University
2009

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ABSTRACT

This study discusses the importance of rigorous design research in the development of an educational game for an academic research project sponsored by an established non-profit diabetes association. The goal of this project was to create a board game to engage children with diabetes, their friends and parents in the diabetic’s daily personal health management, the self-management requirements of which are hard to understand and maintain. The board game format was perceived as a highly appropriate form of communication because of its capacity to simplify large concepts, making them appropriate for the experiential learning required to master complex information.

Research and design process of this case study involved collaborations with graduate student researchers, sponsor clients, subject experts, and faculty advisors. The design team collaborated during several stages of research, and developed a research model for educational board game design encompassing many design research methods, starting with a data gathering stage including interviews and literature review, a creative stage including participatory research methods and generative tools, and an evaluative stage including usability testing and pilot testing. The research model is designed to follow an iterative design process, allowing for the most informative participation from all participants. This study summarizes the collaborative and rigorous research process used in the identification and development of relevant content that informed the design
development of an emotionally connective and engaging game that was fun, educational, and significant to the management of diabetes.
Dedicated to Erika,

my partner in life, love, and friendship
ACKNOWLEDGMENTS

I wish to acknowledge and thank the following people for their assistance in my research and my graduate experience as a whole:

Many thanks to my advisor, Dr. Peter Chan, for his support and encouragement, and his taking me under his wing to introduce me to the intricacies of the academic side of the design field. Thank you for the guidance and continual support. Also, thanks to my committee members, Dr. Liz Sanders and Paul Nini, who introduced me to Design Research and guided me through the learning process as I re-contextualized everything I knew about the design field.

Additional thanks must go to Brian Stone, who, in his capacity as Graduate Studies Chair, has acted as an additional, more informal advising voice. Along with my advisory committee, Brian has always been supportive, helpful, enthusiastic about my research, and has actively looked out for my best interests.

I must, of course, mention my game prototype, which was developed partially in the graduate class taught by Dr. Sanders, Design Research and Inquiry. Developing this prototype for case study as a solo effort would be counterintuitive to the design research methods examined, and as such, I am indebted to a large number of people. For the development of the game itself, I am indebted to the research team of Erwin Lian, Erin Lucarelli, Paul Scudieri, and especially Louis
J. Miller, whose expertise as a schoolteacher was an enormous asset and who also assisted with usability testing of the game's instructions, under the guidance of usability instructor Bob Hale. I also must thank the participants from the Central Ohio Diabetes Association, in particular Sean McGee, Director of Social Enterprise, Jeanne C. Grothaus, Executive Director, and Darlene Honigford, Social Services Director, whose enthusiasm, expertise, and guidance were assets from beginning to end, and who graciously scheduled and administrated the research and playtesting sessions required of the project.

My friend and colleague Robert Strouse was instrumental in designing and coordinating the actual production of the final board game prototype and its materials and in doing so, adapting to what often seemed like insurmountable odds during what most students tend to experience as “summer break.” For the production, Rob and I had assistance from our friend and colleague Annie Abell, as well as the helpful staff at the local firms Priority Designs and Boss Display. Without their assistance and their problem-solving abilities, I am doubtful the game prototype would ever have been finished.

Finally, I would like to thank my family for their love and support, as well as a lifetime of encouragement in my creative pursuits.
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CHAPTER 1: INTRODUCTION TO THE PROBLEM

“One of the most difficult tasks people can perform, however much others may despise it, is the invention of good games…”
—C.G. Jung

“‘Educational’ games are not fun, like broccoli dipped in chocolate. There are few examples of fun educational games and many boring ones.”
—Brian Winn

“Design should make use of the natural properties of people and of the world: it should exploit natural relationships and natural constraints.”
—Donald Norman

It is a widely held common belief that most educational toys and games are neither fun, nor educational, and consequently they are destined to fail. (Jenkins et al. 2003, 244; Royle 2008) Additionally, in his book, The Design of Everyday Things, usability theorist Donald Norman cites a conversation he had with a designer on the design process, in which the designer told him it “usually takes five or six attempts to get a product right.” The designer went on to say, “if a product is truly revolutionary, it is unlikely that anyone will quite know how to design it right the first time; it will take several tries.” The designer also told him that if a new product doesn’t “catch on” in the market, it is destined to fail. This is a huge impediment to innovation. (Norman, 29) If educational games fail to educate, fail to be fun, and consequently fail to catch on, this can stunt their innovation as an industry. Game development, especially in the case of games for retail, typically begins with a finished concept, with the design constructed backward from there, including
design documents that elaborate on all the details and minutiae of the game. The final game that is produced, for whatever reason, very seldom reflects the original design concept. (Zimmerman 2003, 177)

This study argues that educational board games can be fun, and can be designed through research, application, and an iterative design approach, and designers can use an analytical process to ensure so. It will deconstruct games and the theories behind game design, examine what it is about them and their users’ related experiences that makes them fun, and how this can be considered when developing an educational game. It will illustrate these concepts by combining game research and theory, case studies of existing game concepts and their development process, and analysis of design research practices. Ultimately, it will propose a step-by-step research methodology to be used by anyone developing an educational game.

The target audience for this study consists of the designers and related team members working on educational games and toys. The case studies used are of educational board games, but the process could be applied to video games, card games, or any similar type of interactive product based on users participating and engaging in a system. The proposed methodology could also be applied to any standard, non-educational game, especially one with complex subject matter containing information that must be understood and retained for future use.

1.1 Scope of the Study

In order to accomplish these goals, this study will identify, analyze, and
interpret the research process behind the creation of an educational board game. The game in question is designed to engage children living with diabetes, as well as their friends, parents, and caregivers, in personal health management awareness. The Central Ohio Diabetes Association (CODA) of Columbus, OH, sponsored the project, with the intent to implement its production as a new enterprise project.

CODA had previously conceptualized a similar product, which was halted in the research and development stage due to feedback from playtesting sessions. The players, who were children in the age group of 7-12, found the game was not fun and focused too heavily on health risks and issues. They did not respond to the characters of the game, and were indifferent to its setting, which was meant to mimic the layout of Camp Hamwi, CODA’s summer camp for children with diabetes. According to Sean McGee, Director of Social Enterprise at CODA:

“Previous design attempts were unsuccessful in integrating education and play. Some designs over-emphasized clinical knowledge to the point of being unplayable. Our most successful iteration proved almost schizophrenic: During play testing, the players ended up having an in-depth discussion about diabetes while they played a board game. They could just as easily been playing Sorry or Chutes and Ladders while they talked about their personal and family experiences with diabetes.” —Sean McGee

Concurrently with the game’s conceptualization, CODA had been utilizing a team of students at The Ohio State University’s Fisher College of Business to develop a business strategy and marketing plan for the game (fig. 1.1), which was largely made obsolete by the feedback from the playtesting sessions. The CODA staff and related participants expressed in conversation that the project focused too heavily on content and marketing plan for the game. The CODA staff
put the project on hold, and while doing so, lost touch with the original game designer. This prompted them to contact Dr. Peter Chan, a Visual Communication professor in the Department of Industrial, Interior, and Visual Communication Design at The Ohio State University, to discuss the possibilities of reviving this project, and where it could go if it were to involve faculty and students from the Department of Design. After discussing my research interests and educational objectives, Dr. Chan proposed the project to me as a graduate research project, and I began meeting with the staff at CODA. Based on the original board game

Figure 1.1: CODA’s strategy for the original board game in a broader context
development materials provided by CODA, there was an opportunity to formalize a design proposal based on key design principles such as game design, character development, and play quality, and the staff’s reflections expressed this in our conversations. Following our initial meetings, I assembled a research team, initially comprised of myself, Dr. Chan, Design Research pioneer and OSU Design Research professor Dr. Elizabeth Sanders, and a group of graduate students whose backgrounds encompassed graphic design, illustration, art and design education, motion graphics, product design, cognitive and systems engineering, mechanical engineering, as well as one senior undergraduate student in OSU’s Visual Communication Design program.

1.2 Issues specific to diabetes and its representation

“Diabetes is a disease that affects the body’s ability to produce or respond to insulin, a hormone that allows blood glucose (sugar) to enter the cells of the body and be used for energy. Without insulin the body cannot control the amount of sugar in the blood. Over a period of time, high blood sugar can damage the cells in the body leading to problems such as blindness, heart disease, kidney failure, stroke, nerve damage and leg amputations.” (www.diabetesohio.org)

On its website, the Central Ohio Diabetes Association cautions people that diabetes as an affliction is on the rise. According to their statistics, one in ten people will develop diabetes in their lifetime, and if these current trends continue as they are, one in every three children born after the year 2000 will develop diabetes. This statistic can narrow to one in two children, depending on the child’s ethnic, cultural, and economic background. (www.diabetesohio.org)

There are two main types of diabetes. Type 1 diabetes, which was formerly known as juvenile diabetes, occurs most often in children, but is prevalent
enough in adults that doctors now refer to it as Type 1. It is an autoimmune
disease, where the body is programmed to react against itself. (Rubin 2004, 32-33)
Type 2 diabetes was formerly known as adult onset diabetes, and is defined by its
gradual onset. Ten times more people have Type 2 diabetes than Type 1, and this
number is growing, partly due to a global increase in obesity. (Rubin 2004, 38)
Additionally, there are other forms of diabetes, including Gestational diabetes,
which affects pregnant women and usually goes away after pregnancy (but leaves
the affected person at risk for Type 2 diabetes in the future), and other types
that are the result of complications from surgery, malnutrition, drugs, and other
illnesses (www.diabetesohio.org).

These types of diabetes are all managed differently, depending on which
disease type the person has and what that person’s personal medical history and
lifestyle are like. It is a varied and specific management system. The three main
components that make up the management process are meals, meaning what a
person eats, how much of it, and when; motion, meaning how much exercise,
what kind, and how often; and medication, meaning insulin or other types of
medication, the use of which varies drastically from patient to patient. CODA
also lists monitoring as a part of this system. (www.diabetesohio.org) During
interviews with CODA staff, I learned that a common approach to thinking about
the treatment plans for the management of diabetes is to find the most appropriate
balance of these three components for each person. Therefore, it is difficult to
condense specific treatment issues into a system that makes sense to a broad
audience. A game can be the solution to this problem. Games, by their very nature,
are capable of modeling complex situations, and have the capacity to teach us
complicated information and how to perform life skills. (Koster 2005, 64-66)
Using this project as a case study and a framework for the research process, this document will present the elements of games that make them a suitable choice for educational tools, discuss case studies of similar projects, analyze the research process I used with the CODA game project, and extrapolate a research and design model that can be applied to similar projects in the future and be used for further research.
CHAPTER BIBLIOGRAPHY


CHAPTER 2: THE CASE FOR EDUCATIONAL GAMES

“Games capture children’s imaginations and engage them in fantasy worlds.” (Kafai 1995, xiii)

In this chapter, I will make a case for games as a viable form of media for education. By compiling and analyzing research from game designers and scholars, interactivity specialists, and curriculum design experts, I will discuss what makes games appropriate for learning, what concepts are inherent to games, and methods on designing curricula, as well as tools and systems for learning.

Thanks to the growing popularity of interactive media, games have evolved to have the potential of becoming research and educational tools, giving game players a chance to see the world through a different lens. (Westecott 129) By actively giving players the chance to play between the areas of action and consequence, games can offer a positive outcome to our culture and alter the dynamic that exists between people and media. By embracing games as a legitimate form of media, with all the potential to educate and inform as other forms of media, we can in turn allow games to embrace a sense of ethical responsibility. (Westecott 131-132) Emma Westecott summarizes this notion thusly:

“As explorations of game form lead to new outcomes, the market for games will grow from the entertainment sector into other domains, including education,
Games today are focused more on the delightful experience that is felt by players, rather than for any other function. They have the potential to be utilized in more utilitarian areas of our society, but are designed primarily to profit from the entertainment value they provide for players. The entertainment that comes from playing a game comes from the interaction between the player and the game's system of rules and fictions, the contextual “world” it creates for itself. (Zimmerman 176) Additionally, games have the capacity to generate meaning through experience. As they generate multiple outcomes for players, these outcomes can be interpreted through culturally shared meanings and experiences. (Malaby 2007)

According to Thomas Malaby, Anthropologist at the University of Wisconsin—Milwaukee, games are “artifactual,” meaning they are tools created by people for specific purposes. As such, they are intentionally created to be “separable to some degree from everyday experience.” (Malaby 2007) According to game designer Raph Koster, “games might seem abstracted from reality because they are iconic depictions of patterns in the world.” This actually works to assist our psychological understanding of games, as it is consistent with how the human brain visualizes information and absorbs data. (Koster 2005, 34) Our brains are designed to seek out and absorb patterns. Children learn by trial and error, sometimes informed trial and error, and sometimes not. They find patterns and test their boundaries to learn where they actually are and where they will bend. (Koster 2005, 14) Comics theorist Scott McCloud states that human beings have such a natural predilection for pattern recognition that we see human faces in
any set of markings containing two dots and a line. The abstraction of this type of icon should not be thought of as having eliminated particular information, but rather, having focused in on important information. (McCloud 1993, 31-33) Koster refers to this concept as “chunking,” and simplifies this idea by stating, “the brain is good at cutting out the irrelevant.” Human beings rely on this function of “chunking” all the time, with just about every task we do. It’s how we learn to do things at all, from specific, physical tasks such as driving a car or playing a musical instrument to abstract tasks such as communicating with each other using verbal language and recognizing faces in a crowd (fig. 2.1). (Koster 2005, 18-22) Games exist as chunks to be absorbed by the brain. As chunks, they have been abstracted into “icons,” which allows them to quickly be absorbed and understood by our brains. The patterns inherent to the game, the “chunk,” may not be reflected in reality, but its rules and formal systems are learned in exactly the same way as rules about real life. Because they are designed to be understood in the same way that the human brain is designed to learn, games can become powerful learning tools. Koster argues that games are teachers, and that by absorbing their rules and

Figure 2.1: Illustration of McCloud and Koster’s theories regarding iconification and pattern recognition
systems of games, we engage the learning centers in our brains. Which means that regardless of the subject matter of the game, its players are learning. By this rationale, all games are “edutainment.” (Koster 2005, 34-41) This is a common idea in psychological flow theory, which postulates that optimal experiences of mental engagement occur when they are goal directed and bounded by rules. (Csikszentmihalyi, Rathunde, and Whalen)

“Within the games industry, edutainment has become a bad word, suggesting an earnest aesthetic, derivative game play and poor production values.” (Jenkins et al. 2003, 244)

The common wisdom that declares “edutainment” must fail commercially and creatively is based on previous iterations of educational games. These previous iterations were based on making hard concepts seem more palatable by applying an aesthetic to them that is supposed to connect to child players. The theories behind such games are archaic, reflecting learning theories a generation or more removed from their target audience, based in large part on “rote memorization and behaviorist conditioning.” Current learning theories now suggest that learning occurs in more social contexts, with experimentation and investigation, such as rule-bending modes of trial and error. (Jenkins et al. 2003, 244) The Games-to-Teach Project, a collaboration between the Massachusetts Institute of Technology and Microsoft, identifies on their website that “edutainment” products tend to “combine the entertainment value of a bad lecture with the educational value of a bad game.” Their stated goal is to combine their resources at MIT and Microsoft to demonstrate the potential of games as an educational tool. (http://icampus.mit.edu/projects/GamesToTeach.shtml) As principal investigator of the project, Henry Jenkins suggests that game designers have the potential to create truly
educational games even with the technology we currently have, which could include simulation games that allow students to abstractly engage in engineering or architectural projects, role-playing games that allow students to step into the roles of specialized professions, or multiplayer games that can be used to illustrate, by an abstracted experience, life in different eras and places. (Jenkins et al. 2003, 244) Jenkins is also quick to caution that developing an effective educational game is only part of the process of designing an educational experience, which also requires the design of a strategy for utilizing these games in an educational setting. (Jenkins et al. 2003, 252)

Karl Royle from the University of Wolverhampton argues that educational games have failed because they either fail to engage their audience, or they fail to educate. Both students and educators alike feel that educational games are diluted in some way, either presenting a diluted gaming experience or a diluted educational experience. Royle argues that the mindset that drives this kind of thinking stems from people trying to work games into education, rather than trying to work education into games. (Royle 2008)

“Current school work usually presents assignments in a form that assumes that there is only one right way to do it. Designing an educational game, however, presents as task that has several possible solutions.” (Kafai 1995, 2)

Richard Halverson, an Assistant Professor in Educational Administration at the University of Wisconsin, explains that educational institutions are generally very limited in the way they can incorporate games into the classroom setting. The educational content standards that are accepted and in use in national K-12 education dictate a certain understanding of various subjects. When planning curriculum, teachers tend to use games to reinforce lessons, rather than teach
them firsthand, because some games can be unpredictable and even inefficient. The safer solution is to use more transparent educational games to reinforce specific lessons and map onto a pre-defined, standards-based curriculum. This has been common practice in schools for a long time. (Halverson 2005) Although this does not directly affect educational games in the broader context, it still creates a environment of familiarity with only one type of educational game that is often less successful.

2.1 Elements Inherent to Games: Rules and Game Systems

Game designers, researchers, and theorists have long been attempting to define a “game.” Malaby defines a game as a “semibounded and socially legitimate domain of contrived contingency that generates interpretable outcomes.” (Malaby 2007) Roger Caillois defines a game as an “activity which is… voluntary… uncertain, unproductive, governed by rules, make-believe.” Jesper Juul uses “a rule-based formal system with a variable and quantifiable outcome, where different outcomes are assigned different values, the player feels attached to the outcome, and the consequences of the activity are optional and negotiable.” Civilization designer Sid Meier simplified his definition to, “a series of meaningful choices,” while Ernest Adams and Andrew Rollings use, “one or more causally linked series of challenges in a simulated environment.” Katie Salen and Eric Zimmerman use, “a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome.” (Koster 2005, 12-14) And Raph Koster, self-defined “fun theorist,” states, “games are puzzles to solve, just like everything else we encounter in life… the only real difference between games and reality is that the stakes are lower with games.” (Koster 2005, 34) The definitions are varied, and each is deliberately
worded, but the one thing they have in common is that each hinges on the idea of a system of rules.

Games’ rule systems can also vary widely, from more simple, formal systems, such as Tic-Tac-Toe, to more complex, variable ones such as Chess or Poker. The more formal a game system is, the more thoroughly it can be analyzed mathematically, and the more easily it can be understood. Games are meant to exercise the brain, and when they fail to do so, players become bored and stop playing. So if a game has a limited formal system, it will also have limited playability. Long-lasting games tend to incorporate the option of variability. (Koster 2005, 34) This idea is similar to driving a car or playing a musical instrument, in that the brain is constantly engaged in the rules, adapting outside variables to the existing rule system. These rules produce regular, consistent outcomes, but are not intended to reduce unpredictability. (Malaby 2007)

Brian Winn and Carrie Heeter cite game designer and theorist Marc Prensky’s idea of replayability as being a defining characteristic of a “good” game. (Prensky 2001, 179-180) They elaborate that in an ideal circumstance, a player should be able to play a game multiple times and have a different experience each time. Integrating more variables into the game’s formal design is one step toward making a more long-lasting game. (Winn, Heeter) Katie Salen and Eric Zimmerman push the idea that the game’s rule system transforms into an experiential system for the player, and game designers must accommodate this idea of experiential design in order to give their audience a more meaningful experience. (Salen, Zimmerman, 316)
2.2 Elements Inherent to Games: Play

“To design a game is to construct a set of rules. But the point of game design is not to have players experience rules – it is to have players experience play.”
—Eric Zimmerman (Zimmerman 2003, 184)

“Play is free movement within a more rigid structure.”
—Katie Salen and Eric Zimmerman (Salen, Zimmerman, 304)

Eric Zimmerman relates the terms rules and play to structure and experience, in order to have it resonate more with his audience of designers. Designers are used to creating structured systems, such as a car or a typeface, but people experience that system by encountering, exploring and simply using it. The user’s experience is contextually much different than that of the designer’s, which is why designers should never assume they understand the user’s experience until they witness it firsthand. (Zimmerman 2003, 184) Emma Westecott further states that the system the designer creates is simply a set of tools for decision making and the reception of feedback regarding the outcome to the aforementioned decisions. (Westecott 131)

Salen and Zimmerman break the notion of “play” into three categories (fig. 2.2). The first, Game Play,” is really only intended to be the interaction between game players and their experience within a game’s rule system. The second, Ludic Activities, is broader, encompassing games as well as less specific forms of play, such as tossing a Frisbee, or playing on a jungle gym. The third, Being Playful, is broader still, when the spirit of play influences behaviors otherwise considered ordinary, such as teasing friends or wearing playful clothing. (Salen, Zimmerman 2003, 303)
Specific to games, however, play is not something that can be created by a game designer, as it is what the players experience when they play the game by immersing themselves into and engaging with the game’s rule system. The designer’s influence in this is only indirect. (Salen, Zimmerman 2003, 305) Malaby thinks that Salen and Zimmerman are inaccurate, and focused too much on the ideas of pleasure, fun, and entertainment. Malaby feels that these ideas charge games with a normative state, but this is not the case. He suggests we speak of games using terms like “compelling,” or “engaging.” He sees the idea of play as, “a mode of experience, a way of engaging the world.” (Malaby 2007)

2.3 Elements Inherent to Games: Interactivity

In their book, Reading Don’t Fix No Chevys, literacy education specialists Michael Smith and Jeffery Wilhelm question the effectiveness of how literacy is taught in school settings today, citing games as a medium for future exploration. They argue that “games, by their very design, provide both clear goals and immediate feedback.” (Smith and Wilhelm 2002) This notion of “feedback”
is an important concept that separates games from other media such as books or television. It exemplifies the truly interactive experience of the game. In information theory, when a user performs an action, feedback is the information that is sent back to inform them of what they have actually accomplished. (Norman, 27)

Rollings and Adams separate games out as “participatory, or interactive, entertainment,” due to the inherent nature of game players performing tasks within the game’s pre-set system of rules. Books and television, however, are considered passive forms of entertainment, because the information is presented to the viewer, who does not participate in the delivery. Interactivity is the key that makes the game playable. The entertainment of a game comes specifically from the player’s active participation, which makes games unique among any other type of media. Therefore, to be effective, a game has to unify its experience for the players, not just within the set of rules it has designed, but through graphics, language, narrative, and every other element involved. (Rollings and Adams)

A game is a form of participatory, or interactive, entertainment. Watching television, reading, and going to the theater are all forms of passive entertainment. In those media, the entertainment is presented to you, and you’re not expected to participate. In some plays, the audience itself has a role, but even then the actors are in control. The content of the entertainment is the drama, and the way you perceive it is by watching it. This mode is fundamentally passive: They act, you watch. (Rollings and Adams) By using games as a teaching tool, the student assumes an active role in the learning process, as opposed to more traditional educational environments that have them assume the role of a passive observer. (Heitzmann 1983, 14)
2.4 Elements Inherent to Games: Narrative

One of the more important elements of games is the idea of narrative. By their very nature, games tell a story, because games involve a series of choices made by the players. In adventure games, players participate in a larger, obvious story, but in simpler games, the story is the game. Someone playing Tetris creates a story as he or she moves blocks and shapes together. The term “narrative” actually relates to the story the designer creates as a framework for the game, so even though the Tetris player is telling a story through an interactive experience, he or she is not being immersed in a narrative. (Rollings and Adams)

The aforementioned concept of narrative hinges on the idea of dramatic tension. There must be a conflict between the characters in order to drive the overall plot. This is as true with games as it is with novels and other stories. With games, this conflict is almost always directly related to challenges inherent to the game that the players must experience in order to advance to the next stage of gameplay. It is common for games to attempt to strike a middle ground with the narrative, presenting a back story or contextual framework and allowing the players’ choices to advance the remainder of the narrative. (Rollings and Adams)

In the case of educational games, one can break them down into exogenous and endogenous game types. These are the fundamental structures of all educational games. (Malone and Lepper 1987) Exogenous games are structured around a pre-existing gameplay structure, and the educational components tend to be incorporated specifically into the narrative. The game mechanics in these types of games tend not to be connected to the educational components in any way. Since the game's mechanics are generally already in the players’ realm of
experience, the content is the only new information being absorbed. This limits the educational role of the game toward reinforcing knowledge that has already been taught. Similarly, it also limits the story presented, which is often tied in to the educational content. (Winn and Heeter 2006)

Endogenous games, conversely, incorporate the learning aspect into the actual mechanics of the game. They often use existing game concepts, such as a role-playing game, or an adventure game, but experiencing the gameplay itself is how the educational content is delivered to the players. By incorporating content-specific problem-solving exercises and using the game’s system as the pedagogical vehicle, endogenous games can offer a more unique, complex learning environment than exogenous ones. (Halverson 2005; Winn and Heeter 2006) Endogenous games deliver the story through a combined method, by presenting a pre-designed backstory or framework, and allowing the players’ experiences to drive the rest of the storytelling. (Winn and Heeter 2006)

2.5 Elements Inherent to Games: Fun

One intangible quality that good games have is the quality of “fun.” But “fun” is not something easily quantifiable. Computer game developer Pierre-Alexandre Garneau attempted to quantify “fun” by listing out, through analysis, “fourteen forms of fun.” These fourteen elements are often found in games, and are always entertaining. These elements are: beauty, immersion, intellectual problem solving, competition, social interaction, comedy, thrill of danger, physical activity, love, creation, power, discovery, advancement and completion, and application of an ability. (Garneau 2001) Game researcher Carrie Heeter put these fourteen forms of fun to the test during a study at Michigan State University, where she attempted
to pinpoint the difference in “fun” between standard games and educational games. The results of the study concluded that educational games had on average 30% fewer forms of fun than commercial games. The dominant forms of fun included intellectual problem solving in the forms of puzzles and exploration, and less so with competition. Heeter found that educational games tended to be more grounded in reality, and required the players to experience two levels of learning, namely the game rules and the subject matter, whereas the commercial games only required players to learn the game rules. (Heeter et al. 2003) Raph Koster suggests that when games require players to understand patterns, they also train players to block out extraneous information that surrounds the patterns. (Koster 2005, 80) This extraneous information that we are trained to block out is the second level of learning Heeter describes.

“Fun” is what happens when our brains feel good, and endorphins are released into our bodies. When we learn a skill or a piece of information, there is a subtle release of endorphins that goes along with that. It is a part of our biological programming to have fun while learning and advancing the human race. Comprehension, mastery, and solving puzzles are a part of this, and they are the element in games that make them fun. (Koster 2005, 40) Koster postulates that games are inherently teachers, and when they stop teaching us things, presenting us with problems and puzzles to solve, we get bored with them and stop playing. (Koster 2005, 42) This makes “fun” synonymous with “learning,” within the context of games. (Koster 2005, 46) In fact, the assumption with educational games is that they must be made to be fun, implying that learning is not fun for children. Many educational games attempt to disguise the educational component, framing it superficially in leisure-based activities. It can be argued that this is inconsistent
with the nature of games as low-risk, problem-solving tools. (Halverson 2005)

“Fun is about learning in a context where there is no pressure, and that is why games matter.” (Koster 2005, 98)

My colleague, Elise Woolley, a fellow graduate student at The Ohio State University, set out to answer the question, “what is fun,” during a research class at OSU. Working with a team of fellow graduate students from Design and Cognitive Engineering, Woolley and her research team used a series of research methods, including questionnaires, image sorting, word choice, and mind mapping, to determine what people find to be fun and how designers can quantify it and use it to their advantage. What she and her team ultimately discovered was something they colloquially refer to as the “Funtinuum,” a map that one can use to locate

Figure 2.3: Elise Woolley’s Funtinuum
various activities based on their intrinsic qualities and determine the approximate level of fun they would be to most people (fig. 2.3). The Funtinuum exists on an X and Y axis, one representing how social or solitary an activity is, the other how active or passive it is. Social activities include going to a bar with friends, while solitary ones include reading books. Active activities include sports, while passive activities include watching a movie. Woolley’s team concluded that most “fun” activities follow a line that begins at the nexus of the active and social axes, and follows through to the other end, at the nexus of the passive and solitary axes. Reading a book, which is both passive and solitary, is considered to be a fun activity by many people, but would probably be considered less so if the reader had to describe the plot to someone else in the room as he or she read it. Games, like sports, exist toward the end of the active/social nexus, making them an ideal form of fun.

2.6 Elements Inherent to Education: Curriculum Design and Instruction

School reform consultants and advocates Grant Wiggins and Jay McTighe introduce in their book, *Understanding by Design*, the notion that teachers are designers, due to their occupational need for systems-based thinking, their creation of learning experiences and subsequent student assessment, and their diagnosing of students’ needs and creating solutions to fill those needs. They caution that anyone designing educational experiences must always be cognizant of their audiences in the same way that practicing designers must be with client projects. As students fill the role of the “client” in this case, it is their achievement of the proposed learning outcomes that determine the effectiveness of the educational experience. (Wiggins and McTighe 1998, 7) In the case of the CODA board game, the game’s players and end-users fit the role of “client” as much as the
Wiggins and McTighe are proponents of the idea of Backward Curricular Design, which sees a curriculum as “a means to an end.” With this method, curriculum designers begin at the end, by determining what the ultimate desired learning outcomes would be, what the students should know and understand, and then work backward, determining the curriculum needed based on that final outcome. The authors refer to it as a “purposeful task analysis,” a common method of systematic thinking in the design field, where the designer determines a solution and then plans the appropriate method of achievement. They propose a series of three steps toward this end. The first step is to identify the desired results. Second, determine the acceptable evidence that would inform these results, and third, plan the learning experiences and instruction. (Wiggins and McTighe 1998, 8-9)

Wiggins and McTighe emphasize the importance of “understanding” versus “knowing.” “Knowing” relates more to facts and pieces of information, but “understanding” is a lasting result, something a student can extrapolate and use critically in a broader sense. They stress that “understanding” is important when a problem arises that is counterintuitive, or goes against our expectations. “Understanding” challenges the student to rethink what they thought they knew. The challenge in designing instruction for understanding is that the student may not understand that there is value in the subject matter, even though the teacher may find this value to be self-evident. The instruction needs to be contextually relevant to the user’s needs. Students must be guided to analyze their experience to derive the understandings intended and presented by their

“In a curriculum for understanding, rethinking the apparently simple but actually complex is central to the nature of understanding and to a necessarily iterative approach to curricular design.” (Wiggins and McTighe 1998, 25)

This chapter introduced the controversy regarding educational games, and discussed and analyzed schools of thought on educational games and their successes and failures. Additionally, it outlined the elements inherent to games that make them legitimate teaching tools, including rules and rule systems, play, interactivity, narrative, and fun. I will apply this background information in the creation process of the CODA board game. In the next chapter, I will discuss the research methods used in creating the CODA board game.
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CHAPTER 3: REVIEW AND ANALYSIS OF EXISTING GAME DESIGN

In this chapter, I will present some examples of other games being developed, along with research work being done in the realm of educational and serious board games. Games seem to be a relatively popular research topic, but from what I have uncovered, none of these research projects seem to establish a working methodology, reflective or otherwise, for their success. In fact, the way many of these studies are documented, it seems plausible that the designers are treating game design and development as if it is comparable to designing a simple tool, rather than a complex system. Generally speaking, although the research I have uncovered documents the research and design process, it does not tend to discuss the research methods used at length, and the information between game iterations regarding testing and results, chosen methods, and justification for certain choices is all but left out. I have selected what I have found to be useful summaries to use as case studies for comparative analysis.

3.1 Settlers of Catan

I feel I would be remiss not to discuss Settlers of Catan in this study, as it was a profound influence on me when conceptualizing this project and considering the possibilities. Settlers of Catan is a relatively new board game from Germany, which won the Game of the Year (Spiel des Jahres) award coveted in the board game design industry. According to Wired Magazine, “Settlers is now
poised to become the biggest hit in the US since Risk. Along the way, it’s teaching Americans that board games don’t have to be either predictable fluff aimed at kids or competitive, hyperintellectual pastimes for eggheads.” (Curry 2009)

The Wired article goes on to suggest that board games, which have taken a hit in popularity due to more dynamic media such as television and video games, still thrive, because they are more than anything an excuse to spend time with family and friends. The article cites MIT game expert Jesper Juul’s claim that they “create a communal experience that brings people together.” German board games in particular are considered to be at the upper echelon of game design because of their attention to game balance and their ability to stay interesting; specifically, to present a slightly modified gameplay experience during each session.
BoardGameGeek.com founder Derk Solko proposes that popular, well-known games such as Monopoly are not designed to withstand the test of time in terms of gameplay. Monopoly, in particular, presents the same situation each time, and allows for almost no strategy. (Curry 2009)

Settlers of Catan is designed to be simple to play and learn, but dynamic and strategic. The game board is set up in hexagonal shapes to comprise the fictional island of Catan, on which players will settle and attempt to succeed economically. The hexagonal tiles each represent one of four natural resources, and are shuffled and placed, creating a different permutation of the island for each game session. Adding to this randomization is a system where each tile gets a number placed on it to indicate at what point in the game players can collect each resource (fig. 3.1). This alone creates a very large amount of randomizations and allows for the game’s dynamic to be different during each round of play, but in addition to this, players are given the option of choosing where to build their first settlements, throwing yet another variable into the mix. The remainder of the game is a turn-based economic system where players collect resources and use them to expand their settlements and collect points, ultimately allowing them to win. It is competitive without being destructive, and strategic without being exclusive, and it is one of the few board games I personally enjoy playing.

3.2. Questions & Answers

For her graduate thesis, Designer Guillermina Noël developed Questions & Answers, a game for people suffering from Aphasia, a language-impairment disorder that mostly affects people who have suffered a stroke. Aphasia is a very broad affliction, and affects people very differently from one case to another.
Some people can pronounce only a few words, others can speak but mistake words, others are rendered totally mute. The affliction impairs other functions, occasionally some motor skills, and writing ability, but the primary feature is that it impairs speech. Noël identified with aphasia because her father had suffered a stroke, and subsequently was diagnosed with a specific form of it. As board games were a favored pastime of his, Noël developed the game with the intention of giving her father a way to participate in family activities, without his impairment as an obstacle. Aphasia therapy also incorporates game playing to help patients joke and relate with one another without the use of speech.

Noël began her process with a literature review for the subject matter of aphasia, to augment her existing knowledge of the subject matter. She developed three game prototypes, focusing on elements that would specifically help the aphasia patient, including typeface selection, color, and game format. She then sent the prototypes through a heuristic evaluation process, putting them under academic review by eight experts in aphasia and nine experts in design. She selected the recurring ideas from these evaluations and analyzed them, using them to create arguments that support the game and its usage. Noël is clear that her game is only relevant when played in the context of a family setting with an aphasia patient. To take it out of context defeats the purpose of the game.

The game's connection to aphasia is more of a design solution for a particular user, to allow him to relate with his family and participate in group activities. There seems to be no indication that the game itself is designed to educate people about aphasia, beyond offering a context for discussion. (Noël 2008)
3.3 simSchool

Funded by the Preparing Tomorrow’s Teachers to Teach with Technology program of the U.S. Department of Education, simSchool is a computer-based classroom simulation game. Its intention is to immerse new teachers into the classroom experience in a safe environment that effectively replicates the student-teacher experience based on simulated students who have different learning characteristics and personalities. In this respect, simSchool is intended to serve as a “virtual practicum.”

In the game, players begin at a virtual desk looking out onto a simulated classroom of students. The classroom’s population is derived based on the player’s choice of urban, suburban, or rural communities, the demographic data from each being culled from the National Center for Educational Statistics Common Core of Data. The player is given information on each student, and by observing their body language and interacting with them through questions and conversation, is meant to address their individual learning needs and adapt as need be (fig. 3.2).

At the conclusion of the game, the program gives a grade sheet for each student in the class. As players improve within the game, the students’ performance improves, as well. The game also tracks and analyzes the player’s choices and offers an assessment of their performance. Using a network, the player can also get feedback from a remote observer.

The developers hope to utilize simSchool in teacher preparation programs to expedite the training of future teachers. It is their hope that simSchool can be used as a supplemental training program to their practicum experience, giving
Figure 3.2: Screenshots of simSchool from the game’s website, simschool.org
them a more solid grounding in teacher training. (Zibit and Gibson 2005)

3.4 The Project Planner Game

At the Northern School of Design at the University of Central Lancashire in the United Kingdom, a group of researchers developed a board game in conjunction with an organization called SEED (Supportive Environments Encouraging Development). SEED was developing a hospital space for a mental health hospital to facilitate the independent living skills that would allow patients to be discharged.

The SEED staff needed to determine a way to conduct research with hospital staff to facilitate discussion and communication regarding their needs as users and how they can be accommodated by the designer's creative process. Their intent was to empower and encourage the service staff, which typically has little say in this process. To do so, they developed a simple board game called the Project Planner Game. The game was just a means to encourage discussion about the design of the space, but the researchers found it was an effective tool, as games are “familiar and reassuring.”

The first iteration of the game was a simple cardboard game based on the idea of a race. Players would be asked simple discussion questions about interior space design. After the first session, one of the players of the game said, “Gives a say in what we do. It's an ice breaker.” Following this prototype's success, the SEED team collaborated with the researchers from the University of Central Lancashire and produced a second iteration of the game that was more flexible and adaptable to various discussion needs regarding the design process. They received a grant
that allowed them to spend time evaluating the game’s rules, format, and visual graphics, as well as test the second prototype further. In this process, they threw away everything pertaining to the original game and started from scratch, setting the ultimate goal of the game and identifying its key features and system for play. They recognized that “good games offer a variety of strategy options to players,” and that the success of these strategies would be altered depending on the current state of play of the game. Finally, the researchers recognized that it was important for their game to not only be a model of experience, but a fun game, as well.

The researchers kept visual styling and graphics out of their game prototype, “in order not to confuse the issue.” Their final result concluded that for their intents and purposes, they needed to keep the game simple and familiar for the facilitators, as it needed to be easy for them to use it to lead discussions. In doing so, they left the rules open to some interpretation, which led to collaborative decision-making and a group experience. They consider the game effective as a research tool, leading users through the design process. (Lamey, Bristow, and Thompson 2008)

3.5 Summary

While games are still being developed as a part of research, to aid in research, to be used as educational tools, or simply for entertainment, it is clear to me that there is no particular “recipe for success.” Designers and researchers are very interested in games and very interested in applying them to research and educational situations, but as it stands, most seem to develop and include games based on trial and error, and very few have truly investigated how this can be done and if it can be adapted for other projects. In the following chapters, I will present
my own experience with the CODA game project, analyzing the research methods I applied and reflecting on their results. Next, I will discuss design research and the methods I used as a part of the study.
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CHAPTER 4: RESEARCH PROCESS

In this chapter, I will discuss methods of Design Research and ways to apply them. I utilized all of these methods in some way in designing the CODA game. Bruce Hanington, an Associate Professor of Industrial Design at Carnegie Mellon University, proposes a new model for Design Research that is based on a three-phase system, where each step of the research process fits within one of the three phases (fig. 4.1). The first phase, Exploratory Research, encompasses research methods that are designed to discover something about the topic, meaning to learn on an intellectual level. The second phase, Generative Research, encompasses research methods that are designed to make something, such as generative toolkits or other forms of participatory design and co-design. The third and final phase is Evaluative Research, which encompasses methods that are intended to refine the designed subject and evaluate its success or effectiveness. (Hanington 2007) For the sake of structure, I use Hanington’s model as the framework for this chapter’s discussion of different research methods.

“The sequence of research by no means dictates that particular methods are isolated for use within specific phases, but rather may be used flexibly across the stages of research and design. Furthermore, as indicated by the diagram, the phases of research tend to overlap both in timing and methods, rather than existing with distinct start and end points.” (Hanington 2007)

4.1 Exploratory Research: Literature Review

Our research team began the process by familiarizing ourselves with the
subject, its complications, and its management by reading popular publications concerning diabetes and health management, as well as specific literature recommended by the sponsor. Team members reviewed sample game concepts and analyzed the unique characteristics of other diabetes-themed games. They also studied other established models of game design to gain insight on design language, processes, and strategic approaches.

### 4.2 Exploratory Research: Interviews

“User Interviews provide directional design input. You are not trying to get the user to tell you how or what to design; rather, you are trying to elicit their goals and needs by focusing on how they perform their current tasks independent of the specific product being developed. Armed with this information, you’ll be able to tease out their cognitive model, which is invaluable in setting design direction.” (Purpura 2003, 75)

“The duration of these interviews can range from 20 minutes to 1 or more hours. Individual interviews are ideal for learning exactly how each person feels and thinks about a topic or design, without concern for the influence of others.” (Ireland 2003, 25)
The research team took time to meet with the CODA staff as a group, interviewing and discussing the project with them in groups and one-on-one. Interviews were sometimes videotaped, but were always supported by note-taking.

4.3 Generative Research

“Historically, much of human research in design has been conducted as testing, or as an evaluative function to assess the outcomes of design and engineering against user performance. Upon developing a prototype or product, it makes sense to solicit feedback on usefulness and usability. Evaluative research is well documented, for example, in human factors literature on product testing… Generative research is a more focused effort targeted at a deeper understanding of user needs and desires, and concept development through participatory design activities.” (Hanington 2007)

Generative research is a type of research that is applied in order to generate ideas or discover new opportunities, as opposed to evaluating a prototype or an experience. Generative research, as the newest form of design research, is still being explored as a domain by researchers and practitioners. Additionally, generative research often includes participants who do not have traditional research backgrounds, or traditional design backgrounds. Designers are increasingly considering people as “co-creators,” equal participants in the design process that possess relevant expertise. (Sanders 2005) When these people are engaging in participatory activities, the roles of designer and researcher blur, while the user becomes a critical part of the design process. (Sanders 2006) And when people with a wide variety of training and backgrounds are working together, it is helpful for them to express themselves using a common set of tools. (Sanders 2001) According to Sanders:
“[Generative tools] take advantage of the visual ways we have of sensing, knowing, remembering and expressing. The tools give access and expression to the emotional side of experience and acknowledge the subjective perspective. They reveal the unique personal histories people have that contribute to the content and quality of their experiences. These are qualities useful to those of us involved in making people-centered decisions.” (Sanders 2000)

This participatory approach is a natural fit for game design, because according to Andrew Rollings and Ernest Adams, games are participatory by nature. People think about and change the rules of games all the time when playing, to alter their gameplay experience. (Rollings and Adams 2003)

The next step we made in our Generative Research was to start developing a large game development toolkit. Sanders’ approach to toolkits is:

“A toolkit usually contains a background on which to work, together with a large number of simple and ambiguous components that can be arranged and juxtaposed in a variety of ways. The components cover a range of representational types: from literal to abstract.” (Sanders 2000)

“Creating and refining the generative toolkits is a design process by itself. A toolkit is specific to its purpose. For example, we might be exploring people’s feelings about a past experience. Or we might be accessing their understanding of how a system works.” (Sanders 2000)

People select from the toolkit’s components to visually express their thoughts, feelings, and ideas about the subject of the workshop. The toolkit components are deliberately designed to be very general and ambiguous, in order for the participants to project their own ideas onto them. (Sanders 2000) Sanders references comics theorist Scott McCloud’s postulation on “non-visual self-awareness,” which suggests that people respond to cartoons and other simplified
face icons because the simplicity of these images seems in line with what the
viewer feels as “their” face. This allows the specifics of the icon to take a backseat,
and allows viewers to project themselves onto it. He theorizes that if what the icon
looks like matters less, what it says will matter more. (McCloud 1994, 24-37) This
theory is applied with the abstract shapes in the toolkits, allowing for participants
to project a wide variety of meaning and purpose to their components. The
things they create with these components are referred to as “artifacts.” (Sanders
2000) (Sanders 1999) These artifacts are used as inspirational tools for design
teams during the development process (Sanders 2001) These types of toolkits are
growing in usage, but they have not yet been established as a form of research for
game design. As such, we were required to develop our own set of generative tools.

4.4 Iterative Design

Noted game designer and researcher Eric Zimmerman refers to the act
of playtesting a game as a form of iterative design, a design methodology rooted
in a process of design, testing, and analysis (fig. 4.2). This process is cyclical, and
can be extended indefinitely as an ongoing collaboration between the designer
and the audience, using the designed object as the vehicle. In each testing session,
the designers observe the players, question the players, and refine the game as
per the players’ experiences. This process, which differs from the process typically
implemented in the development of games by commercial entities, results in a
more refined and emotionally connective game. (Zimmerman 2003, 176-177)

“As a game evolves (through the iterative process outlined below), it defines and
redefines its own form, the experiences it can provide for players, and the very
questions about design that it can ask. Through this play of design itself, new
questions come into being, present themselves to the designers, and sometimes are
even answered.” (Zimmerman 2003, 176)
Brian Winn and Carrie Heeter state that in particular, educational games need to rely on iterative prototypes. As with standard games, iterative testing allows designers to refine the game’s fundamental system, pieces, and rules, but additionally, it allows participants to assist in the refining of pedagogy and content, as well as gameplay themes based on these concepts. (Winn and Heeter, 2006)

4.5 Evaluative Research

“Historically, much of human research in design has been conducted as testing, or as an evaluative function to assess the outcomes of design and engineering against user performance. Upon developing a prototype or product, it makes sense to solicit feedback on usefulness and usability. Evaluative research is well documented.” (Hanington 2007)

Evaluative research consists of methods that are used to determine the effectiveness of the choices made in the design process. They tend to lean
more toward quantitative methods. Stacy Purpura states that these quantitative methods are “used once research objectives are defined.” They are employed due to their more precise nature, and with the intent to “pin down the details of the research.” (Purpura 2003, 63-64) and “test emerging design concepts against user expectations.” (Hanington 2007)

4.5.1 Usability Testing

“Usability testing… can give you invaluable design insights. Through one-on-one testing that asks targeted users to perform specific, primary tasks and employing a “talk aloud” protocol, you will be able to see if the user’s cognitive model matches the model of the product. Often, the team that worked on a product can no longer be objective about what’s working. This type of test can provide a fresh set of non-biased eyes.” (Purpura 2003, 74)

Usability research studies do not need to engage a wide number of participants, and it is appropriate for sample sizes to be small, as even smaller groups can generate large amounts of content. The goal in these studies is ultimately to determine the usability level of a product, and whether that function is appropriate or timely enough to satisfy its proposed audience. In doing so, this method will require a working prototype so the researcher can view the participants in action. However, the prototype only needs to work; it does not need to be completely finished. This allows the designer to observe, record, and evaluate the design as necessary. (Purpura 2003, 67)

Usability pioneer Jakob Nielsen suggests that when testing for usability, an iterative approach works best. When issues are uncovered, it is good to refine and attempt to fix those issues, but attempting does not always solve the problem.
There is always a risk that fixing an existing usability problem will introduce a new problem. (Nielsen 2000)

“Even though I said that the redesign should “fix” the problems found in the first study, the truth is that you think that the new design overcomes the problems. But since nobody can design the perfect user interface, there is no guarantee that the new design does in fact fix the problems.” (Nielsen 2000)

4.6 Summary

The research methods outlined in this chapter comprise some of the most established and most proven methods for design research with some of the newest and most innovative. Exploratory research has been ongoing for some time, as it is similar to the kind of research done before undertaking other projects from other areas, such as the kind of research an author might utilize while writing historical fiction—researching recorded historical data, technology and language use of the era in question, and perhaps visiting specific locations to ensure a believable, fictional narrative. Evaluative research grew during the 1980s as products with technical interfaces needed to be evaluated for usability and mapping. Generative research, in particular, is the newest domain to be considered. And as such, the skills needed to perform generative research are not necessarily those held by practitioners from more traditional research backgrounds. Despite the fact that some of these methods have not been documented fully, they are swiftly finding their footing in the realm of research. (Sanders 2005) In the development of the CODA game, I have utilized elements from each of these domains of research. I will outline this process in the following two chapters.
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CHAPTER 5: DESIGN OF THE GAME

In this chapter, I will systematically present the research process that the OSU research team and I used when we took on the CODA board game project. By connecting it back to the methods presented in Chapter 4, I will show how the research decisions we made were justified based on the type of information we needed to learn and how they connect back to the history of design research. In this chapter, I will begin with Exploratory research, followed by different types of Generative research.

5.1 Exploratory Research

The research team began by reviewing information provided by CODA regarding the project objectives, user profiles, potential play scenarios, and former business strategy. We also familiarized ourselves with the subject of diabetes, its complications, and its management by reading popular publications concerning diabetes and health management, as well as specific literature recommended by the sponsor. We reviewed CODA’s original sample game concepts and analyzed the unique characteristics of other diabetes-themed games, and studied other established models of game design to gain insight on design language, processes, and strategic approaches.

5.2 Generative Research: First Workshop

The OSU research team took its first step in the generative research process
by holding a storytelling workshop with the project sponsors from CODA in order to understand the sponsors’ hopes and dreams for the future of the game. The goal of this step in the research process is to determine where the emotional connections lie in regard to the project, what the participating group would like to see happen with the project in the future, and discover any previously uncharted territory. This information can then be analyzed and interpreted to inform how and what the game could be. The primary activity of this workshop centered on an emotional toolkit, which is a set of materials given to participants, which they use to create artifacts that can inform a designer’s process. These artifacts are often collages or diaries, and usually are of a personal nature. Emotional toolkits are said to be an effective vehicle for “accessing people’s unspoken feelings and emotional states.” (Sanders 1999)

The emotional toolkit developed for this session was conceptually a simple “storybook,” in keeping with the theme of games and toys. Each participant was given a tabloid-size paper, folded in half. On the outside was a design that hinted at a leather-bound book cover, and on the inside was space to write a story. The design team led the participants by including space for images, drawings, collages, and the text, “in 2010, the game will be…” The workshop participants were sent these storybooks ahead of time and asked to produce something for the upcoming workshop with the research team. As researchers, we assigned the storybook as homework with the intention of saving some time that is better spent working individually, and also to obtain information about the game that had previously not been discussed in a more formal, businesslike setting. We projected the story to be set in the near future in order to make the project more interesting to the participants, which we hoped would increase the likelihood
Figure 5.1: The combined mind map made up of pieces the storytelling toolkit results, connected together as appropriate.
During the workshop, the participants each presented their stories and were allowed to discuss and elaborate on their individual concepts. Afterward, the information from the storybooks was collected, analyzed, and compiled (fig 5.1). The information we received from the storytelling workshop and the emotional toolkit told us several things. First, the results from this workshop indicated that our partners at CODA were very verbal. Their information consisted almost entirely of words, without any illustrations, sketches, photos, or collages. Additionally, the participants spoke at length about each story, summarizing it in many complete sentences without the aid of visual stimulus. We used this knowledge when developing the next workshop of the research process. Second, we learned that it was very important that this game be fun. As far as the CODA representatives were concerned, the educational component of the game could almost take a backseat to fun. It was important to them that the educational component did not seem too obvious, or too central to the game's playability. The CODA participants went so far as to quantify the importance “fun” should maintain within the game's context, suggesting the game be 80% fun, and 20% educational. Third, the game had to somehow incorporate the idea that people with diabetes are always multitasking in order to maintain a successful and healthy lifestyle. The philosophical message the sponsors wished to send was that being able to successfully juggle a life of diet, medication, and exercise is central to successfully living a life with diabetes. They began referring to this as “balance,” and the word would carry through our research through the entire development of the game.
5.3 Generative Research: Second Workshop

The next step we took as a research team was to take the information from the storytelling workshop and use it to inform our process in envisioning the second generative workshop by collecting, organizing, and analyzing our findings, and synthesizing it to determine our next steps. We established the second workshop as a “Strategic Visioning Workshop,” which Sanders defines as a workshop that uses “an assortment of large toolkits to enable a group of people to work together to express their ideas and dreams.” (Sanders 2000) These workshops are devised to allow participants time to work together creating something, which inherently also allows them the opportunity to express themselves and listen to each other’s ideas and dreams in a more connected way. This works to facilitate more effective collaboration between them. Sanders finds that these workshops, when allowing participants to go from a mode of verbal expression to one of visual creation, are always positive and often therapeutic. (Sanders 2000) The participants already know how to express themselves using the toolkits, as it is a simple form of communication, and they enjoy the process of creating something. (Sanders, 2001) In our workshop, we intended to pinpoint what the big ideas were going to be for the game design process by exploring ideas of content and its representation, as well as gameplay and strategy.

The first step we made in preparing for the Strategic Visioning Workshop was to start developing a large game development toolkit. When we began conceptualizing our toolkit, we started by assessing the information we learned from the storytelling workshop. The first thing the research team learned was that our participants’ preferred modes of expression was very verbal, so we decided to use that as the jumping off point for our toolkit. We first brainstormed a series of
word categories that related to games and the type of game we wanted to create: Other Games, Board, Pieces, Mechanics, Randomizer, Context, Decisions + Consequences, Strategy, Goals, and Concepts of Balance. We then brainstormed a series of words that each related to one of the categories. Sanders recommends that words and images be printed as smaller stickers that participants can remove and place as necessary. (Sanders, and William 2001) This is what we did, organizing our lists of words onto a large board, and allowing the participants to select a few words that they responded to from each column and use them as starting points for their groups’ artifacts.

We also decided to include several Velcro-modeling shapes in our toolkit. Velcro-modeling is a system that incorporates abstract Velcro shapes into the research process, allowing participants to create and construct their own responses to the problem at hand. The artifacts created are three-dimensional, but “low-fidelity,” which allows for wider interpretation. (Sanders and William 2001)

“A Velcro-modeling kit will consist of shapes, buttons and other items that are ambiguous in purpose, maximizing the opportunity for people to imagine and impose their own thoughts in the expression of their ideas.” (Sanders and William 2001)

Velcro-modeling is typically picked up once participants have ideas in mind of what they would like to create. They then explore the kit, searching for the appropriate component for their ideas. Sanders states, “it is often the case that people start grabbing pieces and using them intuitively before we can even finish giving the instructions.” (Sanders and William 2001) We had a similar experience with the CODA participants, although it should be noted that
Figure 5.2: The Velcro modeling pieces used in the toolkit

Figure 5.3: Workshop participants selecting from the verbal selection board
the Velcro pieces were mixed in with the rest of the toolkit, and were used concurrently.

Because the research team was developing this game toolkit from scratch, we added some game-related components, both to make things more familiar and comfortable for the participants as well as give substance to some of the more abstract parts of game systems, such as timekeeping devices, randomizers, dice of different sizes, and a very wide variety of small plastic pieces and shapes. Some of these shapes were defined in a specific way, such as inch-tall action figures, animal figures, robot toys, and other inexpensive playing pieces. The remaining components were comprised of small, generic items such as balls, Koosh-style balls, colored cotton balls, abstract game pieces, colored pipe cleaners, bottle caps, sticky notes, and colored paper of different sizes and shapes.

To conduct the Visioning Workshop, we formed three groups of participants, each group being a mixture of participants from the OSU team of researchers and designers, and participants from the staff at CODA who functioned as subject experts, and came from Management, Outreach, and Social Enterprise. This set the groups up with the widest variety of subject knowledge and design experience possible. The groups were given an hour to utilize the toolkit and conceive of some key concepts and ideas for the development of the game. They began by selecting key words from the toolkit to frame their initial exploration and give themselves a starting point for brainstorming and discussion. Using these words as a springboard, they then selected components from the 3-D modeling part of the kit to assemble their artifacts. When the hour was completed, each group had produced a different, yet thoroughly realized game
Figure 5.4: One of the teams collaborating during the workshop

Figure 5.5: The workshop teams, structured for diverse expertise and experience
Figure 5.6: The three game concept artifacts generated in the workshop
theme. As directed, each game theme focused on various aspects of Balance, as it was previously described in the first workshop. Each theme also incorporated ideas from the group regarding what constituted “fun,” and what that meant in the context of an educational game. Each group presented their game themes, after which more in-depth discussions followed among the whole group. The research team collected all game models, kept written notes, and videotaped the whole event for further analysis. Additionally, members of the research team took copious notes, and documented the artifacts created during the workshop.

5.4 Data Analysis

The student researchers reviewed research and process notes, discussed design options, and evaluated the preliminary game themes that emerged after the Strategic Visioning Workshop. We identified two prominent ideas from these three themes. The first was customizable game pieces, which was a big component in two of the three artifacts from the Visioning Workshop. The second was that the mechanics of the game would be based in some way on the idea of living with diabetes by effectively balancing different aspects of life. This idea of balance evolved from the notion of people with diabetes constantly juggling diet, medication and exercise. In doing so, they are attempting to keep in balance. The team focused on these ideas, as well as some smaller components from the artifacts, while condensing the ideas and re-structuring them into effective game solutions. With each team member assigned to specific tasks, we conceptualized two game proposals. The first, which was conceived using a top-down strategy of identifying a major theme or idea and breaking it down into smaller ideas, was based on the popular children’s game, Capture the Flag, but incorporated key aspects from the workshop, including the idea of “staying in
balance” to move forward. The second was conceived more with a bottom-up strategy of synthesizing smaller systems to achieve a grander system, and was based on concepts of power-ups (similar to how video game characters can gain superpowers to alter the gameplay dynamic) and collecting items, something that was incorporated into each of the game artifacts from the workshop and is commonly seen in modern video games. It was based around a balancing function and was set with the theme of Polynesian mythology, with players having to appease the gods to stay in balance, and in turn being rewarded with power-ups based on the pantheon of Polynesian gods. The rest of the research team investigated different ways of conceiving customizable game pieces, and the physical development of a balancing function.

Figure 5.7: The sketches for one of the game proposals during data analysis
In the end, the team members selected the most resonant ideas from these game proposals and incorporated them into the first game prototype. We opted to start with the framework of Capture the Flag, which translated smoothly from the playground to the board. The power-up functions from the second proposal were added into this system, allowing players to gain a useful item when they failed to find their opponent's flag. The references to Polynesian mythology, now out of context, were dropped, which allowed the power-ups to be simplified. We analyzed the proposed balancing function, which we ultimately deemed too complex, and reduced it to its basic concept – that of a bridge that could only be crossed when it was in balance. We re-imagined this not as a technological construct, but an imaginary one, similar to the “Jail” function in Monopoly. And finally, we decided on having the individual playing pieces be customizable, similar to developing an avatar in a digital game.

5.5 Design Development of Paper Prototype

As a team, we decided not to elaborate on the visual appearance and graphic application of the game at this early stage of the development of the game prototype. This was a deliberate decision, based on the perception that people would feel more likely to participate in the game's creation if it had a rough appearance. If the game prototype appeared too finished, it was possible that users could feel their input was too late. Sanders states that unfinished prototypes “invite better feedback and participation in the design process by the design team members, as well as by end-users.” (Sanders 2005) Additionally, when a prototype is relatively rough, it allows for alterations, additions, and edits to be made quickly and without concern, even during testing. (Sanders 2005) With this
project, it was not our intent to focus on visual style, but approach the problem by focusing on strategy and the generation of ideas, which also allows non-visual designers on the team to hold an equal footing with trained visual designers. From CODA’s perspective, this was saving them time and money by not undergoing presentations and revisions of graphics concurrently with the design of the game system. The end result was a prototype that was clear enough for users to understand, but loose enough that there was no particular visual style, and many elements remained hand-made. The tiles of the game board were cut from foam core and applied with a generic decal, and the customizable playing pieces were simply printed on paper and applied to Bristol board. The team felt that some amount of visual design needed to be applied to these pieces in order to make the participants feel that they were playing an actual game. The scenario cards, power-ups, and flags remained hand-written and as “unfinished” as possible. It proved to be quite appropriate for the research. The participants were comfortable in offering changes and additions. One parent, in fact, created new scenario cards during the play testing session itself, which were put into play as soon as they were finished. Game theorist Eric Zimmerman, who has written extensively about games and game systems and mechanics, suggests that when designing a game, it is typical for initial prototypes for the designs to be deliberately left unfinished because they are focused on the game’s rule set that makes up the logic system of the game. Prototypes are meant to test and analyze problems and functions inherent to this system, not problems with graphic, aesthetic, or narrative applications. (Zimmerman 2003, 180) The intent with these initial prototypes is to produce a playable version as quickly as possible, but keep it meaningful for the players. (Zimmerman 2003, 178)
Figure 5.8: The OSU research team building the paper prototype

Figure 5.9: The final paper prototype
Figure 5.10: The body illustrations of the customizable playing pieces
Figure 5.11: The head and backpack illustrations of the customizable playing pieces
5.6 Playtesting Workshop 1

We first tested the game with a set of graduate student colleagues, more as a pilot test than an actual workshop session. We needed it to be clear to people unfamiliar with the system how the system works. Zimmerman suggests that this is a typical and desired approach for applying an iterative process; specifically, “throughout the entire process of design and development… you have as many people as possible play the game.” (Zimmerman 2003, 177) This round of testing unearthed consistency issues and clarity issues within the system of rules we had developed, which were easy to address for the upcoming workshop. We found no fault with the physical design of the prototype, beyond physical limitations with the materials in which it was constructed. We also discovered one other thing during this initial session — when our graduate student colleagues played the game prototype, they played it with all the caution and strategy of two adults playing chess. Their session took almost two hours, mainly due to their cautiousness. This caused us to realize that due to the game’s nature as a strategy game where personal choices have consequences, different people will play the game very differently, depending on their personalities, backgrounds, and personal histories.

Our team continued implementing an iterative design process as we developed our next research workshop with CODA, who in turn assembled a group of families from the game’s target demographic. We had 5 children present to participate, as well as their family members, but ultimately focused our attention on the two oldest who fit within the target audience. One child, Nicole, was 10 years old, and other, Jonathan, was 11. Both children were living with diabetes and came from families where not every member was familiar with the disease. Due
Figure 5.12: An illustrated view of the workshop, featuring players, facilitators, and documentarians/researchers
to the sensitive nature of working with children, CODA arranged and coordinated all administrative details and interaction with the child participants, with the OSU team observing and recording. The workshop was designed to allow children aged 7 to 12, along with their parents, siblings, and other family members, to engage in the creative research process as co-creators. Specifically, as researchers, the OSU team was looking for information that would help determine and refine the play value, complexity, and health management content of the tested concepts. The findings confirmed that the proposed game concept connected emotionally and intellectually with players. The children expressed excitement over building their own character and strategizing moves, and asked to play the game repeatedly. Throughout this process, we were constantly thinking about how these results would inform the creation of our next prototype. Zimmerman suggests that the larger questions that get resolved in this process should allow the designers to focus on this next step, and drive the evolution of the game. (Zimmerman, 178)

5.7 Summary

This chapter covered Exploratory and Generative research methods and how we used them in the CODA project. It also introduced the iterative research process as proposed by Eric Zimmerman. In the next chapter, I will continue with the second half of the development of the CODA project, which encompasses Evaluative research methods and the finalization of the prototype.
Figure 5.13: The process we used in this stage of the research
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CHAPTER 6: REFINEMENT OF THE GAME

The research team continued the development of the game by progressing into an evaluative stage. Although the generative stage of the research process involved a certain amount of evaluative thinking in every step, this next stage was based on evaluation of the existing game concept, design refinement, and production of the final prototype. We used a combination of usability testing, pilot testing, and revision, which culminated in a final playtesting session.

6.1 Usability Testing

Following the success of the Iterative workshops, the group’s involvement in the research and development process became less crucial, and I shifted my focus to revising the physical game prototype and preparing for another level of iterative playtesting. A major deficiency with the first game prototype was the lack of any detailed instructions of any type, i.e., written, codified rules. As the game was constantly being revised in the iterative process, the original rules we had written had quickly become obsolete, and as the revisions continued until the day of the workshop with the CODA participants, we had never revised a new set, and had relied on communicating the game’s rules verbally. So before I made any physical modifications to the game, I set the goal of developing a set of instructions for use with the game. Under the guidance of Bob Hale, a Usability Specialist and Senior Manager of Research & Insights at Resource Interactive, and Lecturer at OSU, I worked to codify the rules we had conceived of and assemble
them into a tangible, written format. In doing so, I worked with Louis Miller from the research team, a fellow graduate student whose maturity and whose experiences as an Art Director and as a classroom teacher had given our team invaluable insight into designing educational tools, putting ourselves in a child’s point of view, and managing the design process.

Miller and I developed two sets of instructions to go along with the game. The first format was designed to use mostly visual aids, similar to the instruction sets found in the games from Hasbro’s Cranium, Inc., and the second format was designed using a mostly written form. The scenario for the usability testing centered on two adults, putting themselves in the shoes of possible parents who are about to play the game with their child for the first time. The focus of the test was to study the clarity and level of gameplay understandability of two formatted instructions for the game rules to adults alone. The testing of gameplay rules with children, which took place verbally during the CODA workshop, was met with considerable success, so we placed our focus entirely on the communication of the aforementioned information in a non-verbal way. The test group we used was comprised of adults representing parents. Our initial assumptions at the onset of the test were that most younger players would not be interested in reading lengthy instructions, and are used to immersive game experiences, getting instant feedback, and self-exploring game environments to find answers and reach goals. We assumed that subjects, even adult subjects, would prefer the instructions with mostly visual aids. We based these assumptions on the idea of “Gamer 4.0,” coined by Karl M. Kapp, author of Gadgets, Games, and Gizmos for Learning. In an interview with Kevin Kruse of e-learningguru.com, Kapp defines the Gamer 4.0 group as children that were born in the early 1990s-2000s, with 1994 as a
Figure 6.1: The visually-based instructions that underwent usability testing.
true, pivotal birth year. He cites Time Magazine’s “Person of the Year” for 1994, “the Internet,” stating that anyone born in 1994 has never known a time without cell phones, video game consoles, or the Internet. The idea of games, through the popularity of video and computer games specifically, has been ingrained into the very way they live their lives, participate in activities and hierarchical structures, and engage in teamwork. (Kapp 2008)

Due to scheduling conflicts and a major holiday weekend, it was difficult to find available participants who were unfamiliar with the game, but we selected two who had never seen or played it before and could easily function as stand-ins for parents of children with diabetes. Our participants were grouped so that they could play the game together. They were given the prototype game and one of the two versions of printed instructions. We asked the participants to think aloud as they studied the instructions and played and explored the game. As investigators, Miller and I observed, recorded, and assessed the understandability and flow of the gameplay communication. The total time of the test was 1 hour and 15 minutes.

The first version of the instructions we gave our subjects was the one with mostly visual aids, and fewer words. Initially, the subjects were attracted to the look of the design of these instructions, and thought the photos included corresponded well to the game pieces in front of them. Their interest in learning the game was heightened based on the visual presentation and the attractive playing pieces. In setting up the game, their reactions were mixed regarding the clarity of the setup details. They were unsure of the placement of their home base tiles and if there was a suggested method for configuring the game board tiles. Additionally, they were confused about how many balance chips should
PRETEST QUESTIONNAIRE

Are you a parent?

- [ ] Yes
- [ ] No

Please rate your level of interest in board games

- [ ] Low
- [ ] Medium
- [ ] High

How often do you play board games?

- [ ] Often
- [ ] Sometimes
- [ ] Never

Please rate your level of experience related to the following:

- Internet usage: low medium high
- Console video games: low medium high
- Virtual reality environments: low medium high

Do you generally read instructions to newly purchased gadgets, devices, or games before using them?

- [ ] Always
- [ ] Sometimes
- [ ] Never
- [ ] Just a quick start guide (if offered)

Please rate your level of knowledge about diabetes.

- [ ] Low
- [ ] Medium
- [ ] High

Figure 6.2: The questionnaire given to usability testing participants
be allocated to each player and how many chips were to be allocated to the balance bridge at the beginning of the game. The participants were struggling to move forward with the game, and we made the decision to switch to the second instructional format without completing testing of the first format. The more verbal format, which was much more thorough, was initially pleasing for the subjects, but that positive experience did not last. After following along, they felt that this set of instructions assumed the player already knew the basics of gameplay and setup, that it was not clear at what point players should do certain things, and that key elements, such as the purpose of the flag, were either left out or mentioned off-hand. One participant went so far as to say, “at this point, I would just make up rules.”

According to Stacey Purpura, research scientist and Research Director at Netflix, it is important to keep in mind that usability research has no correlation to how likeable the object of focus is for the participants, as it is meant strictly to help the designer make decisions about functionality revisions. (Purpura 2003, 67) Throughout the duration of the session, Miller and I had to intervene a few times to get our subjects back on the right track, as the instructions served to stifle gameplay. As the focus of usability research is based on the participants’ interaction with the product in as much depth as possible, it is important that they remain uninterrupted until the completion of the task.

**Figure 6.3: A diagram of the usability testing session**
Our subjects were also not seeing some of the information that was actually there, as their frustration had served to shut down their intuition. Additionally, they wanted to “get it right,” but neither set of instructions allowed for that. Ultimately, the game rules needed to be simplified much more. The visual instructions were preferred, but required more information from the

Figure 6.4: A depiction of the usability testing session in comic strip format

(Purpura 2003, 67)
written instructions in order to serve their appropriate function. Specifically, we highlighted several areas that needed serious revision, but the challenge remained to distill the instructions and present them in a clear and interesting way.

6.2 Pilot Testing

All parties involved in the development of the game recognized a prime situation for testing the playability and informative ability of the game; specifically, Camp Hamwi, a summer camp for children with diabetes run by CODA. Camp Hamwi had a definitive start and end date, which meant I had a production deadline. This session would also re-introduce the sensitive nature of working directly with children. Darlene Honigford at CODA volunteered her counseling staff to run the research sessions, which eliminated the University’s need for approval by the Internal Review Board, which required that I train the counseling staff to act as researchers on my behalf, to ensure successful data collection. The counseling staff would not just be teaching the campers how to play the game, but collecting data while they observe the gaming sessions. In addition to the game and its instructions, I developed a set of training materials for the counselors, including a session checklist, procedural description, and a set of guidelines for running this type of research session. I also put together workbooks for the counselors to facilitate and direct their note taking, and to stand in for an interview or session recap, as I would not be able to be present due to the spontaneity of the gaming sessions.

The issues with the game’s instructions made it clear that I needed to perform a pilot test of this training workshop to ensure the most effective session. Sanders recommends using this method to ensure that things on paper are also
clear when spoken aloud. It is important that the information is as clear, direct, and understandable as possible, because it is very possible and likely that the participants are not used to conducting research. She also states that it almost always requires the revision of materials and tools. (Sanders and William 2001)

I designed my pilot test to introduce the project and its overall scope and purpose to the counselors, to give them as much contextual information about the game as possible. It then introduced them to design research, especially participatory design and the idea of the user as co-designer. This was to let them know how the game prototype was produced. Finally, I developed an explanation for the counselors as to why I needed their help, and what help I needed from them. I then would walk them though the process of introducing...
Sanders recommends that researchers approximate the conditions of their research as much as possible for a pilot test. (Sanders and William 2001) Because of this, I selected participants for my pilot test that were of similar ages to the counselors at Camp Hamwi, and who had experience working with children. All of the participants were graduate students in OSU’s School of Music, and all of them had noteworthy experience as summer camp counselors, with additional teaching experience in the game’s target demographic. None of them had any experience using the game.

At the conclusion of the pilot test, the participants felt the basic steps of the game were easy to understand, including the concept of balance and the game’s “battle mode.” They felt that the nature of the game would require counselors to “learn as they go.” The participants were curious about the board tiles they did not get the chance to turn over, and if not knowing what is under those tiles would cause problems for them facilitating the gaming session. The participants felt that the first Conversation Guide questions regarding the understanding of the game should be broken down more. For instance, offering specific areas of gameplay for the counselors to comment on, rather than speaking holistically about the game. They also felt that there was a lot of steps for each player’s turn, which was counter-intuitive compared to traditional games. The idea of moving three Avatar Pawns seemed different to the participants, like there were too many moves per turn, and there was too much strategic information to keep track of. One participant had a hard time keeping track of which Avatar Pawn belonged to which player, and they collectively suggested that I somehow mark the Avatar
Pawns by color, or by theme. The participants also felt that for the purposes of the testing session, it would be critical to have someone facilitate the session and walk the campers through the game. Regarding gameplay, the participants felt it was too easy to balance the Balance Bridge, but recognized that this would require the right balance of Scenario Cards to alter the Balance Bridge's dynamic. They also believed the Scenario Cards might be more effective if sometimes they were more devastating, altering gameplay more seriously. Finally, they suggested that the inclusion of leveled instructions might be beneficial.

6.3 Construction of Revised Prototype

With the usability research complete, I tasked myself with creating a new game prototype for the upcoming research session, based on the results of the previous research sessions. The number of participants possible for the upcoming research group was promised to be large enough to require the creation of four tangible game prototypes, which would be kept at CODA's Camp Hamwi for the duration of their summer camp sessions, and played on rainy days and during scheduled activity times. I decided that further, smaller tests could be implemented, and I devised a system for creating two versions of the second prototype with minor differences. I analyzed the elements of the game that players responded to positively and refined them to reflect minor stylistic changes, such as the aesthetic design of the characters and the playing pieces, which were taken in two different directions. Citing the players' positive reactions to the customizable pieces, that concept was developed further with prototype version 2.1, and prototype version 2.2 centered around the idea suggested by participants in the pilot test session that each player would have a theme, consisting of a specific terrain and the control of corresponding pieces, using the themes of ice, sand, grass, and water.
The original prototype's paper and cardboard construction, although beneficial in the research process, would not logically hold up to repeated play sessions at a summer camp. The second prototype needed to have all the functionality of the previous one, but be designed to be much more durable. I involved my colleague Robert Strouse, an industrial designer, fellow graduate student, and a former project manager for the creation of museum displays, and after a brief discussion on the functionality of the game pieces, he quickly devised a production system involving laser-cut acrylic, applied decals, and acrylic-welded pieces as needed. We facilitated this with the help of our graduate student colleague Annie Abell, an industrial designer and engineer whose connections with the staff at Priority Designs allowed us access to their prototyping lab, where we spent two days cutting and assembling the acrylic pieces. The customizable playing pieces consisted of bodies with snap-on heads, bases on which to stand, and “backpack” units that were usually some sort of wings or additional arms for the characters. The game's scenario cards were typed up for increased legibility, and applied as decals to water-resistant flashcards. The dice were constructed from wooden blocks with hand-written numbers, and the instructions were extensively revised and re-formatted based on the results of the usability testing, and printed as color booklets. Finally, the entire game packages were collected into durable plastic tubs with handles, which were color-coded by version type. The game was given the working title, “Balance of Power,” to add an air of authenticity for the players.

6.4 Playtesting Workshop 3

The training workshop for the counseling staff at Camp Hamwi was scheduled during their staff training days. The staff training was comprised of two
Figure 6.6: One of the revised Avatar Pawns and production sketch
full days of training for medical situations, emotional counseling training, and the nature of working with children in a scheduled environment. Our training workshop was the last activity during this two-day session. I arrived at the camp to find the training sessions running behind schedule, and set myself up in the lodge area. I found that the participants were not very attentive, putting their heads on the tables and striking up secondary conversations within the first two minutes of my introduction. To me, they clearly seemed exhausted after two days of meetings and paperwork. It was also a hot, July day, and the lodge we were in was open to the outdoors and quite humid. On the spot, I shortened my introduction to the game and to participatory design, while still making sure to mention the major points, such as why I needed their help, and what the object of the game was. It was apparent to me that the staff was not interested in hearing a presentation, and wanted to get down to business with the game.

At my request, the camp staffers split themselves into four different groups. I gave each group a game prototype, either prototype 2.1 or 2.2. Two of these groups played the game to its conclusion with some guidance by me, and the other two became frustrated and gave up, despite my attempts to facilitate. Of the two groups that gave up, one group chose not to go over the rules, opting instead to cheat their way through the game. This made for a difficult gameplay session for them from the very beginning, as their methods of cheating were not based on any known system of rules, but rather devised based on a desire to be finished as quickly as possible. Raph Koster states that players often have no ethical quandary for cheating in games, as it is a natural instinct and a sign of lateral thinking, an important survival skill. He cites an old war adage, “if you cannot choose the battle, at least choose the battlefield.” Successful cheating implies that
the player thoroughly understands the game’s system. (Koster 2005, 112) My group of Camp Hamwi counselors did not understand the game’s system, however, so their cheating attempts only served to stall gameplay even further. Upon learning this, I attempted to make light of the situation, and suggested that since they had just started and didn’t have anything invested in the game, they should attempt to play the game again, but they opted to chat amongst themselves instead. The second team that gave up simply lost interest in learning a new game and opted to converse at their table and wait for the session to be over.

Of the two teams that played the game to conclusion, their participants seemed to be more methodically-minded and had individuals who naturally fell into leadership roles and were sincerely interested in learning how to play. Also, these teams were less open to the option of changing the gameplay to suit the situation. When I suggested that every player take 6 of each Balance Chips instead of 3 as a way of smoothing over a gameplay bump, they seemed to struggle with the idea that I (and they) could simply alter these game rules on the fly. Generally speaking, they seemed more reverential toward the game pieces and game system, and seemed hesitant to make minor changes to allow for a smoother gaming experience.

The biggest complaint from all four groups was that the game pieces slid around constantly on the slick plastic tables of the lodge, due to their construction from smooth acrylic. Some group members felt that the rules were too complicated for children to grasp, while other felt that they were too simplified. Additionally, one staffer felt the game’s pieces were insensitive to gender differences, as the female princess pieces conformed to the same body shape, while
their male counterparts, knights, conformed to the same body shape but with differing color options, but with different helmets as well as different color options. Similar to the results of the pilot test, almost all of the staffers had a problem with having three players on the board at a time.

Even with the heavy editing I did, the instructions remained the biggest stumbling block with this game. Some participants felt the instructions were too lengthy or complicated, while others felt they were too vague and simplified. One participant in particular had a question on where they were allowed to place home base tiles, as the instructions did not specify a specific location. I clarified that this decision was left open to the player, who questioned the strategic rationale behind placing it closer to or further from the Balance Bridge. I informed the player that gameplay will be different for each gaming session, regardless of the arrangement of home base tiles, and was met with some hesitation. This was not the first time I had been asked this question by a player, and my intuition suggests that these players feel there is some piece of information that I am withholding from them, that there is a hidden complication that is not being communicated. I have a suspicion that these players are the same ones who feel the game rules are overly complicated, as the formerly mentioned participant seemed to recognize that certain absences of specific information would yield a broad range of possibilities, implying a large potential for strategy.

The camp counselors would not be testing the game prototypes for at least a week after the training sessions, which gave me time to make several more alterations to them. The production of the game components, despite minor issues such as pieces that were intended to snap together but did not do so effectively, or
game tiles that slid on plastic tables, remained as-is, as I had neither the time nor the resources to create them anew. The other issues revolved around gameplay, rules, and the instructions, which was where I focused my revising time. Despite our original success with the CODA playtesting workshop, I altered the game’s dynamic from each player controlling three Avatar Pawns to one where each player controlled one Avatar Pawn. Conceptually, this allows for a broader range of gameplay, from one-on-one to four-on-four games to games where up to 12 players can be involved, playing as teams. This was the largest change to the instructions, and I feel that the game makes more sense because of it. Adults seemed to have the most difficulty grasping the concept of one player controlling three pieces, so if this revision works to help alleviate that difficulty, it will be a smoother game, overall. Additionally, I made minor additions and revisions to the game instructions, which worked relatively well, but were simply incomplete or deficient in a few key areas.

As planned, the counseling staff played the game with campers during several key activity times during two different camp sessions. The counselors filled out the facilitator workbooks, summarizing the results of their gaming sessions with their campers. Generally, the game was met with positive reactions, with several children expressing interest in purchasing it for future gaming sessions, implying they having fun engaging with the game, if not learning or growing in awareness of the subject matter. Confusion arose about the Balance Bridge’s secondary functions as a playable space, and the amount of strategy being used during gameplay. Players consistently did not understand the purpose of the Stepping Stones power-up, which has been consistent in every version of the game and was recommended be excluded from any future versions. The
campers’ positive reactions and experiences centered on the game as a whole, its focus on Diabetes, the customizable Avatar Pawns, and the capturing of the flag. Their negative reactions and experiences centered on structural details, such as the sliding game tiles, and the act of searching for their opponents’ flags. One counselor felt as though the game required more time than they were able to allot, and that the game’s purpose was still relatively unfocused, but campers seemed to be having fun with the game through all gaming sessions. All counselors seemed to agree that one hour was about the appropriate length for gameplay, as the games that were longer than that tended to lose players’ interest at about the hour point. Of the two prototype versions, one player of prototype 2.1 kept looking at prototype 2.2, thinking 2.2 looked more interesting, while three players of 2.2 came and joined the session for 2.1 and enjoyed it more than 2.2. As the gameplay was not different, I can only assume the more pleasing experience was based either on the aesthetic differences in the game, or perhaps the other group of players and their overall experience. Most counselors, as game facilitators, elected not to use the Stepping Stones component in subsequent rounds of gameplay, which they felt made for a more engaging experience. Additionally, they used a simpler form of gameplay with fewer board tiles and one Avatar Pawn per player, with no teams. The remainder of comments and suggestions culled from the facilitator workbooks were focused on construction of the game pieces, suggesting Velcro or magnets to keep the customizable pieces intact.

6.5 Summary

I was met with what I sensed to be a lot of unnecessary hostility during the most recent playtesting workshop and training session, and I did not sense that it all stemmed from the game itself. It was very hot and humid in the lodge, one
of the hottest days of the summer, and the counseling staff was at the end of their second day of training. The conditions were not conducive to an effective learning environment, and even I found it hard to concentrate. While I was waiting for the staff to arrive, I heard comments from the ones that were already present that they did not want to be sitting in the lodge for another 90 minutes, and they were not happy they had to be in training until 9:00 p.m. The counselors were clearly hot and tired and seemed as though they would rather be swimming or taking naps or resting, which several of them had cut short to attend my session. Also, within the first two minutes of my presentation, they were already conversing among themselves about unrelated topics. These results indicate to me that my problems lay in the planning and organization of the research session. Our environment was clearly a factor in this experience, and I believe it affected the participants’ opinions and experiences, to a detrimental extent. I clearly did not approximate my test conditions as much as possible with my original pilot test, as Sanders suggests, but without knowing the specifics of the workshop, it was impossible to create an accurate simulation of the environment. (Sanders and William 2001) Additionally, I feel that the participants and facilitators focused too much on the deficiencies of the construction of the prototype. As Sanders suggests that rougher prototypes yield results that are more focused on concept and less on the final product, I feel that the use of Acrylic and more realized graphics when producing this game may have made for a more engaging experience for the players, but may have been detrimental to the gathering of research data. (Sanders 2005) I do feel that it was necessary that the game be durable enough to withstand repeated gaming sessions at an outdoor activity-based summer camp, something that could not have been successfully done with the original prototype, but perhaps there is another form of construction that could accomplish both goals.
Additionally, it seems as though the adult players are the ones who have a harder time being patient with the game’s strategic system. They tend to skip chunks of directions, or jump to conclusions regarding aspects of gameplay. In the training session with the staff of Camp Hamwi, this may have been subdued by having other facilitators with me to guide the staff as they learned to play the game. As it was, I was spending approximately five minutes at each table before rotating to the next, and although I could answer lots of questions during those five minutes, that left approximately fifteen minutes in between where the staff members were left to their own devices. One of the most frequent comments I see from adult players is that they almost always think the game is going to be too hard, long, complicated, or intellectual for kids to understand. The results from my sessions with children in the target demographic seem to indicate almost the opposite. I believe this may say something not about the game, but more about how adults see children, and children’s abilities to grasp complex systems.
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CHAPTER 7: SUMMARY OF FINDINGS AND LESSONS LEARNED

This chapter will summarize my findings from the game, and illustrate the various lessons I have learned throughout the process. My research team concluded, following several rounds of testing and iterative design, that this game was successful in introducing and familiarizing players with the process of diabetes management and engaging for the children playing it. It is also a step forward in educational board game design, which I will illustrate by summarizing the findings in relation to the case I made for educational games in Chapter 2.

7.1 Findings Regarding Games

First, by Raph Koster’s definition of games, introduced in Chapter 2, the very fact that we produced a game means that on the most basic level, education and learning are involved, due to the need for players to learn rule systems. We left behind the archaic concepts of educational games being based on “rote memorization and behaviorist conditioning,” in order to follow a more streamlined, systematically-considered process of conceiving the game. When designing the game, one of the thoughts that we kept forefront in our mind was that first and foremost, the game had to work. If the game was functional, then the fun would somehow follow. This is in line with Eric Zimmerman’s proposal that the entertainment one gets from playing a game comes from the interaction between the player and the game’s system of rules and fictions. The “fun” will follow if the system in place is functional.
Our game is based on the idea of engaging in a rule-based system in a social environment, which my research indicates is what draws people to games in the first place. Diabetes management itself is based on a system of rules, and although those rules are different for different people, depending on type of diabetes, age, lifestyle, and many other variables, it can be condensed into the idea of keeping the body in balance by adjusting diet, medication, and exercise. This system of rules became the central focus of the game’s rule system. By engaging this system of rules, our game is intellectually active, although physically only minimally active. But by playing on teams or independently against one another, the players are engaging in a social situation, as well. This defines the game’s place on Elise Woolley’s Funtinuum, proving that it, and other, similar games, is definitely a “fun” activity.

Our game falls within the definition of endogenous games, which, as Brian Winn and Carrie Heeter define it, incorporates the learning aspect into the actual mechanics of the game. We used an altered form of the existing game concept of Capture the Flag as the basis for the game, primarily because it gave us a means to deliver the learning content. This content consisted of proposing situations based on diabetes and its maintenance and defining appropriate consequences, giving players the option to address each situation independently, with appropriate choices being rewarded with progress and inappropriate choices resulting in similarly inappropriate repercussions (fig. 7.1).

Although it is a competitive strategy game, our game also relies on the notion of community and that poor choices can affect all people involved in the situation, whereas good choices can promote progress and give the player
freedom to make bigger choices and attempt to reach more goals. This notion of interactivity is what makes a game unique, and the consequences that its players experience are bound by the idea of “feedback,” which Michael Smith and Jeffery Wilhelm feel allows games to deserve future exploration as educational tools. These consequences define the players’ experiences, and the players’ experiences drive the narrative of the game, but the educational component is built into the structure of the game’s rule system.

As each game session concluded, I found it easier to see that the players truly understood what they were doing as they played. They understood the rules, and they understood how to work within the system and progress toward winning. According to the feedback from test subjects, the game succeeded in being fun, but also functions in an educational capacity, due to its rule system effectively

Figure 7.1: The final CODA game’s Scenario Cards. LEFT: “You played video games instead of going for a walk (minus one exercise point).” RIGHT: “You forgot to test your blood glucose level all day today (minus one medication point).”
representing the diabetic's need to stay “in balance.” Its stand-alone playability has proven to be engaging, and the system in place has proven to be an effective, simplified simulation of the process of diabetes management and its emotional and physical ramifications. There is nothing inherent to the game that directly tells players in words or pictures what diabetes is, how diabetes works, or how people choose to live with the disease. What it does is propose various scenarios, and through choices, consequences, and a small amount of randomization, simplifies and illustrates the process people with diabetes must go through on a daily basis in order to live their lives in the most efficient way possible. When using the game for diabetes awareness, this could be enough, especially for some players. However, I feel that the game would be most appropriately used with a parent, teacher, or care provider functioning as a facilitator who can ask questions or incorporate a discussion at the game’s conclusion to assess and assist the players’ understanding of diabetes management. When combined with some form of educational guidance, such as annotated gameplay facilitation, discussion, or post-game reflection, the CODA game can be an impactful tool for promoting the understanding of how people with diabetes must live in order to manage their disease. Without this, the game would simply be a fun game to play. This was in line with CODA’s original aims, to design a game that could be played and enjoyed on its own merits, with the educational component coming to the forefront as needed. This is in line with Grant Wiggins and Jay McTighe’s notion of “knowing” versus “understanding.”

We did not set out with the goal of teaching people what diabetes is, but rather, to educate and promote awareness of how it affects people. By Raph Koster’s analysis of the brain’s “chunking” of data, games are not intended to present facts
and figures for people to know. They are designed as systems to be understood, so their delivery of information must be appropriate to this concept. For this reason, it was more important to us that the players understand how diabetes affects people than to know facts about diabetes. Wiggins and McTighe propose that “understanding” is a lasting result, something that can be applied in a broader context. Although people experienced with diabetes will likely not learn anything new about their own disease, this game is designed more for children who do not fully understand the system yet, as well as their friends and family members who may not understand it at all.

My fellow researchers and I concluded, following evaluation, that the CODA game prototype achieved the original goals of the study by introducing and familiarizing players with the process of diabetes management and creating an engaging experience for the children playing it. Its educational component was subdued when played for fun, and forefront if used as part of a larger learning environment. The iterative process we used provided multiple stages for the evaluation, analysis and development of the design process of the board game, illustrating that to design a game, designers must constantly revise and evaluate until the final product functions effectively, a widely accepted notion in other areas of product design. The CODA game is a step forward in educational board game design, and provides an example of how analyzing the strengths and limitations of games can be utilized to create an engaging, fun product that is educational.

7.2 The Final CODA Board Game Prototype

The game prototype we ultimately designed, which we gave the working title of Balance of Power, is an educational board game designed for children
Figure 7.2: The final CODA game prototype

aged 7-12 who are living with diabetes (fig. 7.2). It is also targeted at their friends, family members, and caregivers. Playing the game will help all of them understand the fundamental concepts behind the management skills necessary to balance diet, medication, and exercise in order to live with diabetes. The game board is modular in order to support unique qualities for various play strategies that juxtapose real life situations with fun and engaging game interactions. The game is entirely player-driven, requiring no facilitator, but is designed so that educational facilitation is possible in order to explain how the game functions relate to
managing diabetes. It is designed to be inclusive, with different levels of complexity and game length, depending on the age or abilities of the individual players. The Central Ohio Diabetes Association (CODA) of Columbus, OH, sponsored the project, with the original intent to implement its production as a new enterprise project. It should be noted that CODA will not be able to see the project, nor several others, through to its conclusion due to necessary budget cuts stemming from the current slow economy.

### 7.3 The Game Design Model

The model I developed (fig. 7.3) in researching and creating the final prototype for the game can be condensed into four parts: Data Gathering, Creative, Testing and Evaluation, and Prototype. Each part has a set of processes borrowing from different forms of design research and generation. When it is compared to other models of design and research, it becomes clear that each step in the game design model incorporates different types of research methods. It should not be seen as a step-by-step system, but rather, as a fluid, organic structure that can be applied to the research and development of educational board games.

#### 7.3.1 Data Gathering

The first step in this process is Data Gathering. I began with background research, consisting of interviews and meetings with content experts; in this case, CODA staff. I followed this up by forming a research team, and as a team we performed a literature review, to familiarize ourselves with the subject matter of diabetes well enough to make informed creative decisions. I followed this with generative research workshops in order to use the method of co-creation to generate artifacts to aid us in the creation process and allow multiple people to
create, offer input, and participate in the design process. The research team then analyzed all the data collected from this research and used it to conceptualize ideas we could incorporate into the workable game concept.

### 7.3.2 Creative

After reviewing the data (co-creation artifacts, notes, videos, and game ideas), our team distilled these research ideas into one workable game concept that
encompassed all of the important points discussed and incorporated it all into a solid, playable game. We developed a prototype in paper and gator board, keeping design elements simple to encourage more input from any and all participants. Our time was spent determining the intricacies of the game’s rules and establishing and editing its relationship to the management of diabetes.

7.3.3 Testing and Evaluation

We then sent this came concept through an iterative process of playtesting and revision until we gathered enough data to determine the best approach for designing a working prototype. Additionally, it was imperative to perform usability testing on various components; in our case, the game’s instructions. Due to their nature as a somewhat separate system from the game itself, it was impossible to maintain their fluidity and accessibility along with the game, as doing so would have impeded the game design process. On completion and successful revision, the game prototype was ready to undergo pilot testing with a group of participants standing in for the participants at the final testing workshop.

7.3.4 Prototype

Following this session, the prototype was finalized, this time in durable materials such as plexiglass, wood, and plastic in order to survive weeks of use at a summer camp. The game graphics were refined much further to create a more stimulating experience for the players, although they were still not completely finalized, and the game’s proposed implementation was slightly revised. The final prototype was then tested with a large group of participants.
73.5 In relation to other models

Bruce Hanington, chair of the Industrial Design program at Carnegie Mellon University, has proposed a simple, three-part model for design research (fig. 7.4). My proposed model fits within Hanington’s Explore/Generate/Evaluate model quite easily (fig. 7.5). Hanington’s model is meant to “structure projects in design education, with relevant connections to design practice.” (Hanington 2007) Each section of my model overlaps two of Hanington’s areas, so no section is truly Exploratory, Generative, or Evaluative. I employ the use of Hanington’s primary and secondary colors to show this. Research, for example, combines mainly Exploratory and Generative approaches. Creative and Testing both combine Generative and Evaluative approaches. Finally, the development of the final prototype resulted in the evaluation of the results we had achieved and application of that information.

This model also aligns with Carolina Gill’s model of the design process. Gill’s model was put together for a class she developed for The Ohio State University Department of Industrial, Interior, and Visual Communication Design (fig. 7.6). The class, Design 230, is designed to teach design thinking and development processes to students who are not in the design major. Similar to the relationship with Hanington, I use color to show how the processes are similar (fig. 7.7). Gill’s model even includes a representation of the iterative process.

These models of research are similar, and they all work, because of their natural flexibility. Hanington states that in his model in particular, the sequence of the areas is by no means intended to be implemented linearly and
Figure 1: Model of design research

Within exploratory research, students will conduct surveys and questionnaires, observe and talk to people, shop for and try products. Methods are typically ethnographic in nature, and may include participant observation, artifact analysis, photo and diary studies, contextual inquiry, cultural probes, and other methods designed to sample human experience. Exploratory research culminates in a comprehensive understanding of the people and the territory under investigation, and ideally results in implications for design.

Generative research opportunities are set by the exploratory phase, and may include similar methods. Certainly a continued emphasis on empathy for users is encouraged, and any means to this end are supported. Diaries, with or without a photographic or imaging component, may be favored and are often issued as an advance probe or instrument to sensitize participants to the topic area and prepare them for participatory exercises. Participatory methods will include toolkits such as card sorting with images or text, collages, cognitive mapping or other diagramming exercises, experience drawing, and flexible modeling, or Velcro modeling. Participatory design methods may also include co-design activities, a collaborative design process between user and designer (Sanders, 2000).

Generative research is further distinguished between projective and constructive methods (Figure 2). Early exercises are typically projective in nature, focusing on expressive exercises enabling participants to articulate thoughts, feelings, and desires that are difficult to communicate through more conventional verbal means. Furthermore, the creation of an artifact around which a participant may talk will act as a trigger for engaged and comfortable conversation. Projective methods are typically ambiguously instructed, and will include the creative range of collage, drawing, diagramming, image and text based exercises. Constructive methods such as flexible modeling will occur as a later means of concept development, once some concrete parameters are set for product ideation. The key in developing a kit of parts for exercises such as Velcro modeling is to have

Figure 7.5: Hanington’s model of design research (Hanington 2007)

Figure 7.6: How the proposed model from this study compares to Hanington’s model
Figure 7.7: Gill's model of the design process

Figure 7.8: How the proposed model from this study compares to Gill's model
systematically, but flexibly across all stages of research and design. His model deliberately overlaps the three areas, as well, as this is more typical of a designer’s process when applied in practice. There are no “start and stop points” telling a designer where one stage ends and the other begins. (Hanington 2007) Gill’s model is meant to be read similarly, as is mine, as the flexibility and fluidity of this process is inherent to design.
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CHAPTER 8: CONCLUSION

In this study, I have compiled and leveraged several methods of design research to develop a methodology for designing educational board games. The results of this study can be broadly applied within the design field, and I believe that this could culminate in a more widely valued and accepted method for approaching educational tools. The experiences from the design process of my case study can be further used to inform the design of educational board games, but it is my hope that the same process can be adapted to fit the design process for other educational games, educational toys, or even more broadly, the way people conceive of education and curriculum development as a whole. As media evolves, our application of it must also evolve in order to maintain relevance, accessibility, and usability.

When we ask why the educational games we have seen in the past have not been as successful as they could be, perhaps the answer is that they were not designed using a method that is appropriate to what they are. As “edutainment,” they are meant to educate by stimulating their user in a way unseen in typical learning environments. Games, however, are inherently learning environments, as Raph Koster points out. To play a game, one must learn a new system and engage with it, thus testing any newfound knowledge and allowing players to course-correct and fix errors in their judgment. The problem is most likely that designers of educational board games must keep in mind the limitations that
games have, and understand where other educational games fail. The learning
and fun come hand-in-hand, as they are both part of the game's system of rules.
If the educational component is a part of the game's rules, then the learning will
come naturally, and the game will likely be able to be classified as “fun.” One
can conclude that the success of educational games depends largely on what
type of information is being disseminated through the game, and whether that
information is appropriate for utilizing the medium of games. If a subject is more
appropriately disseminated through other media, there may not be any reason to
design a game. For example, because the learning inherently involved with game
playing is naturally a part of the game's rule system, subject matter that consists
largely of facts and figures may not be appropriate, specifically if the learning goal
is to have players remember this information. The design of game systems requires
the players to understand and engage in rule systems, physically interactive
systems, and socially interactive systems. If the information to be presented does
not fit into this vehicle for delivery, perhaps a different dissemination medium
should be considered.

As Donald Norman relates, people will not know how to design
revolutionary products correctly the first time. As stated in Chapter 1, the
prevailing wisdom is that educational games are bound to fail because they can
be neither educational nor fun without sacrificing something from each, but the
application of this methodology could change this opinion. Through the case
study of the CODA game, I have developed and proposed a research methodology
that I feel can not only guide people in designing fun, effective educational board
games, but could perhaps be extrapolated to assist people in designing educational
video games, educational toys, interactive educational media, or simply innovative
school curricula. Now that this design research methodology has been established, it can be used, evaluated, altered, applied to frameworks to develop other educational board games, and perhaps extrapolated to fit all potential forms of learning tools.

“We found the design research process enormously helpful. Erik and his team enabled us to address our biggest challenge; development of an engaging, entertaining game that was attractive to our target audience, without abandoning the educational component. Previous drafts (designed prior to our engagement with Erik and his team) were cumbersome and lopsided, and did a poor job of balancing playability with educational content.” —Sean McGee

8.1 Future Work

The future applications of this research have the potential to follow different paths. Development of educational games is an ongoing interest in the communities of design and education, and this model could be applied to assist and augment their development processes. The structure of the model and the nature of the game design theory cited could be apply to a broader field of design, such as the design process of educational video and computer games—in fact, this could prove to be be a very useful application. With some alteration, the model also has the potential to inform the design of other educational materials, including interactive educational toys and multimedia-based lesson plans and teaching tools. My personal research interests are focused more on the design of tools for educating, training, and communicating complex information than they are on games in particular, so I will explore more deeply and thoroughly in my future research applications.


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APPENDIX A: USABILITY TESTING MATERIALS
INTRODUCTION

Game design requires designers to keep the interests and needs of the target players foremost in mind. In the case of the board game that is the subject of this usability test, the main audience is young (ages 7–12), is of a generation termed Gamer 4.0 (having grown up with high-end console video gaming), and is learning to live with diabetes. The age, reading level, and generational habits of these players make the communication of the instructions of a board game a challenge. Because of virtual gaming environments, these players have developed their own method of learning the rules of a game by exploring through trial and error rather than reading an instruction manual. This kind of play is appropriate in a screen based, virtual reality game, but its appropriateness quickly dissolves when applied to a board game.

Parents are the secondary audience and target of this game’s instruction design. The learning habits of this generation will be different than the primary audience. However, it is not safe to say that this user will be willing to read instructions, either. There are fast-paced societal effects on everyone, and it seems that modern day people have turned away from instruction manuals, as evidenced by the “quick start guides” that ship with electronic devices alongside the main instruction manuals.

Instructions to a board game must rely on two methods of communication. The first is a verbal explanation by someone who has played the game and knows the rules. The second method is by reading the instructions on a box cover or insert. Of these two methods, the latter is logically the concern of the game designer and is the focus of this usability test.
TESTING GOALS
The reason for this test is to assess the level of game play understandability that players exhibit by having learned the rules through reading. It is assumed by the designers of this game that communication will be enhanced and be more successful with the inclusion of graphics and diagrammatic illustrations. This assumption will be tested by employing one version of the rules that is mostly text and one version that is visually supported with graphics.

MATERIALS
Materials for the test will include the following:

Prototype game board and pieces
Printed instruction pages
Recording device (video, audio)

DATA COLLECTION METHODS
The scenario for this test will center on two parents who are about to play the game with their child for the first time. The focus for this test is on the communication of the rules to adults alone. The testing of game play rules with children has taken place with considerable success. The rules were communicated verbally. A test of printed delivery (similar to this test with adults) will be set for a future date, projected to be at the Central Ohio Diabetes Association’s Camp Hamwi during summer of 2008.
The participants in this test will be in groups of two so that they may play the game together. They will be given the prototype game and one of the two versions of printed instructions. The investigators will observe, record, and assess the understandability and flow of game play communication. The following information will be collected from observing participants and collecting their feedback:

- Observations and comments about the clarity of instructions
- Success of participants in playing through the game mechanics
- Time needed to read and understand game play
- Anytime that confusion occurred
- Any positive or critical statements regarding game play or instructions
PROCEDURE

The test will consist of the following procedures and actions by participants:

- Introduction
- Sign a consent form and/or non-disclosure form (if required)
- Complete a pre-test questionnaire
- Scenario (reading instructions, game play)
- Complete a usability questionnaire
- Follow-up discussion

The participants will receive a short, verbal introduction and an orientation to the test plan. This will explain the purpose of the test and state that the product (instructions and game play) is what is being tested not the participants’ performance. The participants will be informed that they are being observed, as well as audio and videotaped.

Participants will be asked to fill out a pre-test questionnaire which establishes their experience with children and play (if they are parents), their frequency and interest in playing board games, and their familiarity with diabetes. They will be asked whether they think the game looks easy to learn and/or appealing.

The performance test will consist of the basic task of the players reading the instructions to each other and then attempting to play the game to a point when basic game play mechanics have been accomplished once.

During the testing, elapsed time and any confusion of game play and what to do next will be noted. Participant comments and behavior will be recorded.
At the conclusion of the test session, the participants will be asked to fill out a brief questionnaire regarding their understanding of the game, the usability of the instructions and game design elements, and their opinion of the game in general.

After the questionnaire period, the participants will be thanked for their involvement and released.
TEST ENVIRONMENT AND EQUIPMENT REQUIREMENTS

- A space with ample room for observing and video taping
- A table that offers easy access by players to all game elements
- Prototype game
- Recording devices
- Scripts, questionnaires, forms

GUIDELINES FOR MONITORING

Observers will maintain an attitude of no vested interest in the results of the test. The game will be presented neutrally. Participants will not be coached or prevented from making mistakes. The testing session will be kept as a relaxed atmosphere. The “thinking aloud” technique will be explained prior to game play and will be encouraged so that observers can know what the players are thinking as they interact with the prototype.

The testing time will not be used to fix problems in game play that may arise. Participants can be asked how they would like an instruction to read or how they would like a rule in the game to be adjusted. Assistance will be offered if participants are confused to the point where play has stopped or cannot continue.
PRETEST QUESTIONNAIRE

Are you a parent?

☐ Yes  ☐ No

Please rate your level of interest in board games

☐ Low  ☐ Medium  ☐ High

How often do you play board games?

☐ Often  ☐ Sometimes  ☐ Never

Please rate your level of experience related to the following:

Internet usage:  low  medium  high
Console video games:  low  medium  high
Virtual reality environments:  low  medium  high

Do you generally read instructions to newly purchased gadgets, devices, or games before using them?

☐ Always  ☐ Sometimes  ☐ Never  ☐ Just a quick start guide (if offered)

Please rate your level of knowledge about diabetes.

☐ Low  ☐ Medium  ☐ High
Hello.

Thank you for participating in our usability study. My name is Erik/Louis, and I will be working with you today. We are testing the ease of use of the instructions for Balance of Power, a board game designed to educate children with diabetes in health management skills. Please keep in mind during the test that your gameplay is not what we are evaluating. We are conducting this test in order to determine whether players are able to easily understand the rules of this game based entirely on the reading of instructions. We are also trying to determine what problems users may encounter, if any, while learning from the instructions. During the test, you will be asked to answer questions about your experience. While you are playing, I will be watching and taking notes.

(User will receive a packet which includes the following: Consent form, background questionnaire, directions for scenarios/tasks, and Usability questionnaire)

Please talk aloud as you are going through the instructions. Also, feel free to ask questions during the session. However, because we would like to conduct this test as if I were not present, I will not be able to answer you. Do you have any questions before we begin?

First, you will fill out a pre-test questionnaire. The rest of the testing session will be comprised of a scenario that has been developed by our team. After you complete the session, I will ask you questions about your experience
Based on the instructions and how well you understood the game from reading them. You will then fill out another questionnaire. At the end, we will have a discussion period where you will be given the opportunity to ask questions and comment on your experience.

Again, please keep in mind we are not testing you, but are just looking for feedback regarding the instructions of the game. There are no right or wrong answers here, so just proceed as you normally would. These instructions have not been tested with people, and there may be changes that need to be made. Please be honest with your positive and negative thoughts.

(Participant will fill out Pre-test Questionnaire)

Thank you for completing the Pre-test Questionnaire. I would like to remind you to please think out loud as you are working. For example, if you are reading something, read it out loud and say anything that might come to mind. For example, if you think something is confusing, please say so. On the other hand, if you find something to be exceptionally clear, these comments are welcome, too. Your comments will help us understand what players are thinking and doing and where they might run into problems.

Let's begin.
POST-SESSION CONVERSATION GUIDE

After the Presentation:

In the remaining few minutes, I’d like to discuss your experiences. Please share any comments you may have. Would you discuss any elements that you found easy or difficult? Describe any aspects of the instructions that you found positive or frustrating.

How well do you think you understand the game?

Do you think the instructions were easy to follow?

Please discuss any parts of the instructions that are unclear.

Can you foresee any difficulty for the children reading these instructions?

How confident are you that you could teach this game to children?

Thank you for coming today and for participating in the usability study. Your time is valuable, and we appreciate your contribution.

(Investigator – turn off all recording devices and review/update notes)
PHOTOGRAPHY, VIDEO, + AUDIO RECORDING
RELEASE FORM

The OSU Design Research Team will videotape, audio record, and photograph this workshop. These tapes and photos will be used for research purposes only. They will not be used commercially.

Please check off one or both of the statements below, then sign and date.

Thank you.

☐ I allow the OSU Design Research Team to videotape, audio record, and photograph me in this workshop session for research purposes.

☐ I allow the OSU Design Research Team to use the photos from this session in their research summary as well as for potential conference materials (papers or presentations) in the future.

--------------------------------------------------
PARTICIPANT NAME (PRINT)  PARTICIPANT SIGNATURE  DATE
CONSENT FORM

The purpose of this study is to evaluate the usability of the Balance of Power instructions. The study will take approximately 60–90 minutes.

I understand that I will perform the following activities:
- Read questions and instructions
- Think out loud while reading and using the instructions
- Discuss positive and negative aspects of the instructions
- Provide answers to the questions in questionnaires

While I am participating in the usability test, I further understand that:
- My first name, photograph, and video footage will be used in a summary of the final results that will be provided to a representative of the OSU Design Research Team or the Central Ohio Diabetes Association.

Compensation for Participation
I will not be compensated for my participation.

Freedom to Withdraw
I realize that research participation is completely voluntary. I understand that I am free to refuse to participate in this study or withdraw at any time. There is no penalty for either non-participation or withdrawal.

Availability of Investigators
If I have concerns or questions about the research, the Investigators can be contacted at

Consent
My signature below indicates that I consent to participate in this research investigation.

____________________________ ____________________________ ______
PARTICIPANT NAME (PRINT) PARTICIPANT SIGNATURE DATE

____________________________ ____________________________ ______
INVESTIGATOR NAME (PRINT) INVESTIGATOR SIGNATURE DATE
USABILITY PROPOSAL

OBJECTIVE

The purpose of this study is to conduct a usability test in order to provide an objective evaluation and analysis of the CODA board game prototype. This game was co-developed with the team at CODA, the Central Ohio Diabetes Association. Its purpose is to use the constructs of the game system to engage children with diabetes in a system that teaches disease management. Specifically, testing will center around the instructions for the game, and whether they are understandable by users of varying age groups. Our intent is to assess the way that instructions are understood for interactive screen-based games as well as traditional board games. Our audience for the CODA board game will be children ages 7-12. These are members of a demographic called Gamer 4.0. They have grown up with the internet and console games. They are used to immersive game experiences, getting instant feedback, and self-exploring game environments to find answers and reach goals. They are not interested in reading instructions. The challenge is to deliver instructions in a way that can be easily absorbed and understood by them and their parents.

EVALUATION

The game instructions will be evaluated by a usability test. As a progression from design research accomplished in Design 786, we propose to play test the effectiveness of the instructions in different ways. The first would be in all written form. The second version would be designed to use mostly visual aids. The third version would be a combination of text and visuals, with an element of interactivity tying it together. We would benchmark these instructions against existing material—other strategy games such as Risk and Settlers of Catan, as well as a classic, such as Monopoly.

DELIVERABLES

1. Usability Audit: The audit will focus on the usability of some existing game instructions and any support materials offered online by the manufacturers. Guidelines for effective communication of informational content will be researched and then consulted during the audit.

2. Test Plan: A test plan including all scenarios, tasks, and questions will be provided. The test plan will include a detailed procedure and all questionnaires.
3. **Conducting the Usability Test:** A usability test will be conducted following the above-mentioned test plan.

4. **Final Report + Presentation:** The findings will be analyzed and summarized in a final report. Specifically, the report will include a summary of findings, user ratings, recommendations based on insights uncovered by testing, and recorded test sessions.

**TEST SESSIONS**

We will conduct group usability testing with four to six users. Each session will last approximately 45-60 minutes. Questions and tasks will pertain to the main categories of the game instructions (such as ____). The last 15 minutes of the sessions will have the subjects participating in an informal/unstructured interview to identify positive and negative aspects of the instructions and judge their overall effectiveness.

**TIMELINE**

- April 7  Usability research briefs/proposals due in class
- April 21 Usability audit reports are due in class
- May 5  Usability test plans are due in class
- June 2  Final test report/presentations are due in class
APPENDIX B: PILOT TEST MATERIALS
PILOT STUDY OVERVIEW

Research Objective
The CODA game will undergo usability testing sessions at 2008’s Camp Hamwi, a summer camp for children with diabetes run by the Central Ohio Diabetes Association. Because of the sensitive nature of conducting research with children, the testing session will be run by the counselors of Camp Hamwi. This will eliminate the need for IRB approval, but it will also require that I train the counselors to act as researchers and collect the data on my behalf.

Pilot Study Objective
The objective of the pilot study is to plan the instructional methods for training the counselors in:

- The playing of the board game
- The collection of data while they observe the children playing the game

Procedural Description for Counselors:
The following is the proposed structure of the training session with the counselors of CODA’s Camp Hamwi.

1. Begin by introducing the project and its overall scope and purpose.
   This will give the counselors the “what” and “why” behind the game. (0–5 min.)
2. Introduce the counselors to the concepts of co-design and design research.
   This will give them “how.” This will be done with a slideshow presentation of these general concepts, as well as an overview of the design process behind the game. (5 min.)
3. Explain to the counselors what I need from them and why I need their help doing research with children. Walk them through the process for introducing the game to their campers. (10–15 min.)

Procedural Description for Campers:
The following is the structural information for the counselors to use to engage their campers in the playing of the board game. It is a set of instructions for the counselors to follow.

1. Gameplay will require at least 3 administrators.
2. Two people will act as facilitators for the players. This will require a basic knowledge of the game and the ability to consult the rules as necessary. Facilitators will begin by leading the players through the gameplay, and will gradually take a backseat as the players come to understand the rules.

3. One or more people should function as a documentor to the process. Key tasks for the documentor include taking photographs, videotaping gameplay scenarios, and taking notes.

Walkthrough
The following is the basic structure of the gameplay event. Adapt as necessary, but please make sure all of these are covered.

1. First, facilitators will introduce the campers to the game and its focus on the idea of balance in the management of diabetes. (5 min.)

2. Read the game instructions to the players. (no more than 5 min.)

3. Each facilitator should team up with a player and get the game started. The players should grasp the full scope of gameplay within 15–30 min.

4. Counselors acting as observers will set up the video camera and take notes while observing gameplay. See attached forms for details.
CHECKLIST FOR SESSION

This is a checklist for the camp counselors, based around the method that has worked for us in the past. It covers all the major points for running a research session such as this.

☐ Collect consent forms and start videotaping.
   (set up camera to tape the gameplay)

☐ Introduce the game and what it is for.
   (educating children in diabetes management)

☐ Mention that the game is like Capture the Flag, but with power-ups and battle modes.

☐ Give the players a brief overview of gameplay mechanics. Such as:
   • You each get three custom characters that you build yourself.
   • You each get a home base and a set of board tiles.
   • You roll the die to see how many tiles you can move across.
   • Each time you move, you’ll read a scenario card that will change the balance chips.
   • If you have an even number of balance chips, you can try to find your opponent’s flag by turning over a tile.
   • Whatever you find under the tiles, you have to send a character out to get it.
   • The first one back with their opponent’s flag wins!

☐ Two facilitators should start by playing with the campers, like coaches.

☐ Facilitators should introduce game concepts when they become important.

☐ When the campers have a grasp of the game, back off (but stay near for questions).
POST-SESSION CONVERSATION GUIDE

After the Presentation:

How confident are you that you could go teach this game?

How well do you think you understand the game?

Were there parts of the session that were unclear?

Can you foresee any difficulty interacting with the children?

How well do you think you understand the concept of participatory design?
Pilot Study Participant Notes

Following gameplay, the participants felt the basic steps of the game were easy to understand, including the concept of balance and the “battle mode.” They feel that the nature of the game would require counselors to “learn as they go.”

The participants were curious about the board tiles they did not get the chance to turn over, and if not knowing what is under those tiles would cause problems for them facilitating the game session.

Participants felt the first Conversation Guide question regarding the understanding of the game should be broken down more. For instance, offering specific areas of gameplay for the counselors to comment on, rather than speaking holistically about the game.

Participants felt there were a lot of steps for each player’s turn, which were counter-intuitive with regards to traditional games. The idea of moving 3 Avatar Pawns seemed different to the participants, like there were too many moves per turn, and there was too much strategic information to keep track of. Erika had a hard time keeping track of which Avatar Pawn belonged to which player. The participants’ suggestions were to somehow mark the Avatar Pawns by color, or by theme. The participants also felt that for the purpose of the testing session, it would be critical to have someone facilitate the session and walk the campers through the game.

Regarding gameplay, the participants felt it was too easy to balance the Balance Bridge. They recognized that this would require the right balance of scenario cards to alter the Balance Bridge’s dynamic. They also believed the scenario cards might be more effective if sometimes they were more devastating, altering gameplay more seriously.

Participants suggested the inclusion of leveled instructions (without knowing this concept was being considered).
APPENDIX C: CONSTRUCTION IDEATION OF AVATAR PAWNS
“BACK” PIECE
w/ FRONT PIECE
ATTACHED

“BACK” PIECE
w/ FRONT PIECE,
LABEL, + HEAD

(neck will change
to fit puzzle piece
hole)

MOST CHARACTERS
WILL HAVE CAPE TO
FILL THE “WHITE SPACE”
ON THE PLASTIC PIECE.
APPENDIX D: FACILITATOR WORKBOOK FROM FINAL SESSION
This workbook is for the observers of the gameplay sessions. Please use this workbook as a guide to help you in the observation process. Every comment will help us all to make this the best Diabetes Education game possible. Please answer the questions to the best of your abilities and include any additional information you can.
Procedural Description for Participants (facilitators) to follow:
The following is the structural information for the facilitators to use to engage others in the playing of the board game. It is a set of instructions for them to follow.

1. Gameplay will require at least 3 administrators.
2. Two people will act as facilitators for the players. This will require a basic knowledge of the game and the ability to consult the rules as necessary. Facilitators will begin by leading the players through the gameplay, and will gradually take a backseat as the players come to understand the rules.
3. One or more people should function as a documentor to the process. The documentor will take notes on the gameplay scenarios.

Suggested Walkthrough
The following is the basic structure of the gameplay event. Adapt as necessary, but please make sure all of these are covered.

1. First, facilitators will introduce the players to the game and its focus on the idea of balance in the management of diabetes. (5 min.)
2. Read the game instructions to the players. (no more than 5 min.)
3. Each facilitator should team up with a player and get the game started. The players should grasp the full scope of gameplay within 15–30 min.
4. Observers will take notes while observing gameplay. See attached form for interview questions to respond to.

INTERVIEW QUESTIONS FOR OBSERVER(S)
This is a list of questions to be answered by the observer(s) of the gameplay sessions. Please feel free to elaborate as necessary.

FIRST ROUND OF PLAY:
1. Game prototype played:
   - PROTOTYPE 1
   - PROTOTYPE 2
2. Are there any aspects of gameplay that are not clear to the players or facilitators?
3. Are the players generally interested in the gameplay?
4. What do the players respond the most to (positively or negatively)?
5. Do the players generally seem to be having fun?
6. How long is the gameplay session?
7. Do they return to play the game again? Explain.
SECONDARY ROUNDS OF GAMEPLAY

1. Game prototype played:
   - PROTOTYPE 1
   - PROTOTYPE 2
   Did the players choose this prototype themselves? Did they prefer it?

2. How long is the session?

3. Do they make up their own rules? Explain.

4. How do they explain the rules to other players?

5. Do they complete the game, or do they stop playing? Explain.

GENERAL QUESTIONS

1. Are there any playing pieces that are more popular than others?

2. Is one of the game prototypes more popular than others?

3. What problems, if any, occurred during gameplay?

4. Did the players change the rules or gameplay structure?
This workbook is for the observers of the gameplay sessions. Please use this workbook as a guide to help you in the observation process. Every comment will help us all to make this the best Diabetes Education game possible. Please answer the questions to the best of your abilities and include any additional information you can.

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This game is one of 2 prototypes. BALANCE OF POWER is being developed by a partnership between the Central Ohio Diabetes Association and The Ohio State University.