EMOTIONS, TECHNOLOGY, AND DIGITAL GAMES

Edited by SHARON Y. TETTEGAH
and WENHAO DAVID HUANG

Emotions and Technology
Communication of Feelings for, with, and through Digital Media

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Series Editor

Sharon Y. Tettegah

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FOREWORD

With respect to technology, it is important to place terms and tools within a historical context, given that in today's society, when speaking to a person who is a Millennial (individuals who are born in the early 1980s to 2000), s(he) may tell you that technology is the internet and smart phones. For the Millennial then, technology may only mean digital or biotechnologies. If we were to speak broadly to some individuals from the Silent Generation, Boomers, Millennials, and Generation Y, technology may also mean automobiles, airlines, overhead projectors, flashlights, microwaves, ATMs, etc. Hence, technology in the twenty-first century can mean many things. For example, technology could mean software applications, hardware, social media platforms, functional magnetic resonance imaging, mobile technology, learning, and content management systems, to name but a few.

Humans and other animals have used tools for centuries; however, the most important aspect of any tool is how we use and interact with it and the emotional responses we experience while we interact with it, either physically or psychologically. The focus of this book series is to provide a variety of conceptual, theoretical, and practical perspectives on the role of emotions and technology. Various psychological and social-emotional aspects of communicating through and with many types of technology are engaged in ways that extend our understanding of technology and its consequences on our lives.

A specific goal and purpose of this book series focuses on emotions and affective interactions with and through technology. In some cases, these interactions are user-to-user, supported by the technology. In other instances, these interactions are between the user and the technology itself. Let us take, for example, researchers who have used animated social simulation technology to measure emotions of educators (Tettegah, 2007) and others, who use biotechnology to measure decision-making and emotional responses of users of technology (Baron-Cohen, 2011; Decety & Ickes, 2009). In a recent article, Solomon (2008) points out, "One of the most critical questions about human nature is the extent to which we can transcend our own biology (p. 13)." I would argue that through our use of technology we, in fact, are attempting to extend and transcend our emotions by way of robots and other intelligent technological agents. As such, we should then ask ourselves: why are discussions of emotions and technology so important?

Inquiry regarding the nature of emotions is not new. In fact, examples of such forms of inquiry have been documented since the dialogues of Socrates and Plato. Researchers and practitioners in psychology, sociology, education, and philosophy understand the complicated nature of emotions, as well as [the importance of] defining emotions and social interactions. The study of emotions is so complicated that we still continue to debate within the fields of philosophy, education, and psychology, the nature of emotions and the roles of affective and cognitive processes involving human learning and behavior. The volumes in this series, therefore, seek to present important discussions, debates, and perspectives involving the interactions of emotions and various technologies. Specifically, through this book series on Emotions and Technology, we present chapters on emotional interactions with, from, and through technology.

The diversity of emotions, played out by humans with and through technology run the gamut of emotions, including joy, anger, love, lust, empathy, compassion, jealousy, motivation, frustration, and hatred. These emotional interactions can occur through interactions with very human-looking technologies (e.g., avatars, robots), or through everyday commonplace technologies (e.g., getting angry at an ATM machine when the user fails to follow instructions). Hence, understanding the ways in which technology affords the mediation of emotions is extremely important toward enhancing our critical understanding of the ways in which student minds, through technology, are profoundly involved in learning, teaching, communicating, and developing social relationships in the twenty-first century.

The majority of the chapters presented in the books in the series will no doubt draw on some of the recent, pervasive, and ubiquitous technologies. Readers can expect to encounter chapters that present discussions involving emotions and mobile phones, iPads, digital games, simulations, MOOCs, social media, virtual reality therapies, and Web 2.0/3.0 technologies. However, the primary focus of this series engages the readers in psychological, information communication, human computer interaction and educational theories and concepts. In other words, technologies will showcase the interactions, however, the concepts discussed promise to be relevant and consistent constructs, whether engaging current technologies or contemplating future tools.

The whole book series began with a call for a single volume. However, there was such a huge response, that what was to be one volume turned into eight volumes. It was very exciting to see such an interest in literature that lies at the intersection of emotions and technology. What is very clear here,

is that human beings are becoming more and more attached to digital technologies, in one form or another. In many ways, we could possibly posit the statement that many individuals in the world are inching their way toward becoming cyborgs. It is apparent that digital technologies are in fact more and more second nature to our everyday life. In fact, digital technologies are changing faster than we are aging.

The life of a new technology can be 6 months to 1 year, while the human lifespan ranges from 0 to 80+ years. With the aforementioned in mind, humans have to consider how their emotions will interact and interface with the many different technologies they will encounter over the course of such a lifetime. It seems as if it were only yesterday that the personal computer was invented and now we have supercomputing on a desktop, billions of data at our fingertips on our smartphone computers, and nanotechnology assisting us with physiological functions of living human animals. Regardless of the technology we use and encounter, emotions will play a major role in personal and social activities.

The major role that technology plays can be observed through the many observations of how humans become excited, frustrated, or relieved, when interacting with new technologies that assist us within our daily activities.

Our hope is that scholars and practitioners from diverse disciplines, such as: Informatics, Psychology, Education, Computer Science, Sociology, Engineering and other Social Science and Science, Technology, Media Studies and Humanities fields of study, will find this series significant and informative to their conceptual, research, and educational practices. Each volume provides unique contributions about how we interact emotionally with, through, and from various digital technologies. Chapters in this series range from how intelligent agents evoke emotions; how humans interact emotionally with virtual weapons; how we learn or do not learn with technology; how organizations are using technology to understand health-related events; to how social media helps to display or shape our emotions and desires.

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PREFACE

EMOTIONS, TECHNOLOGY AND DIGITAL GAMES

In reviewing the history of emotions and games, we find that the intersectional disciplines of psychology, emotions, and digital games are a relatively new field of study and practice. However, a related field of study, affective computing, is about 18 years old (Calvo, D'Mello, Gratch & Kappas, 2015). Affective computing is more general and deals with all forms of affect involving the field of computing, while emotions and digital games are very specific to the study of emotions with, through, and within digital games. In a recent article, Morin (2014) pointed out, that perhaps technology is ruining our ability to read emotions. In some ways this could be true about emotions and particular technologies, while at the same time we should recognize that games have the ability to evoke and sustain emotions in people, and perhaps also develop and generate emotions in intelligent agents.

Games are known for inducing, as well as sustaining, affective responses. Look, for example, at the role of games that were played during 3000 BC to present day. Games have always provided humans with pleasure and disappointment. It is a recognized fact that human nature relies on the induction of emotions in play and other behaviors. One primary reason why people participate in games, but also observe them, lies in the reality that games stimulate us and generate all types of emotional responses. Keeping in mind the diverse focus on game development, creation, and play, playing games allows people to experience enjoyment, excitement, anxiety, anger, frustration, and many other emotions. Given the complexity of games and the multifaceted nature of human emotions, the conceptual and empirical relationships between emotions and games remain as a critical field of research, driven by three research questions. First, how and what do people "feel" before, during, and after playing a game? Second, how can we manage player's affective processing in games through purposeful design, so we can better predict their effort investment in game playing based on their emotions? Third, how can we detect emotion, in its complexities, in individuals while playing a game? Answers to these questions further contribute to enhancing the utilitarian aspects of gameplaying beyond its entertaining value, such as, improving learning or performance outcomes. We know there is something about games, analog or digital, that has attracted individuals for thousands of years. It is our hope that with the chapters in this

volume, we will continue our preoccupation and interest in the study of games. Authors, in the *Emotions and Games* volume include researchers and practitioners from a broad range of disciplines. For example, authors discuss the role of ethics, social emotional learning, investigations in how gameplay may help with emotional processing of dreams, language development, collaboration, and levels of immersion.

This volume presents a unique and timely collection of theoretical and empirical work to help us address the aforementioned conceptual, theoretical, and research questions that are raised in the field of game design and learning. Chapters, in this volume, include contributions from Learning Sciences, Computer Science, Education, English, and Psychology. This volume has three sections: (1) Embodied Experiences: Affective and Cognitive Benefits; (2) Emotions, Tools, and Ties; (3) Emotional Affordances, Video Games, and Learning. These three sections are summarized in more detail below.

EMBODIED EXPERIENCES: AFFECTIVE AND COGNITIVE BENEFITS OF GAMING

The first section of this volume articulates how we can learn a lot by studying psycho-social experiences of gamers. The chapters explore the impact of game-induced emotions beyond the context of games. Authors in this section make arguments that playing video games (or computer-based games in general) could provide experiences that transcend conventional boundaries between fiction and reality.

One may ask the question, How can games help to reduce nightmares? Bown and Gackenbach, maintain games may offer protection in our waking life by reducing certain types of nightmares. In their chapter, they argue that threatening situations often need rehearsing and that video games could provide players with a type of rehearsal process that would yield long-term benefits for nightmare protection effect and creativity. Games may help us to deal with trauma in ways perhaps we had not considered.

Bumbalough and Henze apply post-traumatic stress disorder (PTSD) as an analysis framework to delineate how digital narratives represented by two video games (*Max Payne* and *Metal Gear Solid*) can help high school students understand psychological and social problems, such as, rape, post-traumatic stress, and racial genocide. The authors argue that games deal with all types of social and psychological problems that are mirrored in our society, and we need to address digital representations of psycho-social problems in a

responsible manner. Ethical behavior, perspective taking, and empathy are cognitive and affective characteristics that are important in our society.

Schrier delivers a discussion, using a mixed methods case study to compare *FABLE III*-players' ethical decision-making, thinking process, and empathy. Two groups were compared: those who played the game and those who were provided with paper non-game scenarios. The author reveals some discrepancies between the two groups in terms of how they applied their emotions, ethical thinking processes, the level of empathy-driven practices, and the transfer of ethical thinking post-gameplay. The chapter provides preliminary empirical support to substantiate the relationships among emotion, empathy, and ethical thinking, induced by a game-based environment. Many of us who play games perhaps have had a physical experience in reality similar to that experienced in a virtual environment.

Oliveira argues that it is important to go beyond the intradiegetics for any type of storied experience. She argues that storied experiences are often the phenomenon of ectodiegesis while game playing. That is, how external (realistic) environments beyond the context of a fictional world portrayed by a game may influence game players' immersive experiences inside and outside the virtual environment.

EMOTIONS, TOOLS, AND TIES

The second section of this volume shifts readers' attention to emotional affordances of tools, broadly speaking, within the context of gameplay.

Toh, grounded in the appraisal theory, proposes a framework to analyze video game players' decision-making processes in selecting and customizing their weapons in the gameplay. Specifically, the chapter intends to connect emotional processing to the appreciation of the weaponry in the game, which is an ambitious attempt to develop an analytical framework in understanding how game players select and customize their in-game weapons in relation to the drive of emotional processing.

Sanders, through multiple case studies, examine player's emotional experience when playing video games. The author presents a discussion of Louise Rosenblatt's transactional theory, to establish the role of video-game playing as a new literacy. The underlying concept that enhances the value of playing video games as a legitimate literary experience, is meaningful to advance the field of game-based learning research and development.

Lu, Buday, Thompson, and Baranowski present a practical approach to engage young children with active video games (AVGs) for carrying out physical exercises. The interdisciplinary study contributes to the field in

terms of narrative development for engagement purposes, game-based environment design for better opportunities to be augmented by a variety of narratives, and most importantly, to engage young children with necessary physical activities.

Gorham and Gorham investigate the affective affordances of video games, within the field of English as a Foreign Language (EFL) and their effects on emotions. The authors provide a review of the literature, in the field of mind, brain, and education (MBE), as a foundation for their case study involving adult interactions and emotional stimulation with commercial off-the-shelf video games (COTS).

EMOTIONAL AFFORDANCES, VIDEO GAMES, AND LEARNING

Researchers and practitioners often debate whether or not learning occurs as players interact with content in video games. This section provides conceptual, theoretical, and empirical discussions on learning and playing, affection, and cognition from instructional perspectives.

Jiménez compares the impact of story on the perceived level of "fun" by the participants in three conditions (Original, Abstract, and Character). While the learning gain among all three groups was equivalent, the perceived level of "fun" positively correlated with the learning gain in the "Character" group (i.e., the enhanced story version of the game). The chapter verifies the relationship between positive emotion (fun) and learning.

Nikolayev, Clark, and Reich report a qualitative study based on randomly selected online games, a preliminary overview of various educational opportunities, complexity levels, and the delivery strategies of the educational tasks embodied among 66 games. The findings articulate that opportunities for emotion regulations are largely missing in online games for preschoolers. Recommendations are provided on how the design of online games could better support social emotional development in early learners.

Reese integrates prior research to illustrate the interaction between learning and affects in effective game-based learning. Through a case study approach, this chapter effectively showcases the efficacy of the "Flowometer" as well as an online instructional video game (the *Selene* series) in helping researchers and instructional video-game designers understand the underlying affective and cognitive processing players go through during game interactions and play. The finding that challenges the "flow" experience considering the player's lack of expertise prompts further research questions in the field of game-based learning and its design.

Schrier and Shaenfield suggest game design principles to promote collaborative interactions among players by observing four players playing an online multiplayer game, *Way*. The chapter provides some empirical support through the "thick descriptions" of game players' thinking aloud and the observer's notes. This chapter offers an interesting perspective in designing the richness of a game-based collaboration by reducing the game's affordances that support players' communications. This approach can inspire future game-based interaction and interactivity research to only consider salient aspects of game playing while insulating players from secondary game system features.

Humphries, examined pro-social behaviors of 73 4th grade students using digital and analog versions of a game to measure four constructs: Theory of Mind (TOM), perspective taking, emotion recognition, and empathy. Through a mixed methods experimental design, Humphries' study compared the efficacy between game-based interactive psychology tests with their analog counterparts. In particular, the comparison is focused on the viability of technology to test preschool children's cognitive and affective developmental competencies. This is a rare endeavor to combine four different psychology tests in the game-based environment for preschool children. The cognitive grouping identified in the study, along with suggested affective constructs derived from the interactivity with the game, has provided interesting insights.

A relevant and productive ecology of scholarship must constantly embrace new interactions among disciplines in order to continuously advance the field of research and practice. This collection of chapters provides a rare opportunity for the fields of psychology, computing, video-game design, and game-based learning to begin to interact with one another. We contend that the chapters, in addition to demonstrating the authors' intellectual curiosities and scholarships, are well positioned to diversify our thinking in conceptualizing research inquiries, designing measurements, and understanding relationships, to elevate the role of human emotions in disseminating and acquiring knowledge and expertise through video-game playing. As a result of this volume, we are hopeful that these chapters will inspire researchers and practitioners in similar areas of inquiry in scholarly and practical ways.

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SECTION I

Embodied Experiences: Affective and Cognitive Benefits of Gaming

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CHAPTER 1

Video Games, Nightmares, and Emotional Processing

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Humans are natural storytellers. Besides the survival benefit that comes with remembering and recounting past events, stories rouse our emotions. What started with the oral tradition of sitting around a fire and telling a tale has now evolved to include digital mediums. Different paradigms for conveying a story have been created with each new technological discovery, and the pace of development is getting faster. If books can be considered one-dimensional stories, the added visuals of movies could be two-dimensional stories. We argue that video games are three-dimensional because they give the player another layer of experience with the story: control. The sense of being part of the world and influencing it achieves a level of immersion that cannot be attained with traditional storytelling and ultimately evokes an emotional response unobtainable by any other means. In this chapter, we explore how video games are an interface between computers and human emotions.

In a non-obvious way, gaming can alter our emotions in the long term, and they accomplish this indirectly—while we are asleep. To understand this process, a few points must first be understood about sleeping and, most importantly, dreaming. If our brains can be compared with computer systems, then our dreams are the monitors set to display a raw feed of binary data. The neural processes that occur during sleep are deeply involved with our emotions (especially our ability to regulate them) and video-gameplay undoubtedly influences them. By studying dreams, researchers are looking indirectly at one aspect of the brain's nighttime processing and discovering the implications that video-gameplay have on our lives, dreaming, and waking.

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DREAMS

Western cultures have the unfortunate tendency to minimize the importance of dreams. Dreams are not the meaningless byproduct of sleep, nor are they phenomena that only a few people experience. Everybody dreams at night—the brain needs to—but some dreams are more memorable than others, with the majority of dreams easily forgotten. Nonetheless, the work of dreams is done each night when we sleep and researchers are beginning to understand exactly why this work is so important.

Basically, dreams are our mental experiences of the brain's activity while sleeping. Yet the cognitive experience of sleep is separated from external stimuli and the dreamer lives in a biologically constructed virtual reality. The dreamscape is composed of imagined perceptions that often feel very real—hence, it is a true virtual reality. Even if the dreamer realizes they are within a dream, which occasionally happens, the felt experience remains. In such cases, the dream is called a "lucid dream." Individual differences seem to determine the extent of control a person has in a lucid dream, and sometimes the violation of rules from waking reality in a lucid dream is enough to dispel the effect and cause the dreamer to wake up.

Related to lucid dreams but categorically different is the "control dream." The metacognitive component of awareness about dreaming is missing in this sort of dream, but the dreamer can still exert some control over the dream. Deliberate decision-making is present and is even allowed to violate the physics of waking reality. The degree of control a dreamer has can be measured on a continuum and varies between aspects of the dream. It is easier to control one's own choices in a dream than to control the behavior of a dream character. Control dreams are much more common than lucid dreams.

Application of Dreams

Besides the entertainment humans sometimes get from their dreams, they can highlight important personal issues for us. This line of thinking is, of course, taken to a clinical extreme in Freud's theory of psychoanalysis and Jung's analytical psychology, but contemporary psychologists help clients explore and alter dream imagery for the treatment of many psychological issues (Hill, 2003). However, even non-psychologists can consider what images appear in their dreams and gain personal awareness. For instance, the coping mechanisms of waking life are bypassed during sleep and unpleasant, albeit real, cognitions and their associated emotions present themselves to us as metaphors. In full force, trauma can emerge in nightmares, which can be

so real that a person can become re-traumatized through recalling the dream alone (Barrett, 2001).

However, the re-emergence of emotionally provocative subjects in dreams has an important function—emotional regulation. Conscious knowledge of something does not always reflect the deeper beliefs of the mind and dreams act as a medium for perceiving these deeper beliefs. For instance, when the death of a loved one occurs, a person's dreams often reflect their inner level of acceptance and emotional processing. After the death of a loved one, people commonly have dreams of that person still being alive but over time, their dreams change and begin to reflect acceptance of their death. If a person recently experienced a traumatic loss but their dreams are not associated with the subject of the loss in any way, this may be an indication that they are not coping with or processing the event. Alternatively, the opposite is where the dream re-enacts the trauma with no changes and thus no indications of healing.

Some researchers believe that this relation between dreams and emotional events is partly the byproduct of the neural mechanisms for emotional regulation, among other processes. Levin and Nielsen (2009) propose a model of brain activation that occurs during rapid eye movement (REM) sleep that could explain the origin and purpose of dreams. Several brain structures that form a cohesive and interconnected network of limbic and forebrain regions are active during REM episodes with the purpose of fear-memory extinction. These brain regions access small pieces of memory and recombine them in meaningful ways to allow for emotional expression. The pieces of memory that are emotionally provocative or fear-related are presented in new contexts, which creates novel experiences and facilitates fear-memory extinction. Imagine, for example, that someone pulls a scary prank and bangs on your bedroom door at night and that frightens you. According to the model of fear-memory extinction you might have a dream that night with the same scary banging noise—but in a completely unrelated context, such as at work or in your backyard. Exposure to the frightening element in a safe context facilitates extinction. Video games can provide the same effect, which will be addressed later.

Within Levin and Nielsen's (2009) model for dreaming, nightmares occur when the affective load of a particular experience overwhelms this process and leads to disturbed dreaming. At a basic level, our dreams are constructed from the emotionally arousing events of the day but when certain events are overpowering, or if you happen to be particularly sensitive to certain emotions, the natural reactivation of these memories in dreams can

be disturbing. A series of neural correlates support this, as researchers have shown activation of specific brain regions during nightmares that are responsible for such things as fear conditioning, impulsivity, pain distress, social exclusion, and separation anxiety (Levin & Nielsen, 2009). Nonetheless, when this system functions properly, the dreamer's past emotions can be processed and regulated effectively.

One researcher proposes that dreams not only help with processing memories, but also help with preparing for the future. Revonsuo (2000) proposes the threat simulation theory, which defines dream consciousness as an evolutionary adaptation to provide a virtual model of the world for us, where we can safely rehearse the perception and avoidance of threatening elements. The threatening elements are extrapolated from emotionally salient memories. Dreams are the ideal virtual environment for this sort of training because they have no limits and they feel very real. From a historical perspective, humans evolved from primitive times where daily threats to survival were abundant, so the added mental preparedness of threat simulation in dreaming may have given some individuals a selection advantage. Revonsuo (2000) suggests that this is the very reason why humans dream.

Many other theories exist to explain why we dream. Theories of information processing suggest that dreams are the mental representation of the brain organizing memories and forming semantic connections. This is evidenced in experiences when we go to sleep puzzling over questions, only to awake in the morning with the answers. The theory of memory consolidation suggests that sleep and dreams are times when information is crystallized and stored in long-term memory, which is supported by experimental studies that measure memory performance with or without sleep. However, among all of them is the commonality that dreaming is a vital part of healthy brain function. Unfortunately, dreaming can sometimes go haywire and become pathological for many reasons, some still unknown. Techniques to enhance or restore healthy dream function are therefore important for our wellbeing and research from our laboratory has been focused on how media use in general, and video games specifically, may play a role.

HOW VIDEO GAMES AFFECT DREAMS

Bearing in mind that dreams are a reflection of brain processes, including emotional regulation, it follows that if something can alter dreams, it is actually altering the underlying processes. Video games appear to have the power to do that. Past research efforts in our laboratory indicated that gamers

potentially have more dream lucidity than non-gamers (Gackenbach, 2008), which was then compared with the work of Hunt (1995), who studied the dreams of meditators. What followed was a theory that video-gameplay might influence dreams in the same way as meditation (Gackenbach & Hunt, 2014). Relatedly, Preston (1998) originally suggested that virtual worlds might provide the high level of mental absorption in altered states of consciousness that was traditionally only available to meditators. Indeed, many parallels can be found between gameplay and meditation (Gackenbach, 2008). Our research supports this idea, through finding that gamers and meditators both show high attention, high absorption, and high levels of lucidity and control in their dreams.

Lucid and Control Dreams

Our ability to give mental attention to a subject is the crux of the matter. We found that gamers tend to experience a sense of presence (feeling as if they are a part of the playing experience) that is comparable with the presence they feel in dreams (Gackenbach & Rosie, 2011), but the gamer's ability to devote attention to the game mediated the results. Incidentally, gamers appear to have enhanced attention abilities due to the demands of games (Wright, Blakeley, & Boot, 2012), and tentative support exists for the very same mechanisms leading to increased mindfulness (Gackenbach & Bown, 2011)—a primary element of wellbeing. Gamers also display a positive association between gaming and a metacognitive dimension of lucid dreaming similar to waking consciousness (Gackenbach & Kuruvilla, 2013). When compared with meditators and a control group, gamers have a higher level of lucidity than the control group but higher levels of dream control than both the control group and the meditators (Swanston & Gackenbach, 2011).

The implications of this are promising, one being that gaming can promote lucid dreaming, which has the potential to enhance the treatment of depression, anxiety, post-traumatic stress disorder, and even attention deficit problems (Holzinger, 2014; Jones & Stumbrys, 2014). Additionally, as frightening or emotionally charged dream elements naturally arise, having the ability to control a dream could be particularly helpful. As suggested by Levin and Nielsen (2009), emotional regulation occurs during dreams by presenting fear-memories in incompatible contexts to facilitate extinction. A true nightmare would be the experience of these fear-memories in a supporting context. Thus, if video-game playing imparts an ability to control dreams, it grants power to the dreamer to change the context of fear-memories in the dream. More fear-memory extinction results in greater emotional regulation.

Dream Bizarreness

Aside from the regulation of emotions, another positive effect that video games appear to have on us, is increased creativity. Our understanding of the world is built upon semantic associations in our brains, which are interconnected schemas of thought that help us make sense of our perceptions. When we are awake, we filter those associations and channel them into things that make sense. However, when we are asleep, that filter is switched off. Revonsuo (2006) suggests that dreams are the play-by-play experience of activated neural networks underlying the semantic associations we have. Sometimes a skip in the network results in apparently bizarre dream imagery. Ultimately, it seems that dream bizarreness reflects the semantic neural networks the dreamer has—which becomes quite significant when certain people appear to have more dream bizarreness than others.

Since the beginning of our research into the dreams of gamers, we have consistently found more dead and imaginary characters in their dreams than in the dreams of the "norms." We expanded this inquiry and found that high-end gamers appear to have more bizarreness in their dreams than low-end gamers and non-gamers alike (Gackenbach, Kuruvilla, & Dopko, 2009). We became curious about the correlations dream bizarreness might have with creativity and asked participants to submit a 2-week dream diary for analysis (Gackenbach & Dopko, 2011). The results were compelling. Dream bizarreness, as evaluated by the dreamers and researchers, was positively associated with creativity scores but unrelated to having used media within the previous 24 h. Instead, a long-term history of media usage was the determining factor. It may be that a long history of gaming enhances creativity.

Threatening Dreams

Apart from creativity and control dreams, gaming might have another profound effect on dreaming and sleep. Recall that Revonsuo's (2000) threat simulation theory suggests we dream because it allows us to rehearse potential threats, which are based on emotionally salient memories. Video-game playing may fulfill this need during waking life by providing another imaginary realm to rehearse threats. Researchers have demonstrated that the waking rehearsal of nightmares decreases the intensity and persistence of threatening dreams (Krakow et al., 2000). Importantly, nightmares are distinguished from bad dreams because they usually result with the dreamer waking up, feeling as if they are being chased, and feeling more threat,

whereas bad dreams tend to predominantly contain relationship issues (Zadra & Donderi, 2000). Video games frequently contain threatening elements that the player must contend with, which might partially satisfy the natural need to rehearse threat. They may also provide a practice effect that leads to a mental reflex for action in the face of threat.

We did not find an association between gaming and threat in dreams in our first study, but gamers reported that their dreams were not scary or nightmarish, despite an increased amount of violence (Gackenbach & Kuruvilla, 2008a). As is well understood, modern games are violent and alter the way gamers perceive aggression (for a review, see Greitemeyer, 2014). Perhaps this generalizes to dreams and illuminates the relationship between playing violent video games and the need for threat simulation while asleep. Whatever the mechanism may be, gamers do not sense as much threat in their dreams, despite stimuli that the average person would find threatening. The end result is that gamers have dreams where they can exert control and feel less threatened in the face of nightmarish events. In a recent study from our laboratory, we asked respondents who had reported a nightmare if they were more likely to fight or flee in terms of the dreamt danger. Only male gamers were most likely to say they fought, the rest fled the danger (Boyes & Gackenbach, 2014). Gamers, males at least, are effectively more protected from nightmares.

NIGHTMARE PROTECTION

Research continued into the relationship between gamers and dreams, and in 2009, we became curious about gamers' nightmares. We found that high-end gamers tended to have less misfortune and more intense aggression when something bad happened in their dreams, which occurred less often overall (Gackenbach et al., 2009). High-end gamers being those who play video games on average several times a week, typically play for more than 2 h per session; have played more than 50 video games in their lifetime; and have been playing video games since Grade 3 or earlier. The most common nightmare scenario is an inexplicable threat (misfortune), which is potentially violent, followed by an abrupt awakening. The relationship between games and nightmares was explored and replicated (Gackenbach & Kuruvilla, 2008b), followed by four more studies to further explore the question (Gackenbach, Ellerman, & Hall, 2011; Gackenbach & Kuruvilla, 2008a; Le & Gackenbach, 2009). Three of these studies explored aggression and threat in dreams by way of the threat simulation hypothesis. Fundamentally,

each study included an analysis on the content and imagery of dreamers to correlate behavior in dreams with threatening dream situations. Results indicated that the rehearsal of threatening, aggressive, or violent situations in waking life was associated with a lower degree of perceived threat in dreams. The 2011 study was a turning point that directly led to the nightmare protection thesis.

The study in 2011 examined soldiers who play video games (Gackenbach et al., 2011). Soldiers were screened for post-traumatic stress and information was collected about their history of trauma and emotional reactivity—which was controlled for in the results. Frequent gaming was associated with less highly aggressive threat in dreams, but no difference in total amount of threat. In other words, gamers were more able to tolerate and respond to threat in their dreams than non-gamers. Anecdotally, a young soldier wrote to the first author to comment about the research saying, "I am currently in Iraq. I just read an article on video games and dreams. I'm a huge video gamer, and I've always wondered why I never have nightmares … they all ways seem so fun to me!" This study led researchers to conclude that gaming may inoculate gamers against some of the negative experiences of nightmares. Aside from the protective and regulatory effects this has on human emotion, this protection could help avoid further traumatization that occasionally results from severe nightmares (Barrett, 2001).

A replication of the military study using undergraduate students confirmed, but qualified, the nightmare protection hypothesis, suggesting that only male high-end gamers receive this benefit (Gackenbach, Darlington, Ferguson, & Boyes, 2013). Emotional reactivity differences between male and female gamers were controlled for, and three other potential explanations were suggested. First, in this study, the female high-end gamers played more casual-genre games than the male high-end gamers. Second, female high-end gamers played less multiplayer-type games than the male high-end gamers. Finally, sex-role conflict was suggested as a possible explanation, in as much as internalized, culturally imposed sex roles exist uncontested in the unconscious mind during dreams. Research by Schredl, Kim, Labudek, Schäler, and Göitz (2013) suggests that people who align with more feminine traits have an increased frequency of nightmares compared with those who align with masculinity. Additional experimental support for the nightmare protection effect being exclusive to male high-end gamers was recently produced (Flockhart, Gackenbach, & Ditner, 2014).

Boyes and Gackenbach (2014) argue that female gamers experience more nightmares than their male counterparts and feel that they are more

threatening and disempowering. In the same study, the researchers found that between high-end male and female gamers, the former typically play "combat-centric games," while the latter play "casual games" (puzzle games, social games, etc.). Threatening-game stimuli and the rehearsal of defense appears to be the key to nightmare protection. However, defensive reactions to threat are broadly categorized as fleeing, fighting, or freezing. Thus, state coping was examined in nightmares to determine possible correlations with games. Fleeing was the most frequent response across all subjects, but fighting back was unique in high-end male gamers compared with female gamers. This finding adds support to the concept of defensive rehearsal in video games generalizing to nightmares for male gamers.

Essentially, from these experiments, we have evidence that playing simulated combat video games allows male high-end gamers to better cope with negative dream events. Fear or anxiety is not reported as often from this group when compared with everyone else in the context of violent or threatening dream events. Male high-end gamers appear to interpret threatening situations as exciting rather than anxiety-provoking, and this may be due to repeated exposure. Combat-centric video games impart, through rehearsal, long-term defensive responses and these responses should generalize to other virtual or constructed realities. Consequently, the concept that waking life is yet another constructed reality (Blackmore, 2012) may hold some interesting implications for gamers but is outside the scope of this chapter. Our future research will explore the female exception to the nightmare protection thesis.

THE FUTURE

In the bigger picture, the next potential evolution of storytelling and its implications for emotional regulation has just started to emerge in mainstream technology—a fourth dimension of storytelling. Stereoscopic experiences, referred to in the popular media simply as virtual reality (VR), gives the player added visual-spatial cues. This can create a powerful sense of presence for the observer, which is the unmistakable belief of being in the virtual environment. Several start-up companies are currently racing to launch consumer-level devices for the public. Although current video games have considerable power to influence our dreams and emotions, they still ask users to suspend *disbelief* to achieve the best effect. With VR comes the ability to induce a feeling of presence, forcing users to suspend their *belief* if they want to attune back to reality. This may trigger a paradigm shift in the way humans relate to media and how it shapes the

human mind. This suggestion might have some truth to it, since a technology powerful enough to achieve "presence" is, for the first time in history, soon to be available to everyone.

Video games played through VR to enhance feelings of presence are an exciting prospect for dream researchers, because it is an opportunity to engage the emotions of players even more. More presence in video games could enhance the effects on waking emotional regulation (via lucid and control dreaming) and nightmare protection. If VR games can increase a player's tendency to experience lucid or control dreams, this opens up new therapeutic options for psychologists and computer scientists. Anecdotally, experiences of increased lucid dreaming have already been reported in our laboratory following VR gameplay. Pursuant to Revonsuo's (2000) threat simulation theory, a feeling of presence generated by VR in a threatening situation may more strongly satisfy our need to rehearse threat, ultimately enhancing the nightmare protection effect. Dreams are an experiential portal to the raw processes of our brain and we are now discovering exciting new ways to use video games as a tool with which to tinker. A confluence of psychologists, computer scientists, and game developers is needed to reveal the full yield of this inquiry.

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CHAPTER 2

Infinite Ammo: Exploring Issues of Post-traumatic Stress Disorder in Popular Video Games

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INTRODUCTION

In March 2014, the city of Indianapolis witnessed its first ever Comic Con convention. For 3 days, thousands of fans stormed the downtown area, dressed as favorite comic book superheroes and sci-fi protagonists. As one of the early academic presentations of the show, it was difficult not to get swept up in the carnival of it all; we treated our study of the portrayal of post-traumatic stress disorder (PTSD) within popular video games seriously, but admittedly, it is easy to lose focus when Luke Skywalker is sword-fighting Captain Jack Sparrow in the hallway next to your scholarly panel!

The tone of the event sobered when a young man attending our talk stood to ask a question, his right hand gripping a walking cane as if it were a service weapon. He explained that he was in the infantry in the US Army and had been deployed to Iraq before returning to Indiana, after receiving a medical discharge from being wounded in the field. He claimed that playing video games helped to alleviate his symptoms of PTSD, and wondered if our research touched on the lives of gamers coping with trauma, who see their experiences mirrored in popular digital media. To be frank, the question left us standing on the stage with our hands on our hips; our novelty T-shirts and grad school blazers failing to give off the nerd culture credibility we had hoped to espouse. No, we admitted, reluctantly, we had not reached that far.

The soldier's inquiry left us asking a lot of questions regarding the impact of how PTSD is commonly portrayed in popular console video games. Can violent digital images trigger feelings of distress in gamers with PTSD? Are game developers responsible for portraying traumatic events in a palatable fashion? Do children and adults process violent video games in significantly different ways? The questions kept unraveling, and to be honest, we felt

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unqualified to answer many of them. After all, we are not mental health professionals or experts on recovery.

However, while we may not be qualified to answer some of the most pertinent questions regarding how people process trauma in games, the Comic Con conversation helped us to realize that our passion for digital literacy could be influential in helping spark a dialog about PTSD between game developers and consumers. As educators, we consistently argue that the ability to unpack relevant literary narratives is an important skill to develop for twenty-first century literacies; these literacies are "multiple, dynamic, and malleable," and "are inextricably linked with particular histories, life possibilities, and social trajectories of individuals and groups" (National Council of Teachers of English, 2008). By approaching quality video games as complex, literary texts, we hope to contribute to the dialog by examining themes of trauma in a similar fashion to analyzing themes within a novel or a painting, for example.

In order to understand how mainstream digital narratives convey the issues related to PTSD, here we analyze the scripts, or narratives, of two game franchises: the *Metal Gear Solid* franchise by Konami, and the *Max Payne* franchise by Rockstar Games, both third-person shooter series. According to King and Krzywinska (2006, p. 57), the digital narrative or storytelling in a video game, is recognized as an important part of interactive play. If digital narratives are indeed interactive, what happens when gamers internalize a literary character's lived trauma in a digital playscape? Our hope is that this chapter will serve as a pilot study for further research that can address such inquiries. For now, the aim is simply to encourage others to discuss and craft responses to the questions we are unprepared to answer.

LITERATURE REVIEW

Before moving further, it is first important to make a distinction between *violence* and *trauma*. We define *trauma* here, as the damage digital characters experience to their psyche as a result of distressing environments and incidents, whereas *violence* is simple wanton destruction created by a main character in a game. Furthermore, in analyzing trauma, we use the term "PTSD" in the clinical sense: the disruption of the fight-or-flight response due to a traumatic event in the person's life (National Institute of Mental Health, 2014). In the video games we analyze, *Metal Gear Solid* and *Max Payne*, PTSD plays a major role in the decisions made by the characters as they experience traumatic events during gameplay.

In addressing the issue of PTSD in digital narratives, we believe it is important to realize the different factors in motivation that lead to gaming. One of the many factors identified in gameplay is violent catharsis (Hilgard, Engelhardt, & Bartholow, 2013). This violent catharsis is when the gamer plays a game in order to vent pent-up aggression through playable violence. While the term "violent catharsis" sparks some fierce debate, Dill and Dill (1998, p. 408) imply that this catharsis is important because violent video games are among the most played. Instead of viewing gameplay as a violent, lived experience, it can be viewed as a way to engage players in purposeful choice-making through the lens of a fictional character. Though developers should be considerate when using violent catharsis as a vehicle for gameplay, we take the stance of Gee (2006, p. 1), when he claims that popular video games are only harmful when played without "thought, reflection, and engagement with the world around [them]."

Addressing Gee's call for the critical reflection of games, we believe that exploring the issues of trauma and PTSD in popular media is imperative: according to the US Department of Veterans Affairs (2014), as high as 7-8% of the general American public will experience PTSD in their lifetime. The same study shows that more than half of all adults will be exposed to trauma, citing "sexual assault, child abuse … accidents, physical assault, combat, disaster, [and] witness [to] death or injury" as commonly lived scenarios. Concurrently, as the average age of gamers in America continues to rise (31 being the mean age according to a 2014 study by the Entertainment Software Association), the modern video-game market has seen an increase of games aimed at mature audiences. The Entertainment Software Rating Board (2014) may rate a game as *mature* if its content contains "blood and gore," "sexual violence," and "drug references," for example. The similarities between "mature themes" in a game and commonly-lived traumatic scenarios may not be entirely coincidental, as suggested in our subsequent data analysis.

Additionally, a brief look at the latest statistics in gaming shows that nearly 50% of households play games, with 29% of those gamers under the age of 18. The number of youth who identify as gamers raises unique questions regarding PTSD in digital narratives, as recent studies show that over 88% of school-aged children are exposed to a traumatic event in their lifetime (Luthra et al., 2008, p. 1922). While not all the aforementioned children have experienced PTSD as a result of their trauma, we examine PTSD as experienced by the literary characters in games as a way of exemplifying possible effects the theme of trauma has on gameplay. After all, over 50% of

the games that children and young adults play deal with violence or trauma (being of the shooter, action, and fighter genre) in some way (Entertainment Software Association, 2014).

However, considering that the average gamer has now played games for 14 years (Entertainment Software Association, 2014), a growing number of parent gamers have begun using video games as a way of connecting with their children and younger family members. For the first time in the history of gaming, there is a possibility of fostering inter-generational dialog regarding the role of PTSD in digital narratives. In order to promote such dialog, we now turn our attention to a brief survey of games that contain themes of violence and trauma. After giving readers a brief glimpse of games and providing the necessary historical context, we will return to our research question in order to conduct a literary analysis of two third-person shooter games ("third person" meaning a behind or over-the-shoulder view of the playable protagonist, and "shooter" meaning that aiming and firing a weapon is the prevalent game mechanic).

VIOLENCE AND PTSD ACROSS GENRES

While the majority of our data analysis revolves around the *Max Payne* and *Metal Gear Solid* franchises, by briefly touching upon other popular games, we hope to convey the sense of how trauma is often depicted in current digital media. An important point to note is that, while some traumatic video games contain violence, not all violent video games contain trauma. Take, for example, the 2011 console release *Bulletstorm* by Electronic Arts, a game that the entertainment website, IGN Entertainment Company (IGN), describes as a "violently charming popcorn shooter" (Gies, 2011). Sporting the tagline "Kill with Skill," *Bulletstorm* stands apart from other first-person shooter games by tasking the player with murdering enemies in innovative ways—such as shooting an opponent in the rear end, strapping explosives to their back before boot-kicking them in the chest and riddling their flailing body with bullets, as it is sent flying into a patch of spiny cacti. *Game Informer* magazine praised *Bulletstorm's* clever action mechanic, stating that the "sadistic opus arrives at a time when most shooters do little more than let you blast dudes in the head while things explode. *Bulletstorm* has those things, but also lets you shoot a man in the testicles and kick slide his head off" (Turi, 2011). While the gameplay consists of impaling and chain-whipping countless foes left and right, the narrative never allows the player to question the impact of their decisions or internalize the weight of taking the life of another.

The spikey-haired, catch-phrase-spouting, over-the-top-action protagonist *Jet Brody* stands in contrast to the main characters of games with heavier narratives. In the critically acclaimed game *Heavy Rain* by Sony Computer Entertainment, for example, protagonist Ethan Mars, succumbs to chronic depression and drug addiction after the death of his son. The tragedy leaves our hero with crippling agoraphobia; he is prone to blackouts and the player's responses to signs of Ethan's anxieties have a tremendous impact on how the story unfolds. The symptoms of Ethan's PTSD become a Macguffin, or a plot device that significantly propels the narrative of a story. While *Bulletstorm* is sensationally violent and empty of consequence, *Heavy Rain* is sorrowful, uncomfortable even in its attempt to authentically digitize the staple American antihero. And as the demographic of gamers has matured in the past two decades, a growing number of game protagonists are starting to look more like Ethan and less like Jet.

Although the *Max Payne* and *Metal Gear Solid* series were among the first games to take an adult look at issues involving PTSD, the theme is now an increasingly popular plot device in games that extend outside the shooter genre. For example, in the Sci-fi/horror game *Dead Space* by Electronic Arts, players step into the perspective of Isaac Clarke—a deep-space systems engineer whose fragile psyche crumbles as he and his shipmates are attacked by an onslaught of deranged necromorphs. Another example, in the mythological-themed action game, *God of War* by Sony Computer Entertainment, the protagonist Kratos seeks revenge against the god Ares after the deity forces Kratos's hand to slaughter his own wife and daughter in bloodlust. Finally, Joel in the survival/horror game *The Last of Us* by Sony Computer Entertainment suffers PTSD from the death of his daughter Sarah who was gunned down by quarantine police during the inception of a massive infectious outbreak (the zombie apocalypse). While this list is neither extensive nor exhaustive, the intent is to show that tropes involved with PTSD appear frequently in franchises well outside the sphere of the typical military shooter, where games like *Spec Ops: The Line* by 2K Games, commonly use themes of trauma as a Macguffin.

THE EVOLUTION OF VIOLENCE IN GAMING

Perhaps one reason why we have seen a saturation of such themes is because of the evolutionary writing in the video-game medium. Games from the 8-bit era often relied on formulaic, princess-in-another-castle plots, but the storytelling in modern games is much more involved and contains mature themes. For example, in the 1985 classic side-scrolling 'beat 'em' up' game for Nintendo called *Kung Fu* (a home console port of a popular arcade cabinet) —consisting of only five levels,

your character must jump-kick, karate chop, and kill at least 60 opponents in order to beat the game. After completing the second level (and killing at least 24 enemies), only then is the player privy to a shred of plotline. The text "SAVE SYLVIA FROM MR. X" appears in white letters. We hear the chiptune sound of laughter and a crude two-dimensional sprite of Sylvia can be seen tied to a chair, exclaiming "HELP ME THOMAS!" This is the first time we even learn the name of our protagonist—let alone his mission—which suggests how little attention game developers paid to storylines in the early days of gaming. At the end of the game, if the player can jump-kick Mr. X enough times in the head, Thomas embraces Sylvia, music plays, 8-bit hearts dance above their heads, and text on the screen flashes: "CONGRATULATIONS THOMAS AND SYLVIA! BUT THEIR HAPPINESS DOES NOT CONTINUE LONG." And then the game starts all over from the beginning. End of story.

Metal Gear Solid (1998) and *Max Payne* (2001) were influential titles in that their involved, mature plotlines stood apart from the games sporting threadbare narratives at the time. These groundbreaking games sold well and encouraged other game developers to also craft complex playable characters. As a result, many contemporary games showcase damaged digital characters that force players to empathize and internalize grief in a way that games such as *Kung Fu* never did. For example, all three protagonists from the *BioShock* trilogy by 2K Games—a contemporary series acclaimed for the literary merit of its storyline—exhibit multiple symptoms of trauma and psychological scarring. In the most recent installment, *BioShock Infinite*, protagonist Booker DeWitt becomes an emotionally hollow man following the death of his wife, turning to drinking and gambling as coping mechanisms. While numerous critics praised *Infinite's* masterful storytelling, Jeff Cork—senior editor of *Game Informer* magazine—criticized the game's reliance on gunplay, arguing that the involved narrative was enough to carry the story of the AAA (i.e., large-scale, high-budget) franchise (Cork, 2013). Kirk Hamilton from the entertainment website *Kotaku* echoed this criticism, suggesting that "the ridiculous violence stands out in such sharp relief when placed against the game's thoughtful story and lovely world" (Hamilton, 2013). Chris Plante of *Polygon* magazine argued that while *Infinite* could have been a crossover hit for individuals new to gaming, the gore more than likely alienated newcomers to the medium (Plante, 2013). Finally, *BuzzFeed* staff writer Joseph Bernstein lamented that *Infinite* follows a familiar formula of starting off "brainy" in the first hour before resorting to the tired mechanic of giving a player a gun (Bernstein, 2013). And while the aforementioned critics concede that developers must make concessions for purposes of

marketability and giving consumers a playable skill component in the game, the common opinion is that the introduction of violent gameplay often dilutes what could otherwise be a groundbreaking digital narrative. Ken Levine, creative director of the *BioShock* franchise, said just as much in a response to criticism of violence within the game: "It's a limitation of the medium … so we tend to have fewer forms [of gameplay] in the gamespace" (Totillo, 2013). It could be argued that as long as franchises rely on ballistics and combat as prevailing gaming mechanics, it is likely that we will continue to see themes involving PTSD in digital narratives.

RESEARCH QUESTION

The major question we pose is this: How are issues of trauma being portrayed in the video games that young adults play? Gaming is often an ill-defined term; for example, both games showcase a combination of playable levels with interactive environments, as well as passive cut scenes that may resemble a film clip or digital graphic novel. Because some experiences are dependent on the action of the gamer, while others are carefully-scripted and unmalleable, we use the terms "game" and "digital narrative" interchangeably.

By analyzing the *Max Payne* and *Metal Gear* series, we pay attention to some of the most popular games played on the most popular consoles. The sales figures for the game series have exceeded 12 million for *Max Payne* (Rockstar Games, 2014) and 30 million for *Metal Gear* (Konami, 2014), not to mention the millions made from movies and other supplemental media. *Max Payne* and *Metal Gear Solid* are influential games as they were among the first digital narratives in popular media to directly address issues associated with PTSD (a theme that is becoming increasingly common, as our analysis shows). In answering our question, our aim is to: (1) create a dialog between the makers of these games and the gamers that play these games in order to ensure that issues of trauma and PTSD are presented authentically and responsibly, and (2) give gamers and non-gamers insight into the digital literacies with which millions of youth and adults engage on a, sometimes, daily basis.

Thematic Analysis of PTSD in Digital Narratives

I'm afraid of the night. That's why I don't sleep next to you.

—Raiden.

Our analysis of PTSD in video games focuses on two game series, *Max Payne* and *Metal Gear Solid*. The *Max Payne* series, first developed in 2001, consists of

three games that have spanned across two console generations. Published by Rockstar Games, the Western noir franchise chronicles the life of a Drug Enforcement Agency (DEA) agent struggling with depression and chemical dependency after his wife and child are murdered. The *Metal Gear Solid* series, whose first game appeared on the PlayStation® system in 1998, consists of four games that have spanned across three console generations (with a fifth installment soon to be released for PlayStation® 4 and Xbox One, the fourth console generation in which the series appeared). Written, produced, and directed by Konami's Hideo Kojima, the Japanese stealth game recounts the espionage adventures of three separate protagonists: (1) Solid Snake, a grizzled Marine Corps vet in a booming war economy who is haunted by the lives he has taken on the battlefield; (2) Big Boss, father of Snake, who defects from the American military after a traumatic incident wherein the government forced him to assassinate his former mentor; and (3) Raiden, a former child soldier in Liberia, who was subject to numerous psychological and cybernetic experiments, which severely altered his psyche and physicality.

By juxtaposing the various ways that PTSD is portrayed in the two popular series, we were able to identify the following six prevalent themes, as mentioned above: how characters use trauma to manufacture identity; how issues of PTSD interfere with personal relationships; how trauma is represented via nightmares; how self-medication is used as a coping mechanism; how PTSD is personified through villains; and how issues of trauma serve as catalysts for gunplay.

Using Trauma to Manufacture Identity

> *Your past is like pieces of a broken mirror. You try to pick them up, but you only end up cutting yourself.*
>
> ***—Max Payne.***

The *Max Payne* franchise is essentially an homage to old New York detective pulp novels, with Max serving as the quintessential hardboiled antihero. As in many film noir movies and books of the genre, Max's identity is conveyed through an internal monolog during gameplay, film clips, and graphic novel cut scenes that resemble pulp comics. Following the murder of his wife and newborn daughter at the hands of a warring drug cartel, the player is privy to the descent of Max's mental state:

> *The past is a gaping hole. You try to run from it, but the more you run, the deeper, more terrible it grows behind you, its edges yawning at your heels. Your only chance is to turn around and face it. But it's like looking down into the grave of your love, or kissing the mouth of a gun, a bullet trembling in its dark nest, ready to blow your head off.*

The foundation of Max's identity is so heavily reliant on his lived trauma that suffering is signified within the character's own name: Max *Payne*.

Our protagonist's identity is also conveyed through the setting of each level. Many of the settings are reminiscent of film noir New York, where we find Max emptying magazines and dodging bullets in boarded-up buildings and on cracked concrete sidewalks. Such settings serve as an allegory for how the hero sees himself. In perhaps the most memorable level from *Max Payne 2*, we find Max rushing through a burning Fun House; the flaming clowns and cracked mirrors resemble the crazed and cracked state of our hero's psyche. Meanwhile, in *Max Payne 3*, the mob ambushes Max while visiting his wife's grave; Max ducks behind rows of tombstones, while bullets chip away at the black stone graves, much like our hero's eroding moral code. The interactive levels depict unsafe, unstable environments that portray our protagonist as a character in chaos.

In the *Metal Gear Solid* series, identity is often conveyed through symbols. Perhaps the most identifiable symbol is the bandana worn by both Snake and Big Boss. In *Metal Gear Solid 3* we learn the origin of the symbol: when Big Boss confronts his mentor, The Boss, about her defection to the Soviet Union, The Boss disavows their tutelage. *He has not yet found an emotion to carry into battle*, she tells her fellow defectors. She pummels Big Boss and throws him off a rope bridge—but on his way down, his flailing hands grab his mentor's signature headband. On the next level, when Big Boss confronts her a second time, The Boss responds: *There's no need to prove you are virtuous here. Just look at that bandana. If you can't put the past behind you, you won't survive long*. After Big Boss assassinates his mentor in the final level, the bandana becomes a visual reminder of his trauma in subsequent sequels. His lived trauma becomes a physical artifact to wear on his brow.

The manufacturing of identity in the series is also conveyed through names. Although Raiden is the military code name for protagonist Jack, he is also constantly referred to by the monikers *Jack the Ripper* and *White Devil* because of his brutal tactics as a child soldier. Another iconic name in the series is *Gray Fox*, the code name of the "perfect soldier" Frank Jaeger. After Jaeger is mortally wounded in the pre-Solid series game *Metal Gear 2*, the military reconstructs him through genome therapy, cybernetics, and nanomachines, causing him to embrace the Gray Fox moniker and forget his identity as Frank Jaeger. During Fox's death in *Metal Gear Solid*, his last words to Solid Snake are fraught with bleak imagery: *After Zanzibar, I was taken from the battle, neither truly alive, nor truly dead, an undying shadow, in a world of lights. Now, in front of you, I can finally die*. In addition to the evident gray shadow allegory, the quotation metaphorically represents PTSD

another way: considering that Fox was turned into a "cyborg ninja" after being "taken from the battle," the soldier's feelings are likened to being a robot: cold, mechanical, and quite possibly artificial.

PTSD and Its Effect on Romantic Relationships

> *Like all the bad things in my life, it started with the death of a woman. I couldn't save her.*
>
> ***—Max Payne.***

Following the murder of his wife and baby girl, Max convinces himself that he is cursed; the running theme of the series is that all the women he comes across end up dying (a twist on the common hero-saving-the-girl trope in popular fiction and earlier games). As a result, Max essentially becomes an unlovable protagonist; the fall of his character is seemingly justified to the player because he is more or less abandoned by the affectionate figures in his life. Max's first chance at redemption comes with the introduction of a deuteragonist named Mona Sax—a woman sent to assassinate Max until the two fall in love. Despite her duel-wielding ballistic prowess, she is eventually gunned down like the rest of the women in Max's life. *God I turned out to be such a damsel in distress*, she says in the closing chapter of *Max Payne 2*. As Mona dies from her injuries and police surround the crime scene, Max's internal monolog hints at the dynamic between love and trauma:

> *It is almost morning. Waking up from the American dream. Now, like all my loves, she is mine forever. She has brought me here, to this moment of clarity. Where time slows down, and I choose to look back, to see myself. And in that act of seeing, I am reborn …*
> *… I had a dream of my wife. She was dead. But it was all right.*

It could be argued that the culmination of Mona's entire life (and death) serves as a catalyst for Max's healing. The monolog suggests that Max finds closure in regards to the murder of his wife, perhaps implying that the event of Mona's passing absolves him of demons from previous traumatic experiences.

Similar to Max, Snake and Big Boss from *Metal Gear Solid* are basically unloved protagonists; while they may stumble upon a love interest on the battlefield, there is always a sense that the relationship is fleeting. The only protagonist allowed an extended romantic interest is Raiden, whose trauma often serves as an opposing force at odds with the intimate aspects of a personal relationship. In *Metal Gear Solid 2*, Raiden's girlfriend Rose confronts him about the effect that PTSD has on their courtship. *You've*

got a "no trespassing" sign pasted on your heart, she says, pleading with him to let her in. The primary disagreement between the two revolves around Raiden's refusal to let Rose enter his bedroom. As the narrative unfolds, and Rose barges into the forbidden space, it becomes evident to the player that the room is representative of Raiden's heart and emotional state:

> *It wasn't your violent nature that scared me. It was your room … your heart … There wasn't anything in your room—only a bed and a small desk. It looked like a prison cell … No television set … no family pictures … not even a poster … A lifeless room … almost like your empty heart.*

The image suggests that having PTSD is similar to inhabiting a hollow space, lacking in memories, possessions, hobbies, and, in Rose's case, even the love of another.

Trauma and Nightmares

> *The nightmares? They never go away, Snake. Once you've been on the battlefield, tasted the exhilaration, the tension … it all becomes part of you. Once you've awakened the warrior within … it never sleeps again.*
>
> ***—Big Boss.***

Nightmares are a staple of the *Max Payne* franchise, with entire levels dedicated to the dreams of the tortured protagonist. In the first *Max Payne*, Max relives the murder of his wife and daughter in a nightmare; the walls are wallpapered like a nursery, cradle music is heard in the background amidst a continuous wail, and an ominous blood trail is left for the protagonist to follow. The dream begins with an internal monolog: *The nightmare was always the same. Violent shapes moving in darkness, old and ugly. The killer's mad laughter was a riddle filled with wicked innuendo … Somewhere, the baby was crying*. As Max approaches the door to his child's room, boards and nails burst from the doorframe, blocking his path. Of course, once Max reaches his family, he is always too late to save them.

In *Max Payne 2*, the nightmares exist more as a vehicle for Max to reflect on the plot and how events in the game relate to his crumbling mental state. Max is betrayed by his friend Vladimir Lem—an informer and notorious mob boss—who shoots our protagonist in the head. As Max slips into the darkness, he begins to hallucinate about the violent images he has seen in the game. *Stay with it and you can live a lifetime in that split second. In the dream I was an invisible ghost hovering outside my body*. As the scene cuts to the dream sequence, the graphics shifting in a haze, the player sees rain, a building with boarded windows and a battered door covered with yellow caution tape. As

Max moves into the room of the crime scene, the player sees the police chief standing by the message *SHE MADE ME DO IT* written in blood on the wall. *A crime of passion*, the police chief says. *This one's yours, Payne. You're the only one who can solve it*. Max looks down to the sheet-covered body on the ground, only to realize that the victim is him. Cameras flash from somewhere off-screen. *A bullet in the head*, Max says. The jumble of images forces the player to examine how the protagonist has internalized the events of the game. *The killer's looking for an answer*, the chief concludes, *But he's looking for it in the wrong place. He should be looking for it in his own head*. How the pieces of the dream fit together is not entirely clear to the player, which parallels the confusing processes often experienced by survivors attempting to reflect on traumatic experiences in a linear fashion.

In the *Metal Gear Solid* franchise, nightmares are also used to convey how trauma is internalized by main characters. In *Metal Gear Solid 3*, Big Boss is captured by enemy forces, tortured, and left in a Russian prison cell. The sequence contains a nightmare through the form of an "Easter egg" on the original PlayStation® 2 version. Merriam-Webster (2014) defines an Easter egg as "a hidden feature in a commercially released product (as software or a DVD)." If players turn off their PlayStation® 2s after the torture sequence, the game when restarted will boot up to a playable nightmare level experienced during Big Boss's sleep. In the nightmare, the protagonist becomes a vampire hunter, wielding large hook swords used to fight off hordes of undead assailants. In actuality, the Easter egg is a demo of a scrapped game called *Guy Savage*, created by long-time *Metal Gear* collaborator Shuyo Murata. However, in *Metal Gear Solid 3* the vampiric nightmare exists as a personification of Big Boss' fears. After the level ends, Big Boss speaks of the nightmare to his colleague, Eva: *It was almost real. I was holding a sword in my hand*. Eva tells Big Boss to stop hiding from himself, clarifying:

> *I know how you feel [Big Boss]. I'm a spy, too. You don't realize it, but the fake you is eating away at the real you. The person you're pretending to be is becoming the person you are. And the real you is screaming out from somewhere deep inside. That's what you saw in your dream.*

At the end, Eva offers to sing Big Boss a lullaby, though she readily admits she does not know any—an indicator of the human concessions soldiers must make on the battlefield.

In *Metal Gear Solid 4*, Snake is forced to return to Shadow Moses, an Alaskan archipelago that served as the main setting in the original *Metal Gear*

Solid. Just as with the *Guy Savage* Easter egg, the dream is playable; the level in actuality is a carbon copy of a level from the original 32-bit PlayStation® game. After players beat the level, a polygon-faced Snake awakes with a gasp—his face simultaneously ages and returns to the high-definition graphics typical on PlayStation® 3. When Snake's friend Otacon asks if he is alright, Snake responds *I was having that dream again*, suggesting that the character has carried trauma from experiences in the first game through subsequent sequel releases.

PTSD and Self-medication

> *The smell in this place reminded me of how long it had been since I'd had any food. A drinker eats when he's loaded. A real drunk eats when he's not.*
>
> ***—Max Payne.***

As in many games from the shooter, action, and platformer genres, the health of Max Payne's character is present on the heads-up-display (commonly referred to as the HUD in gaming culture). Instead of a life bar, the HUD is in the form of a hollow human figure: as Max takes damage from gunfire, the hollow man fills red to let the player know how close to death their character is. In the *Max Payne* franchise, the only way to heal your character is by finding bottles of painkillers scattered around each level. When Max takes a bottle of painkillers, he often rattles off one-liners, such as *breakfast of champions* and *I need to get to my unhappy place*. While the humorous quips are designed to elicit laughs from the player, they also point out the chemical dependency often formed by individuals coping with PTSD. The slogan of the painkiller bottle reads, *Interfectum 600 mg. A serious painkiller for serious pain*, which could suggest that narcotics in the game are seen as a means to an end—they are viewed as tiny tools to help the player press on and reload the magazine. Several characters in the game are often seen popping pills during moments of stress, suggesting that chemical dependency is all a part of the cost of being a hardboiled detective. Although Max's chemical dependency to painkillers is hinted at in the first two games of the series, his pill addiction becomes a major narrative element in the third installment.

"Flaws provide friction, and friction and conflict is what drives stories, so for us, it would be harder to make an interesting game about a more perfect person," head writer Dan Houser explains. "A man who has spent his life killing, even in the service of his idea of what is right or wrong, is going to be extremely damaged. That seemed the only way to approach this game and it is who this character is" (Crecente, 2012). Whether joking about

having *a hole in my second-favorite drinking arm* or vivid depictions of Max passing out on the floor, the running thread of alcohol addiction is ever present in the narrative of *Max Payne*. In one memorable sequence, a drunken Max grips an empty whiskey glass in his palm. As the glass shatters from the flex of his fist, a murky Max Payne watches the blood drip down his arm. Much like the painkillers, a manufactured brand called Kong Whiskey is present in the noir world. The bottle depicts a raging simian with the slogan, *Makes You Go Ape*.

Since *Metal Gear Solid* is told from the perspectives of soldiers in the war economy, medical coping mechanisms are used in a slightly different way than recreational drugs. However, such mechanisms are also used as a vehicle for main characters to stifle their trauma and push past the pain. A running theme in *Metal Gear Solid* lore is the use of nanomachines that are far more advanced than any microscopic devices used by the military today. In the game, the machines are used to administer adrenaline, neuroenhancers, nutrients, and Benzedrine into the bodies of soldiers in combat. In a memorable scene from *Metal Gear Solid*, Snake complains to medical support staff Naomi Hunter that his body aches after succumbing to torture from an enemy combatant. Naomi instructs the player to hold the controller up to their arm. As she administers drugs from the nanomachines in the game, the player feels the controller vibrate on their arm in real life.

In *Metal Gear Solid 4*, PTSD is such a prevalent theme that there is actually a "stress meter" (or "psyche gauge") below the life bar on the HUD. Players are responsible for maintaining the stress level of their character—if the action gets too hectic, the bar will drop and affect Snake's combat performance. The meter also dramatically rises and falls in cut-scene conversations with other characters, alluding that one-on-one conversations can trigger undesired emotions in individuals coping with PTSD. If stress grows unbearable, your meter will flash; one of the only ways to regain your "psyche" is to inject a nano-suppressing syringe into Snake's neck.

Trauma Represented Through Antagonists

> *From the moment we're thrown into this world, we're fated to bring each other nothing but pain and misery.*
>
> ***—Psycho Mantis.***

Many digital narratives use "the bad guy" as a way to personify the mental state of the tortured protagonist. The most fitting example from the Max Payne franchise is the character of Jack Lupino, a major antagonist and "boss

fight" in the first *Max Payne* game. In the initial installment, Max is a DEA agent on the trail of a crime syndicate distributing a psychotropic drug called "Valkyr." Max becomes obsessed with bringing down the drug ring after learning that the crime family associated with the narcotic was responsible for murdering his wife and child. Max becomes convinced that an underboss named Jack Lupino is responsible for the hit on his family; Lupino is a schizophrenic who has become addicted to the drug Valkyr, forcing him to believe that he himself is actually a messenger from Hell. Lupino begins referring to himself as "the wolf" and even howls at his enemies during battle. Max learns that Lupino has changed the appearance of his nightclub into a gothic church, where the antagonist commits ritual blood murders and other demonic ceremonies to appease the demons in his head. When Max storms Lupino's lair, he finds the base covered with candles, ritual books, and pentagrams—a personification of Max's own fall from grace into the depths of damnation. After members of Lupino's cult drop fire and grenades down on our hero, the player finally meets the face behind the grating voice: Lupino is a large, heavyweight, bald man with a fiery face tattoo, a wild Hawaiian shirt, and a huge shotgun. With a face as demonic as his personality, Max hears the antagonist speak:

> *I have tasted the flesh of fallen angels. I have tasted the devil's green blood. It runs in my veins. I've seen beyond a world of skin. The architecture of blood and bone and marrow. Death is coming! She is coming … and hell follows with her! This is the twilight winter … I am ready to be her son. Her time is now … and all that stand in her way … must die!*

The monolog ends in a maniacal cackle as the screen changes to Max's perspective. As the boss battle ensues, the player is forced to confront a personification of the demons that also plague Max. The fallen angel imagery became such a staple of the first game that it was adapted into the film *Max Payne* starring Mark Wahlberg: when characters trip on "V" they often see hallucinations in the forms of fiery archangels, dragging the user straight to hell.

Metal Gear Solid also uses antagonists that personify trauma. The first installment showcases one of the most iconic boss battles in video game history: the fight against Psycho Mantis. Mantis has telepathic abilities and wears a gas mask to hide his disfigured face and prevent the thoughts of others from entering his mind. Like the protagonists, Mantis suffers from PTSD, which manifests itself in violent, psychotic tendencies. Psycho Mantis represents the mental indoctrination of soldiers in the war economy, with brain-washing a prevailing theme. His twisted thoughts and mangled face

are hidden behind a mask, forever trapped away from a society destined to bring pain and misery.

In *Metal Gear Solid 3*, Big Boss is confronted by a specter named The Sorrow. When Big Boss jumps from a waterfall and slips into unconsciousness, he enters a spiritual realm belonging to The Sorrow and the lives of fallen enemies. The Sorrow emerges from the water, crying blood, and floats into the sky:

> *I am The Sorrow. Like you I am filled with sadness. This world is one of sadness … Battle brings death … Death brings sorrow. The living … may not hear them. Their voices … may fall upon deaf ears. But make no mistake … the dead … are not silent. Now you will know the sorrow of those whose lives you have ended.*

The last line alludes to the subsequent boss battle, which conveys PTSD in a unique way: Big Boss is forced to trudge down a narrow canal toward The Sorrow, while ghosts of enemies the player has killed in the game walk past. However, if the player has killed no enemies in gameplay, the canal is empty and Big Boss can walk through unmolested. In a sense, the battle forces the player to confront the lives they have taken on the battlefield, which is dually representative of the trauma Big Boss carries with him as well.

Finally, in *Metal Gear Solid 4* the main antagonists, "The Beauty and the Beast Corp" are all former child soldiers fraught with issues of PTSD. Kojima used popular Japanese fashion models to voice and motion capture each character, intentionally juxtaposing their physical beauty with beastly trauma. Each character, Raging Raven, Crying Wolf, Laughing Octopus, and Screaming Mantis, uses a different emotion to cope with her own PTSD. For example, Crying Wolf was an African refugee when a rival militia attacked her camp. When she tried to silence the cries of her baby brother, she accidentally smothered him to death. After the incident, she began to hallucinate that a wolf was following her, howling like her baby brother. When she finally reached a government-run camp, "the wolf" stalked the village at night silencing the cries of babies that tortured her.

Guns. Lots of Guns

> *War has changed. It's no longer about nations, ideologies or ethnicity. It's an endless series of proxy battles, fought by mercenaries and machines. War, and its consumption of life, has become a well-oiled machine.*
>
> ***—Solid Snake.***

Numerous books, magazine articles and gamer blogs have been written on the insistent use of guns in video games. In fact, the use of guns in *Max Payne*

and *Metal Gear Solid* is so prevalent that it is difficult to pick out isolated incidents as examples. Guns appear in some form in nearly every single level of every *Max Payne* game and every single level of every *Metal Gear Solid* game. Guns range from pistols and tranquilizer guns to shotguns and assault rifles, to grenade launchers and role playing game (RPG) surface-to-air rocket launchers. Ballistic weapons even direct the gameplay of each game: one of the most notable mechanics of the *Max Payne* franchise is the bullet time mechanic. At the press of a button, Max dives into the air and time slows down. During the dive, the player gets an opportunity to fire at multiple targets in slow-motion before hitting the ground. Meanwhile, the *Metal Gear Solid* franchise practices a tactic called on-site procurement (or OSP). Snake or Big Boss is often dropped off on the battlefield with no weapons, and it is up to the player to search each military base for guns and other weapons to use in combat. This tells the player that weapons are a valuable commodity, and they must spend their time finding "bigger and badder" weaponry in every level.

Rather than finding instances where guns are found in each digital narrative, there is a more urgent need to foster dialog regarding the reliance that high budget franchises have on using guns in gameplay and storyline. In an article posted in *Kotaku*, entitled The Disappointment of Guns in Video Games, Editor-in-chief Stephen Totillo made a bold statement about the shooter genre:

> *Having a gun in a game seldom means that one shot gets fired. It means that thousands do. It means that, when we play in these gun-filled game worlds, we live in places where our heroes are merciless, where we/they aim for the head, where everyone we see is defined, at first glance as (1) a person to shoot or (2) a person to spare. There's a heat to these worlds and a hostility. These gun-filled game worlds feel cynical, angry and, worst, reduced. So little feels possible. When two people see each other in these worlds, most likely, one will shoot the other to death.*
>
> ***(Totillo, 2014).***

Totillo argues that the relationships formed between characters in games are extremely limited when this ballistic binary is introduced in a narrative. Rather than forming complex relationships, game developers often take the easy way out by adding guns to the narrative. However, while critics may gripe about lack of originality, digital publishing companies continue to believe that there is an "easily perceivable market" of consumers who purchase games solely for the shooter-based mechanic in the gameplay (Rath, 2014). If we hope to see more non-shooter gameplay varieties in

AAA games, it is important that consumers monetarily support digital narratives that attempt to break new grounds in their storytelling techniques.

CONCLUSION

In 2014, the prolog to *Metal Gear Solid V* was released, entitled *Metal Gear Solid: Ground Zeroes*. The game quickly came under fire from some fans who discovered a controversial Easter egg in the form of a cassette tape procured by Big Boss. The audio of the cassette tape, when played, documents a torturous event in which a male character is forced by gunpoint to rape a fellow prisoner-of-war. For the most part, the criticism of the scene does not stem from the inclusion of the subject matter itself; instead, some bloggers argue that the writers handle the matter in an irresponsible way. For example, one critic claims that the weighted theme of sexual assault stands at odds with the often "wild, whiplashing narrative tone" of the series (Parish, 2014), while another chastises the decision of presenting rape to the player via an Easter egg (with Easter eggs traditionally being a way for game developers to reward dedicated fans) (Jenkins, 2014). In the comments sections of blogs, some fans defend creator Hideo Kojima, for instance, arguing that critics fail to consider the cultural nuances of the Japanese narrative (which often juxtaposes slapstick comic relief against weighted themes). Regardless, considering that *Metal Gear Solid V* promises to tackle additional themes such as rape, racial genocide, amputation, the rearing of child soldiers, and government-sponsored torture, the need to discuss and examine PTSD in games is more urgent than ever. We will continue to see digital narratives with increasingly mature themes, and those of us defending the literary merit of such games must propel the dialog forward to ensure that themes, such as trauma are conveyed in a responsible way.

Although we are approaching these video games with a critical eye, we believe that the digital narratives representing *Max Payne* and *Metal Gear Solid* stand upon a foundation of rich, relevant texts that rival many of the narratives in the traditional fictional canon. While storytelling within games has undoubtedly maturated in the past two decades, we can undoubtedly help contemporary digital narratives further evolve by critically reflecting on their themes in a public space. We encourage responses from gamers and non-gamers, developers, critics, veterans, mental-health professionals, educators, and most importantly, survivors of lived trauma. Hopefully, this will spark a discourse on how the gaming community can approach the various issues of trauma in a way that fosters reparative growth and minimizes

the harms of un-nurtured pain. While the discussion of video-game violence in open forums may be dismissed as irrelevant by detractors outside the gaming community, it is important that gamers who value quality digital narratives remain persistent. After all, in the words of Big Boss: *We fight because we are needed*.

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CHAPTER 3

Emotion, Empathy, and Ethical Thinking in *Fable III*

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INTRODUCTION

What is the role of emotions, empathy, and ethical decision-making in video games, and how do they interrelate? This exploratory study investigates the role-playing video game, *Fable III*, and how participants make ethical decisions in the game while considering emotions and other empathy-related skills and thought processes, in relation to their choices.

The role of emotions and empathy in ethical decision-making is not yet well understood. Part of this is due to the complexity of defining emotions and empathy, and the individual differences in how people express and identify emotions, as well as the difficulty in modeling and empirically studying ethical decision-making itself (Cottone & Claus, 2000; O'Fallon & Butterfield, 2005; Rogerson, Gottlieb, Handelsman, Knapp, & Younggren, 2011). Some models of ethical decision-making do not clearly explicate how emotion, emotional intelligence, and/or emotional awareness are part of the process (e.g., Rest, 1986), whereas other models are more explicit about it (Krishnakumar & Rymph, 2012).

Adding games to the mix contributes to the complexity of the decision-making model. On the flip side, however, using video games potentially helps us to better understand how emotion and empathy is involved in ethical thinking and decision-making—particularly if we use role-playing video games that have ethical choices in them. I define role-playing games as rule-based systems with "quantifiable outcomes" (Juul, 2005), where players overcome obstacles, make decisions, and manage resources (Costikyan, 2002), and build a character's abilities (one's role in the game), to enhance completion of the game's goals. A number of video games include ethical choices as part of their gameplay, the outcomes of which may have quantitative effects on a player's relationships with nonplaying characters (NPCs), effects on the story or plotlines experienced, changes in the game's environment, changes in

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a player's avatar's karma points or goodness/badness level, or even no outcome at all (Schrier, 2010, 2014a; Stevenson, 2011).

By investigating how participants think through ethical decisions in contexts, such as role-playing video games, we may further our understanding of the interrelationship among emotions, empathy, and ethical decision-making. This type of study is particularly essential because people are spending a significant portion of their time playing games (Entertainment Software Association (ESA), 2014; NPD Group, 2012). Adults and children are increasingly spending time in games and virtual environments—211.5 million people in the USA play games (NPD Group, 2012) or 59% of Americans play games (ESA, 2014). Moreover, many studies are suggesting an increase in ethics "crises" such as citing a rise in cheating and plagiarism (Riemenschneider, Leonard, & Manley, 2011) and the accounting and business scandals of recent years (Floyd, Xu, Atkins, & Caldwell, 2013; Riemenschneider et al., 2011). Regardless of the existence of an actual crisis, there is a need for understanding ethical decision-making. The Harvard Graduate School of Education's "The Making Caring Common" Project, released a report (Weissbourd, Jones, Anderson, Kahn, & Russell, 2014) that explained that the participants were privileging achievement and their own individual concerns, over caring and fairness, in relation to their peers. The report explains that, "When children do not prioritize caring and fairness in relation to their self-concerns—and when they view their peers as even less likely to prioritize these values—there is a lower bar for many forms of harmful behavior, including cruelty, disrespect, dishonesty, and cheating" (Weissbourd et al., 2014). Understanding the role of emotion- and empathy-related skills and thought processes in these decisions could help to create interventions to potentially change children's and other's priorities.

Defining Empathy, Emotions, Ethics, and Ethical Thinking

This section introduces and defines four terms: empathy, ethics, ethical thinking, and emotions.

Empathy

Empathy is complex, and there are many differing views on how it is manifested cognitively and behaviorally, including as, "emotional contagion based on unconscious mimicry, … as the projection of one's thoughts and feelings onto others, … as the ability to accurately infer another's thoughts and feelings, …." (Decety & Ickes, 2009, vii-viii).

Similarly, Batson (2009) explains that empathy has been applied to many different phenomena, and often gets conflated with sympathy, despite the fact that they are unique terms (Jolliffe & Farrington, 2006). Batson (2009) explains eight typical uses of the term empathy, including:

1. Knowing another person's thoughts and feelings.
2. Adapting or mimicking the responses of another.
3. Feeling what another feels.
4. Putting oneself in another's shoes.
5. Imagining how someone else is feeling or thinking.
6. Imagining how one would feel if they were in another's shoes.
7. Feeling strong emotions (e.g., distress, unease, anxiety) while observing someone else's misfortune or pain.
8. Feeling another's pain or misfortune.

Gerdes, Segal, Jackson, and Mullins (2011), building on Decety's definitions of empathy, identify four components of empathy, which include many affective aspects:

1. The ability to automatically and affectively respond to others, which may involve sharing each other's emotional states.
2. The capacity to cognitively take on the perspective of another individual.
3. The ability to identify and modulate one's own emotions.
4. The ability to be both self-aware and aware of someone else, in a way that allows a person to at least temporarily feel what someone else feels or identifies with another, while also understanding the separation between self and other (Decety & Jackson, 2004; Decety & Moriguchi, 2007; Gerdes et al., 2011).

Notably, many of the empathy term uses and components of empathy are affective and emotion-related.

Finally, Mencl and May (2009) define empathy as having positive intentionality, such that there is a relationship between empathy and pro-social behavior. They explain empathy as: "the moral emotion concerning the welfare of others that facilitates interpersonal relationships and positively influences people to engage in pro-social and altruistic behaviors" (Mencl & May, 2009). However, others have argued that empathy is not necessarily related to pro-social behavior, as empathy could be used to manipulate, just as much as to care (Noddings, 2010). Vascocelos, Hollis, Nowbahari, and Kacelnik (2012) suggest that empathy and pro-sociality are not the same, and that each is open to interpretation based on the intentionality of the individual. Jolliffe and Farrington (2004, 2006) have questioned the relationship between empathy and pro-sociality, and expressed that confounding factors,

such as identity (Hardy, 2006) intelligence or socioeconomic status, may affect this relationship.

This study focuses less on trying to define empathy, and instead focuses on identifying and investigating the skills and thought processes related to cognitive and affective aspects of empathy. These skills and thought processes are labeled in the study as empathy-related skills and thought processes.

Ethics and Ethical Thinking

The term "ethics" is also complicated and open to interpretation. Typically, the term "morals" refers to universal principles (Tierney, 1994) or the principles or rules that guide someone's behavior or activities (Wines, 2008). Ethics is seen as a more reflective, affective, and cognitive process, whereby people apply moral principles to specific choices, scenarios, and possibilities (Wines, 2008). The purpose of ethics could be to live a good life (Sicart, 2005, 2009), or to act with humanity (Nussbaum, 2010), but the specific approach to ethics that one uses can be quite personal, unique, or a hybrid of many approaches. For example, there are hundreds of years of theories (or "schools") on how people approach ethics, such as Kantian, utilitarian, hedonistic, or the ethics of care (Shafer-Landau, 2010), and these approaches each have their own limitations and benefits. The ethics of care approach is specifically relevant to this exploratory study. There are two main types of moral orientations or main perspectives, whereby people approach ethics (Levitt & Aligo, 2013), which have been suggested:

1. People may approach ethics with a more justice-oriented approach, or one that focuses on equality and fairness (Botes, 2000).
2. Others may approach ethics with a care orientation, or one that focuses on relationships, caring for others and their needs (Botes, 2000; Gilligan, 1982).

Both Gilligan (1982) and Noddings (2003) have been influential in developing the ethics of care approach. This approach began as a critique of Kohlberg's (1969) theory of moral development, and other more male- and justice-centered approaches to morality and ethical decision-making. The existence of the ethics of care perspective presumes a relationship between ethical decision-making and care-, emotion- and empathy-related concepts, which heretofore had been not considered.

For the purposes of clarity in this chapter, the term "ethics" will be used and it will assemble all skills and cognitive or affective processes related to the practice of ethics under the umbrella term, "ethical thinking." In this way, ethical thinking becomes a type of literacy or constellation of skills, affective,

and thought processes related to determining how to act ethically and how to think through ethical scenarios (Schrier, 2011, 2012, 2014a, 2014b; Schrier & Kinzer, 2009). The skills, concepts, and processes related to ethical thinking could include, for example, perspective-taking, consideration of another's emotions, interpretation of evidence, or reflection on one's personal ethics. The specific skills and thought processes (that constitute ethical thinking) discussed in this chapter emerge from participants playing *Fable III*, and how they think through its ethical choices.

Emotions

Not surprisingly, defining emotions and the affective aspects of human life is also difficult. Emotions are typically defined as "intense feelings directed at someone or something" (Krishnakumar & Rymph, 2012, p. 324). They may vary in terms of being positive or negative, or in intensity, and they have a role in almost all social and physical contexts, affecting one's decision-making and choices (Krishnakumar & Rymph, 2012). There are a number of generally-agreed upon categories of emotions that have been found cross-culturally and cross-disciplinarily, including anger, fear, disgust, surprise, happiness, and sadness (Ekman, 1999). Understanding the specific emotions used in *Fable III* is less important than whether emotions, on the whole, were identified as being used in ethical decision-making, including one's own emotions, or the perceived or interpreted emotions of another individual (or even NPC, who is a game character that is artificially intelligent and controlled through the game).

In this sense, what is being studied is not emotion, *per se*, but the skills or thought processes that the participants use when making decisions that are "emotion-related," and are more akin to the assemblage of skills and thought processes related to emotional awareness or emotional intelligence. "Emotional intelligence" deals with the ability of an individual to manage, use, understand, identify, and handle emotions in a variety of situations and contexts (Krishnakumar & Rymph, 2012; Salovey & Mayer, 1990). Krishnakumar and Rymph (2012, p. 328) define four branches of emotional intelligence: "(1) the ability to perceive emotions; (2) the ability to thoughtfully use emotions; (3) the ability to understand emotions; and (4) the ability to manage emotions." It is suggested that emotional intelligence, and its concomitant abilities, are relevant to, and play a significant role in, ethical decision-making (Krishnakumar & Rymph, 2012).

The Relationships Among Ethics, Emotions, and Empathy

A number of researchers have suggested relationships among emotions, empathy, and ethical decision-making. Krishnakumar and Rymph (2012)

explain that many models of ethical decision-making focus on the cognitive, rather than affective aspects. Yet, ethical decision-making and emotions are intertwined, and intense negative or positive emotions can function as obstacles or enhancements to decision-making (Krishnakumar & Rymph, 2012). For example, Krishnakumar and Rymph's (2012) study critiques Rest's (1986) model of ethical decision-making, by exposing the importance of emotions, particularly negative emotions, such as anger, to the process. Moreover, their results suggest that how a person manages the emotions throughout the ethical decision-making process affects how those emotions may help or halt it (Krishnakumar & Rymph, 2012). Similarly, the role of emotions and feelings in general decision-making has been suggested (e.g., Dunbar, 2005; Etzioni, 1988).

Empathy- and care-related concepts, skills, and thought processes have also been suggested to be related to ethical decision-making. Critiquing Kohlberg's (1969) six stages of moral development, Gilligan (1982) explains that care is a key component of moral thinking, and that people's relationships and connections to others affect how they think through ethical choices. Similarly, Noddings (1984, p. 244) posits that morality requires a "sentiment of natural caring" and that caring forms the foundation and motivation for ethical relationships. She argues that discourse around ethics and ethical behavior often centers on logic, mathematical calculations, fairness, objectivity, order, and justice—traits traditionally associated with the masculine—rather than the natural, instinctual, empathetic, emotional—traits traditionally associated with the feminine (Noddings, 2003). Noddings argues that it is in fact caring and wanting to care—being in a caring relationship—that motivates us to act morally, and not mathematical calculations or logic (Noddings, 2003). Other theorists, such as Dewey (2008), blend together the caring and emotional, with reasoning and logical components, when defining ethics.

Also, Jolliffe and Farrington (2006) posit that empathy is also integral to moral development and ethical practice, and created a basic empathy scale that integrates both the affective and cognitive abilities typically associated with empathy. Mencl and May (2009) empirically tested the extent to which cognitive and affective empathy plays a role in ethical decision-making in managerial contexts, and included empathy as a factor that mediates or facilitates a situation's ethical quality by enhancing one's understanding of the implications of the situation and by influencing moral judgment (Mencl & May, 2009). This resulted in the development of a new framework for ethical decision-making that includes empathy in relation to a managerial context

(Mencl & May, 2009). In general, however, empirical research on the relationship between ethics and empathy is sparse, especially in nonmanagement contexts.

While there has not been as much research focused on the interplay of emotion- and empathy-related skills and thought processes, and ethical decision-making, one study suggested that the inclusion of empathy and feelings in ethical decision-making and ethical thinking may even lead to more humane outcomes. Lurie (2004) investigated ethical decisions made in a managerial context, and results suggested that managers that use emotions effectively make more compassionate decisions and strengthen relationships among people. Overall, these studies suggest relationships between the three elements, though determining the extent to which they affect each other is less clear.

Games, Emotion, Empathy, and Ethics

Prior research suggests that games may be useful ways to unpack the relationships between emotion, empathy, and ethics. For example, art, including film, music, literature, and paintings, can be moving (Gerdes et al., 2011), which helps encourage empathy and emotional awareness. Gerdes et al. (2011, p. 122) explain that, "Using the medium of art can be a way to engage people in training or retraining the mirror neurons for affective sharing and the cognitive pathways for self/other-awareness, mental flexibility, and emotion regulation." Moreover, Gerdes et al. (2011, p. 123) explain that role-playing, and psychodrama help to encourage "perspective-taking, self/other-awareness, and emotion regulation …," which are emotion and empathy-related. These types of activities can have implications for ethical thinking. For example, Doorn and Kroesen (2013) explain the use of role play in an engineering ethics activity that helped the participants become aware of their decisions, create new ethical solutions, and consider other perspectives.

In addition, storytelling and narrative experiences can be relevant to emotion-, empathy-, and ethics-related processes. Stories can work as ethics examples, modeling action or values, and help people become more aware of their own and other's emotions and perspectives. Stories can help us experiment with different possibilities and outcomes, and gives us access into other people's emotional states, potentially encouraging us to further practice emotion- and empathy-related skills and thought processes. For example, Cragg (1997, p. 236) explains that, "to weaken the grip of prejudice in a society, people, particularly children have to be brought into contact with images, stories, and experiences that challenge stereotypes and change perceptions."

Knowing all this, it is not as much of a stretch to consider that some games—as works of art that can have story and role-play elements—may also be practice fields for emotion- and empathy-related skills and thought processes, coupled with ethical decision-making. In games, participants can try out choices and consequences, experiment with alternative viewpoints, experience other's displays of emotions, and take on new approaches to ethics (Schrier, 2010, 2014a; Schrier & Kinzer, 2009). Shea-Dinkin et al. (2013) argue that games can move people and be emotionally meaningful. Sicart (2009) views games as "designed ethical objects," which may embed ethical choices as part of their gameplay, and that they are also human artifacts, that, by their very nature, are themselves ethical systems that express values and perspectives. Zagal (2009, 2011) argues that "ethically notable" games can motivate moral reflection and reasoning.

Similarly, Steinkeuhler and Simkins (2008) argue that role-playing game participants enact ethical decision-making, and games can be a context for making situated decisions, and reflecting on the outcomes of those decisions. This research, however, does not consider empathy or emotions as components of this decision-making, and looks instead at how the player makes decisions in the game, such as through social context, rather than the discrete skills or thought processes used to make ethical decisions.

There are limited examples of research that considers the empathy-related aspects of games and decision-making in games, however this is a burgeoning field. Schrier, Diamond, and Langendoen (2010) describe *Mission U.S.: For Crown or Colony*, a game created by PBS/WNET and Electric Funstuff for middle school students, to encourage the practice of historical empathy-related skills, reflection, and ethical thinking skills. Schrier et al. explain that the Boston Massacre is a key moment in the game, because each player receives slightly different vignettes showing what happened, since what happened is still unknown. Teachers would pause the game and use this in-game moment to question students regarding their differing perspectives on the event, motivate students to discuss any differences, and to reflect on why each player received varied vignettes. In the next part of the game, students would decide what happened at the Boston Massacre at an official deposition, where their responses (and whether they lie or not about what they saw) would have consequences for their game's ending, and for how their character's relationships with the NPCs would turn out. The researcher's findings suggested that the game helped enhance skills, such as empathy and historical empathy, ethical reasoning, and awareness of ethical issues (Schrier et al., 2010). This game did activate empathy-related skills and thought processes in ethical decision-making, at least in a history-based scenarios.

On the other hand, researchers have also debated whether the ethical choices that appear in games are authentic and approximate real-life situations, as they may be too simplistic (Melenson, 2011; Švelch, 2010). Morality meters in games, such as the karma point system in *Fallout III*, and the renegade/paragon system in the *Mass Effect* series may not encourage ethical thinking, but rather, motivate players to maximize "goodness" or "badness," as if it is just another in-game mechanic, such as agility, strength, or happiness (Švelch, 2010). Zagal (2009) further challenges this notion by asking whether games need to have explicit ethical decision points or choices to motivate moral reflection, or whether such thought can occur in the "quotidian" or everyday activities of a game, such as *Heavy Rain* (Zagal, 2012).

While researchers have begun to debate the potential of games as an authentic context for ethical thinking, they have not closely investigated or empirically reviewed which ethical thinking processes occur in games, nor analyzed the factors, skills, and thought processes related to such processes. This research fills this gap by exploring and systematically investigating, classifying, and comparing the skills and thought processes employed in the ethical decision-making processes in a game, *Fable III*, while considering how emotion- and empathy-related processes are related to this.

Research Questions

This chapter does not focus on whether games, as media artifacts, or time spent playing games, are "ethical," but instead, how people navigate emotion- and empathy-related skills and thought processes while making ethical decisions in the games, and perhaps, the nature of ethical decision-making itself. The following are the research questions used for this study:

1. What types of skills and thought processes do players use to make ethical decisions in *Fable III*?
2. What, if any, emotion-related skills and thought processes are used when thinking through ethical decisions in *Fable III* and in the control (non-game) condition? Are there differences among conditions?
3. What, if any, empathy-related skills and thought processes are used when thinking through ethical decisions in *Fable III* and in the control (non-game) condition? Are there differences among conditions?

METHOD

An exploratory, multiple case study with mixed methodologies was conducted to investigate how ethical decisions were made in *Fable III* (2010),

a role-playing video game developed by Lionhead Studios. *Fable III* was chosen in part to the popularity of the series overall (e.g., Alderman, 2010; Burg, 2008), inclusion of ethical choices that all players would receive as part of the game, and the relatively short length of game play required to play this game.

Participants

In total, 30 participants were recruited and completed the study. All participants were male, aged 18-34 years old, who have access to an Xbox 360, play games regularly (at least 1 h per week), and had never played *Fable III*. All participants were male to minimize potential differences between subjects, given the limited sample size. Participants self-reported as Asian or Pacific Islander (10%); Black or African-American (13.33%); Hispanic or Latino (20%); or White (56.67%).

Procedure

All participants were asked to fill out a survey that included demographic and attitudinal questions. Participants were randomly assigned into two groups: Game Condition ($n = 20$) group or the Control Condition ($n = 10$) group. In the Game Condition, participants played *Fable III* for at least 9 h over the course of about 1 month. At five specific points in *Fable III*, participants filled out journal entries, where they named the ethical decisions they made as part of the quests or activities, explained why it was an ethical decision for them, and described how they made their decisions. They all paused playing *Fable III* at the same point, at which time the researcher observed them playing the game. During the in-person observation, they were instructed to "talk aloud" while making any decision in the game, or express out loud any thoughts, feelings, or rationales when making an ethical decision in the game. Following the in-person gameplaying observation, a semi-structured interview (McMillan & Schumacher, 2001) was performed.

Participants in the Control Condition did not play *Fable III*. They were provided with five written scenarios based on those encountered in *Fable III*, and filled out a journal entry on each scenario. They also participated in a 40-minute semi-structured interview after submitting their journal entries. Since the five scenarios were *read*, rather than *played*, this could reveal any differences in how skills and thought processes were practiced in the game, and how elements, such as game mechanics, context of an open world, relationships with game characters, identification of character's emotions, etc., may

relate to any similarities and differences. Exploration of the 20 cases of ethical decision-making in *Fable III* could also suggest how empathy and emotions are factors in game-based ethical choices.

Coding Scheme

The researcher developed a coding scheme by analyzing 10% of the total transcripts of the 150 journal entries from the 30 participants; 30 interview transcripts; and 30 responses to each of the five scenarios on the survey. The transcripts were first analyzed by coding or tagging the individual words used by the participants, to describe their skills and thought processes. Next, the same transcripts were analyzed using thematic coding, which involves labeling each passage of the transcript with more general themes describing the skills and thought processes used. Finally, all words and themes were consolidated for repetition, and those that were related specifically to *Fable III*'s game play were removed. In doing so, the researcher identified and classified 35 discrete skills and 20 thought processes employed by the participants, including empathy-related skills and thought processes (see Tables 3.1 and 3.2). "Discrete" refers to how the skills and thought processes were coded, not to how they may be have been used by the participant. Skills were defined as any behavior or action performed in relation to, or applied to, making a decision in a scenario, such as "prioritizing goals." A thought process was any act of cognition in relation to, or applied to, making a decision in a scenario, such as the "prioritization of relationships over other factors." Once the coding scheme was generated, all of the transcripts were then coded using these skills and thought processes. This process was tested

Table 3.1 Empathy-related skills used in *Fable III*, by category

Skills	Category
Consider own emotions	Empathy-related/emotion-related
Consider someone's motivation	Empathy-related
Perspective-taking/consider someone's perspective	Empathy-related
Consider another's emotions/feelings	Empathy-related/emotion-related
Assess relationship with another character/person	Empathy-related
Consider other's opinions/seeks the character's opinion	Empathy-related
Consider another's character or values	Empathy-related

Table 3.2 All empathy-related thought processes used in *Fable III*, by category

Thought processes	Category
Prioritization of other's perspectives	Empathy-related
Prioritization of feelings/emotions	Empathy-related/emotion-related
Prioritization of relationships	Empathy-related
Solving a problem from another perspective	Empathy-related
Prioritization of someone else's opinions	Empathy-related
Integrating perspectives from another character	Empathy-related

for an inter-rater agreement of at least 85%, which was surpassed following the first round of testing.

Rather than privilege one definition or use of empathy over another, in this exploratory study, all expressed cognitive, behavioral, and affective activities used, which related to Batson's (2009) eight uses, listed above, or Gerdes et al.'s (2011) four described components of empathy, are labeled as empathy-related.

Summary of Game and Scenarios Used

Synopsis of Fable III

Fable III is a role-playing game developed by Lionhead Studios and released in October 2011. It is set in the same world (Albion) as prequels *Fable* (2004) and *Fable II* (2008), but includes a different story and characters. In general, the *Fable* series includes story-driven experiences where participants play an avatar, or a character that represents the player in the virtual world of the game. They can shape this character (the "role") by how they play in the game; for example, through the successful completion of quests, how they treat others in the game and make decisions in the game, and through leveling up or gaining new skills (e.g., sword abilities or magic casting abilities).

In *Fable III*, specifically, the player begins as the prince or princess of Albion. The first half of the game involves going on quests (such as finding special diamonds) and building relationships with NPCs, or virtual, computer-generated characters not controlled by a human player. The goal in the first half of the game is to overthrow one's brother, the evil King Logan.

Once Logan is overthrown, the player becomes the King or Queen of Albion, and the game's structure changes. In this half of the game, players decide how to rule Albion. They are asked by an NPC, at specific intervals

in the game, to make decisions, for example, about raising or lowering taxes, or preserving the environment.

Throughout the entirety of *Fable III*, the player builds his avatar's reputation based on his or her behavior during quests, interactions with any NPCs, and the choices he or she makes. As a result, the avatar's moral standing changes, the avatar's appearance changes, how NPCs treat the avatar changes, and the world of Albion also evolves. For example, players, via their avatar, can kill an innocent townsperson, which may decrease their moral standing; NPCs in the game may treat the avatar with more fear. One participant noted that his in-game child NPC would repeatedly ask him why he killed one of the innocent townspeople, which he had accidentally shot during a quest.

For the purposes of this chapter, two of the ethical decisions experienced in *Fable III* will be focused upon, as well as one additional scenario, which was provided to all participants in all conditions during the semi-structured interview.

While there were many more scenarios that were identified as being ethical decisions by the participants, these are focused upon particularly because they were all identified as being an ethical decision *and* helped to elucidate the complex relationship among emotions, empathy, and ethical thinking. While there were hundreds of decisions in the game (e.g., from should I walk up or down, to should I use a bow and arrow, or cast a spell on this enemy), all participants identified these two specific decisions in the game as being "ethical"—that is, having a choice that involves a value judgment. It was not predetermined which scenarios to include prior to the study, in order to reduce interviewer bias, and to ensure that the study only analyzed ethical decisions, and not just any decision points.

"Surrender a Friend"

The "Surrender a Friend" scenario occurs in the very beginning of *Fable III*. In this scenario, the player, as a prince or princess, is introduced to his/her childhood friend, named Elise or Elliot, depending on the avatar's gender. (The friend is the opposite gender.) After a very brief period of time with the friend, the prince/princess is captured and brought to his/her brother, King Logan, who has caught three protesting villagers. Logan asks participants to sacrifice either Elise/Elliot or the three villagers. Or, if participants do not decide or wait too long, both Elise/Elliot and the villagers are killed. Also, during this scene, Elise/Elliot begs to be sacrificed and the villagers look scared.

"Walter"

The "Walter" scenario occurs in the middle of playing *Fable III*. After the player sees either a friend and/or the villagers sacrificed, they are imprisoned by Logan. The player escapes and goes on quests to find ways to overthrow Logan. To do this, Walter becomes a mentor, trains the player, and helps in all quests. During one of the quests, an enemy blinds Walter, so the player needs to drag Walter out of a cave and toward safety. The act of dragging Walter is very slow, frustrating, and tedious; the player needs to drag this character by holding down the controller for a number of minutes, which is physically and mentally challenging both inside the game and in real life. Once the player reaches the end of the cave, Walter collapses and exclaims that he cannot go any further. At this point, the player must decide whether to continue to drag Walter across a wide desert or leave him behind, by either continuing to press on the controller forcefully for an indefinite period of time, or finally releasing Walter (and the controller), and being able to maneuver the game much more easily.

"Drill"

This scenario did not appear in the game or the written scenarios, but was provided to all study participants right after the interview. Participants were read the same exact scenario by the researcher, and told to imagine that they are working at a company that hosts an auction of old equipment to its employees. While working, the participant observes a fellow employee, 2 months from retirement, slipping a drill into his car. The participant is then asked what he would do in this situation.

RESULTS

General Results

All "talk aloud" utterances, interview statements, and journal entries were coded using an interviewer-developed scheme that identified and classified skills and thought processes into one of the following four categories: reasoning-related; empathy-related; reflection-related; and information gathering-related. For example, the skills "consider another character's emotions" and "consider other's opinions" were marked as empathy-related because they involved seeing the world through another person's or character's eyes and factoring in their perceived perspectives (both of which relate to Batson's eight uses of empathy (Batson, 2009). As a counterpoint, "Prioritizing goals or options" and "consideration of consequences" were

marked as reasoning-related because they involved analyzing and interpreting evidence, data, and other information, to help make a decision.

Seven empathy-related skills and six empathy-related thought processes were identified as being used in the game and control conditions (see Tables 3.1 and 3.2).

Two skills ("Consider own emotions" and "Consider another's emotions") and one thought process ("Prioritization of feelings/emotions") involved emotions (see Tables 3.1 and 3.2).

Empathy-related skills and thought processes were used frequently in the game overall when participants made ethical decisions in *Fable III*. For example, the top 10 skills used by game participants included two empathy-related ones, "Consider relationship with another character" and "Consider another's character" (see Table 3.3).

None of the top 10 skills used most frequently by control condition participants in the written scenario, however, were empathy-related (see Table 3.4).

Four of the top five thought processes used by game participants were empathy-related (see Table 3.5); whereas the top two thought processes used by control participants were reasoning-related (see Table 3.6).

Summarized Results by Scenario

To evaluate the ethical thinking skills and thought processes performed in the "Surrender a Friend," "Walter," and "Drill" scenarios, and the role emotion- and empathy-related skills and thought processes played in ethical

Table 3.3 Highest frequency skills used overall in *Fable III*

Skills	Category
Providing reasons for decision	Reasoning-related
Using evidence to support choices	Reasoning-related
Consideration of consequences	Reasoning-related
Analysis of situation or context	Reasoning-related
Interpretation of information	Reasoning-related
Prioritizing goals	Reasoning-related
Weigh different options	Reasoning-related
Identify pros and cons	Reasoning-related
Consider relationship with another character	Empathy-related
Consider another's character	Empathy-related
Financial assessment	Reasoning-related

Table 3.4 Highest frequency skills used overall in the control condition

Skills	Category
Providing reasons for decision	Reasoning-related
Using evidence to support choices	Reasoning-related
Consideration of consequences	Reasoning-related
Analysis of situation or context	Reasoning-related
Interpretation of information	Reasoning-related
Prioritizing goals	Reasoning-related
Financial assessment	Reasoning-related
Identify pros and cons	Reasoning-related
Weigh different options	Reasoning-related
Consider how information would affect choices	Information gathering-related

Table 3.5 Highest frequency thought processes used overall in *Fable III*

Thought processes	Category
Imagining what-if scenarios	Reasoning-related
Integrating perspectives from another character	Empathy-related
Prioritizing relationships	Empathy-related
Prioritizing of other's perspectives	Empathy-related
Prioritizing someone else's feelings	Empathy-related

Table 3.6 Highest frequency thought processes used overall in the control condition

Thought processes	Category
Prioritization of financial/resource gain	Reasoning-related
Imagining what-if scenarios	Reasoning-related
Prioritization of safety/people's lives	Empathy-related
Prioritizing relationships	Empathy-related
Prioritizing of other's perspectives	Empathy-related

decision-making, statistical analysis was conducted. Frequency counts were derived and Fisher's exact test was conducted to note any significant differences on answering similar scenarios on the Control versus Game Conditions, and between scenarios, on any skill or thought process that emerged. Due to the limited sample size, although some differences were found to be statistically significant, they should still be considered as trends, and further investigated. For clarity, Control scenario results are designated as "B" and Game scenario results are designated as "C."

Table 3.7 Differences in empathy-related skills and thought processes in the "Surrender a Friend" scenario, by condition

	Control ($n = 10$)	Game ($n = 20$)	Significance
Consider other's emotions	90%	35%	$p = 0.0067$
Consider one's own emotions	60%	20%	$p = 0.0449$
Consider another's character	90%	50%	$p = 0.0485$
Prioritization of relationships	70%	25%	$p = 0.0450$

"Surrender a Friend"

Using Fisher's exact test, there was a significant difference on three empathy-related skills (see Table 3.7):

1. "Consider other's emotions or feelings" on B (90%) versus C (35%) ($p = 0.0067$).
2. "Consider one's own emotions" on B (60%) versus C (20%) ($p = 0.0449$).
3. "Consider another's character" on B (90%) versus C (50%) ($p = 0.0485$).

Using Fisher's exact test, there was a significant difference on one empathy-related thought process ("Prioritization of relationships") on B (70%) versus C (25%) ($p = 0.0450$).

"Walter"

In the "Walter" scenario, more than any other piece of evidence, game participants "prioritized relationships" when considering what to do in the "Walter" scenario. Control condition participants were not provided with an analogous scenario; therefore, this scenario will only be discussed in comparison with other game scenarios.

The empathy-related skills and thought processes used were compared with the "Surrender a Friend" scenario for Game condition participants only. Using Fisher's exact test, there was a significant difference on one empathy-related skill, "Assess relationship with another character/people" on "Surrender a Friend" (50%) versus "Walter" (85%) ($p = 0.0407$).

Using Fisher's exact test, there was a significant difference on one empathy-related thought process ("Prioritization of relationships") on "Surrender a Friend" (25%) versus "Walter" (80%) ($p = 0.0012$).

It should be emphasized that the two scenarios that were compared, "Walter" and "Surrender a Friend," are not exactly analogous, as you are

not choosing between sacrificing Walter and other NPCs, but rather, you are choosing to save Walter versus putting your own self (via your avatar) in potential danger.

"Drill"

Frequency counts were derived and Fisher's exact test was conducted to note any significant differences in the ethical thinking skills and processes in how the Control and Game group participants thought through "Drill (B)" versus "Drill (C)," which were both provided to all participants during the interview process.

Using Fisher's exact test, there was a significant difference on one empathy-related thought process, "Integrating and problem solving from another perspective," on B (30%) versus C (75%) ($p = 0.0450$), and a directional difference on one empathy-related skill, "consider other's feelings/emotions" on B (0%) versus C (25%) ($p = 0.1400$).

DISCUSSION

Empathy-Related and Emotion-Related Skills and Thought Processes Were Practiced when Playing *Fable III*

The results of the present study suggest that a variety of ethical thinking skills and thought processes were employed while playing *Fable III*, and many of them were emotion-related and empathy-related. Participants did identify and consider the emotions of artificially intelligent NPCs, and that factored into their ethical decision-making process. In addition, they considered their own emotions as part of the process in a game. Participants used a majority of the eight different conceptions of empathy (Batson, 2009), such as putting themselves in another's shoes and considering another person's thoughts and feelings, when they were making ethical decisions in *Fable III*.

Empathy-related skills, including ones related to emotion, were frequently used in both the Control and Game conditions. One possible reason for this is that both scenarios included a story context (either written or via a game), and the story itself may motivate frequent use of empathy-related skills and thought processes. As discussed earlier in this chapter, a story can motivate empathy-related skills and thought processes. For example, Johnson (2012) explains how the use of a story (narrative fiction) enhanced affective empathy. More research should be used to further parse any differences between how story functions in a written and game context in motivating emotion-related empathy skills, thought processes, and cognitive-related empathy skills and thought processes, and ethical thinking.

Empathy-Related and Emotion-Related Skills Thought Processes Were Practiced in Tandem with Reasoning-Related and Other Skills

Empathy-related thought processes were identified as those skills and thought processes related to emotions and feelings, the taking of other's perspectives, and prioritization of other's feelings or perspectives, as based on the literature review (see Tables 3.1–3.3, 3.5, and 3.6). Reasoning-related skills and thought processes were identified as those skills and thought processes related to assessing choices, thinking through consequences, prioritizing goals, or weighing pros and cons, regardless of whether it involved emotions, empathy, or neither (see Tables 3.3–3.6). A negative relationship between the use of empathy and reasoning skills and thought processes to make ethical decisions was not suggested by this study. Rather, empathy and other types of skills were used in tandem to make decisions. The use of emotions and affects in ethical decision-making, which was not at the expense of reasoning, is echoed by researchers, such as Robinson (2004) and Hanoch (2002), who reunify the rational with the emotional, and see any separation as superficial. fMRI (functional MRI) studies suggest that there are distinct areas of the brain—ones related to emotion and ones related to cognition—that are activated differentially by various types of ethical scenarios, further complicating these findings (Borg, Hynes, van Horn, Grafton, & Sinnott-Armstrong, 2006).

Empathy-Related and Emotion-Related Skills and Thought Processes Were Practiced More Frequently when Participants Were Able to Build Relationships with NPCs Over Time

Results suggested that in *Fable III*, there was a more frequent use of empathy-related thought processes/skills, such as considering the emotions of an NPC, if the participant experienced a relationship with an NPC over time in the game. This was exhibited in how the participant thought through the "Walter" scenario, as opposed to the "Surrender a Friend" scenario. The "Surrender a Friend" scenario took place at the very beginning of *Fable III*, when participants did not yet have an opportunity to establish a relationship with Elise/Elliot. Although they were told this was a close childhood friend, they did not experience the relationship in the game. However, the "Walter" choice occurred in the middle of the game, after the participant had spent many hours interacting with the character, and building a (virtual) friendship with him. These assertions are supported by the participants' explanations during their interview post-game. One participant said regarding Elliot, "All of my interaction with Elliot so far, I've really only had three or four minutes of

experience with Elliot prior to killing him off, so I didn't have an established relationship with him like I have with a lot of these characters now. So I didn't really feel any kind of connection with him."

Similarly, another participant echoed this by saying, in regard to Elliot, "I also felt that I had no attachment to the character's bf [sic], because he literally was only in a few scenes in the beginning. Attachments usually grow with time. I would think by the end of the game, if I had to choose between my dog dying or a group of people, I would probably pick my dog."

On the other hand, participants were adamant about not sacrificing Walter, as they had developed a strong relationship with this NPC over time. One participant said, "There was no way I was going to leave [Walter] behind. He's been my companion and guide the entire game. I would've walked at that really slow speed for quite a while before dropping him. I was pretty attached to [Walter]." Another participant echoed this by saying, "I owe everything I have to Walter and I am who I am because of him. This was a fantastic time to return Walter's selflessness by helping him in a time of need. In addition, since he was blinded and traumatized by the ordeal in the caves, Walter needed help more than ever. Helping Walter in the situation could have meant death for both of us, but in a time of need, friends and family sacrifice for each other and that's why I chose to do so."

The participants were visibly distraught and worried about saving Walter and his fate, rather than the choice itself, whereas the participants were more stressed and worried about their choice in saving Elliot/Elise or the villagers, rather than the fate of Elliot/Elise. More research that focuses specifically on the player's emotions at the different points in the game, rather than just how they responded to their own or their perceptions of other's emotions, should be further researched.

Game Participants Needed to Experience a Relationship First-Hand to Feel Emotionally Involved, Whereas in a Written Story, Participants Could Feel Emotionally Involved Immediately, Though Perhaps Not as Deeply

As opposed to those in the game version of "Surrender a Friend," those in the control condition seemed to immediately empathize with and express attachment to the childhood friend (Elise/Elliot), as described in the written scenario. The results and interview responses suggested that those in the control condition thought of an actual friend when approaching the scenario, rather than considering a new fictional friend, and inserted their old friend into the scenario. On the other hand, the game participants did

not immediately accept Elise/Elliot as their actual friend, even if the game introduced them as such—rather, they needed to build that relationship over time as if the character were a stranger.

This could be in part because the control group participants were not interacting with a fully-visualized in-game fictional character, and could more readily inscribe their real childhood friend over the term "friend" in the written scenario, and empathize with him/her. The game participants did not have the same immediate attachment to the NPC character, even though it was supposed to be their close friend, so they were not able to empathize with him/her as readily.

That said, once the game participants had the time to build a relationship with an NPC character, the attachment to that character, and practice of empathy-related and emotion-related skills and thought processes, may be even deeper than that of an imagined person or character.

These results suggests that in a game, participants may perform emotion- and empathy-related skills more frequently when making ethical decisions if their relationships with NPCs emerge over time, even if they are digital, programmed creations. Research should be conducted to consider if this would be different if there were real people playing as the virtual characters, rather than just computer-generated NPCs.

Game Participants May Be Able to Apply Empathy-Related and Emotion-Related Skills More Readily After Playing *Fable III*, than the Control Condition Participants

There was significantly more frequent use of an empathy-related thought process on "Drill" for game participants, as opposed to control participants. This suggests that the experience of *Fable III* and an role-playing game (RPG) context (rather than just a written story context) could enable participants to more readily consider other's perspectives and consider other's emotions, even in scenarios outside of a game. Another possibility comes from recent research that suggests that people who commit immoral acts in a game, or need to make choices that violate care and justice, may make players more guilty and sensitive to others in situations outside of the game (Grizzard, Tamborini, Lewis, Wang, & Prabhu, 2014). In other words, people playing *Fable III* may have been more sensitive to other's emotions because of the guilt they felt after making difficult decisions in the game. More research is needed to understand this finding and its underlying mechanism, but it suggests that ethical decision-making could be affected, at least in the short term.

CONCLUSION

The results of this study suggest that participants do practice ethical thinking and thought processes in games such as *Fable III*, and that emotion- and empathy-related skills are components of game player's ethical decision-making, reflecting Mencl and May's (2009) findings. Differences in the content and context of a scenario, rather than the fact that the scenario is part of a gaming environment, may be a more salient factor in the extent to which a person uses empathy-related skills and thought processes, which has also been suggested by Levitt and Aligo (2013).

There are some compelling differences between how participants make ethical decisions in games versus written scenarios. One is how participants related to a character in the story versus a character in a game. In the game, players seemed to need to experience their friendship first-hand with an in-game character, which related to greater reported attachment to a character, a self-reported emotional reaction to that character's fate, and more frequent use of empathy-related skills. In the written story, participants did not seem to need that extra time to build a relationship with a character, as they were able to replace that character, in their minds, with one of their actual friends, and then imagine the scenario with their friend in mind. This has important implications for designing and using games to enable people to practice ethics, in that people may be less likely to employ empathy-related skills and thought processes until they have had the time and experience to build relationships with the characters. How this could be achieved most effectively should be studied further.

The results also suggested that a role- and story-based context, and the practice of empathy, emotion-related, and other ethical thinking skills and thought processes in a game, may enable more frequent empathy practice outside of the game, as opposed to a written context. The story in a written context, while motivating empathy as part of ethical decision-making, may not lead to as frequent use of empathy-related skills and thought processes as are practiced in a game context, particularly once participants have developed relationships to other characters in the game.

Moreover, the results suggest that reasoning and affective or empathy-related skills and thought processes were not in opposition to each other. Rather, if participants were frequently practicing empathy-related skills and thought processes, they were not less likely to practice reasoning-related skills and thought processes. These results also have implications for elucidating the relationship between empathy and ethical thinking, and for helping us better model ethical decision-making in general.

A larger sample size and inclusion of female game players in the same experimental design would also be useful in further understanding the relationship between empathy, reasoning, and other components of ethical decision-making in role-playing games and nongame contexts. Although a larger sample size would have helped increase the power to detect differences, and increase overall confidence in any significant differences, a small sample size is not always problematic (Abelson, 1997).

Finally, this exploratory study suggests that games, such as *Fable III*, may provide useful contexts for researching the nature of ethical thinking, and the relationship among emotions, empathy, and ethics. We need to continue investigating emotions, empathy, and ethical thinking in other games, and empirically evaluating how specific in-game elements affect how people practice ethics.

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CHAPTER 4

Half a Second, That is Enough: Involuntary Micro-suspensions of Disbelief and Ectodiegesis as Phenomena of Immersion Processes in Pervasive Games

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TERMINOLOGY

The terms "immersion," "diegesis," and "ectodiegesis" have been used within this chapter, assuming the following definitions:

Immersion: state of consciousness where the sense of time and space is temporarily lost due to an environment design

Diegesis: a fictional world with logical and temporal organization that has its own laws

Ectodiegesis: influence of external elements in the diegesis.

INTRODUCTION

Since the popularization of the internet and thus broad access to new technologies, the way of consuming stories, and consequently, the building of imaginary universes, is changing completely. Considering that the new forms of consumption of fictional products will be reconfiguring, it will also reconfigure the imaginative faculties of interactors. The narratives spread across various media, such as transmedia storytelling, for example, require more non-trivial effort, as Aarseth defines, of interactors than traditional reading, for an imaginative composition of fragmented fictional universes.

An example of contemporary transmedia production, which requires non-trivial effort for the formation of possible worlds based on fragmented storytelling, are alternate reality games (ARGs). ARGs are games that use the ordinary urban space itself as part of the game board. The players personify

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themselves, building collectively the narrative developments, and transforming the consumption experience of storytelling and link it to their sociability, by means of a fictional tacit agreement, which confirms the intentional suspension of disbelief (Coleridge; McGonigal; among others).

However, as game genres establish and superimpose a direct relation with the factual universe, the boundaries that separate the fictional and the non-fictional are constantly broadened, allowing permeability (Nieuwdorp, 2005) of these fluid membranes. At times, there is overflow of the fictional universe into the ordinary world. However, players intentionally adjust their cognitive apparatus through fictional agreement in order to keep them closer to reality inside their own fictional environment, avoiding "drownings in the diegesis" (Oliveira, 2011), during the immersion process. The diegesis derived concept of narratology, can be understood as a dimension of the fictional universe, with its own dynamics and social system.

Nonetheless, in an ethnographic study based on focused interviews, it was revealed that the overflow occurs not only from the fictional universe into the real world, but that the opposite is also true. In other words, as a result of being on an everyday support through the use of urban spaces, the ordinary world acts directly on the immersive phenomenon of players. Thus, the ordinary world may interfere in the narrative, by means of the environment, ordinary sounds, and the unpredictability of everyday events. This phenomenon, which is called here "ectodiegesis" enables the occurrence of unintended micro-suspension of disbelief,[1] and forces the players to doubt the existential nature of the story they are consuming (Long, 2000). Unlike the diegetic levels proposed by Genette (1995), the ectodiegesis is the influence of the external environment beyond the support of the narrative, in relation to the diegetic level. For example, the ectodiegesis phenomenon could be a sudden drop in public lighting during a live-action, as pointed out by one of the interviewees. The desire for occurrence of this phenomenon as part of the imaginary construction of the fictional universe drives the player to the pervasive experience. In this study, we demonstrate that transmedia practices can contribute, with different spectatorship schemes, to different audiences, offering different experiences to the interactors. To this end, we will discuss some issues regarding the genre of game that overflows the boundaries between "reality" and "fictionality."

[1] As stated by one respondent, who said that for half a second of the game he doubted the veracity of the actions of the narrative, pointing this yearning as absolutely necessary for the experience.

DEFINING THE MAGIC CIRCLE OF THE GENRE OF THE GAME

In 1991, Mark Weiser, a researcher at the Paolo Alto Research Center, created the term "ubiquitous computing," also called *Ubicomp*, to express a new paradigm in computation scenarios, intending to present a prognosis of what would later transform the human-machine relation throughout the 21st century. Weiser proposed that, in the third stage of computation, computers should be part of everyday life in an "invisible" form, so that the individuals/users would not notice their existence. In other words, computers would be everywhere, performing their tasks, integrating with human actions, without demanding the same attention effort. To the researcher, technologies would adopt the following trends: to become so absorbed in daily lives of human beings that they would no longer be perceived in their own environment, for example, electricity; and technologies would tend to be physically smaller, and more engaged in the interactive relationship. According to Weiser (1991), "the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (p. 1). Such assumption builds the basic foundation to the concept of pervasivity, i.e., to exist in all parts of a particular thing or place at the same time, unnoticed in a diversity of spaces.

According to Schneider and Kortuem (2001), pervasive games can be treated as games that bring together two logics: ubiquitous, location-based technologies, and live action role-playing (LARPs). Jane McGonigal (2006) defines them as games that concentrate the focus of the user in some kind of device (e.g., some location-based service, LBS), which becomes fundamental to the game course. Other authors, such as Montola, Stenros, and Waern (2009), use the expression "pervasive games" to assign a category of games based on Weiser's paradigm, as stated above. Since the word "pervasive" relates to the notions of [something] "infiltrated", or "penetrating", the authors believe these games point to their fusion with the physical space, usually urban, and also to fluiditate alternate boundaries between reality and fiction.

Concerning *in-game* sociability, and also through mechanisms of sharing an image of oneself by videos or photographs on websites or forums, and especially for this goal, pervasive games are essentially corporate, so other gamers can keep up the individual performance on the gameplay. Categories of pervasive games exist, but these are not closed, since the appropriation of technological devices to other ends beyond their original purpose is a recurrent practice, happening as fast as the creation of new ubiquitous technologies.

Therefore, such games can be divided into the following categories[2]:

1. Technological device: location-based, mobile, QR code, transmediatic, augmented reality, mixed reality, geocasting, etc.
2. Context of production: mainstream, educational, marketing, independent
3. Diegesis system: live action role playing game, alternate reality game, treasure hunts, etc.

In this chapter, we limit ourselves to alternate reality games (ARGs), i.e., games which move between the boundaries of reality and fictionality, through puzzles that occupy both virtual and urban spaces. Originating from the experience of role-playing games, ARGs are considered a subcategory of pervasive games. Pervasive games or ubiquitous games (McGonigal, 2006), seek to transcend their actions beyond the material support mediator between the player and the program, exploring both electronic virtual spaces and urban physical spaces of the tangible reality.

It is a type of game which has a fragmented narrative as its central axis and tends to be used, besides the internet, in various platforms and devices, including the urban space itself for the distribution of puzzles and riddles of the game. Its structure involves different communication tools: e-mail, social media, SMS, websites, mobiles, etc. It is used to connect characters, played by actors and players in a fictional universe, where the audience must solve puzzles and investigate mysteries, among other challenges, to advance the transmedia narrative, which disperses the elements in different channels (Oliveira; Andrade).

Dan Provost defines the ARG as:

> *an interactive narrative that uses the real world as a platform, often involving multiple media and game elements, to tell a story that may be affected by ideas or actions of participants. All players are intensely involved in the story that takes place in real time and cannot be repeated (p. 2).*

The author considers the ARGs as the first form of metafictional narrative art native to the internet, which "blurs" the line between fiction and reality. According to Provost, the complexity of this game genre often requires the use of collective intelligence to solve the puzzles that are assigned.

[2] These categories, as previously mentioned, are not determinants. They can form hybrids, as well as the upcoming of new types, since technological advances and their appropriation may occur.

THIS IS NOT A GAME

"This Is Not A Game" (TINAG) is when players pretend that it is not a game in order to maximize their experience in the process of playing ARGs. McGonigal (2003) calls this "faking"; a "Pinocchio effect," where players willingly suspend their disbelief, not caring about the inclusion of non-diegetic elements into the game. The author states that this pretense is a conscious decision to prolong the pleasures of experience, whose active pretense of belief provides opportunities for participation and collaboration, ignoring all metacommunicational elements that could indicate the physical, temporal, and social boundaries of a game. In this case, the acronym TINAG is an easy reminder to demarcate the boundaries between reality and fiction, during the experience, reflecting the involvement or the immersion of players in the diegetic universe created by an ARG. Based on this concept, we will discuss the processes in this immersive game genre, taking into account environmental factors that contribute to a phenomenon, which we shall call "ectodiegetic immersion." This phenomenon will be explored below, and is constitutive of the "own" immersion in general, assuming that a subject feels immersed in the presence of a conjunction of several factors, including the environment where the player is located. However, this immersion needs more than one element to facilitate an immersive effect; the inclusion of non-diegetic elements in the narrative.

Our hypothesis is that the immersive phenomenon consists not only of various intradiegetic and endonarrative elements, but also that its unpredictability is caused by ectodiegetic elements. In other words, the environmental elements that directly influence the spatial and temporal relationships in pervasive games.

The question that drives this research is: How do the players perceive this external influence in the game's diegesis and what are the elements identified in this relationship? Furthermore, how do we relate such elements, identified by the players, are able to contribute to the immersive process in gaming.

METHODS

This research has a qualitative character. Therefore, we proposed a methodology consisting of interviews with nine players who recently interacted with ARGs. The interviews were with a group of Brazilian players, graduate students from the Media Studies Department at the Federal Fluminense University, Rio de Janeiro. The students played and created pervasive games

as part of the final work of a course taught by the author of this chapter, in partnership with another professor of the department, Dr Emmanoel Ferreira.

The discipline, "Workshop of pervasive games," was proposed as a theoretical discussion and an exercise in creating pervasive games, exploring various genres. In total, five games were developed by the students. These games took place between June and July, 2012. To understand the behavior of the players and producers, we observed and participated; in moments of excitement in some parts of the games, when the narrative was more intense, in more isolated locations. According to Lüdke and André (1986), observation is one of the basic instruments for collecting qualitative data in an investigation. Thus, we used this technique to collect data on certain aspects of the players (Marconi & Lakatos, 1990).

Based on the game experiences, students reported how they felt about the game, and described their feelings about the proposed discipline. They highlighted that the experience was very positive and that the campus had been practically empty and dark, due to a strike, which was crucial to the immersion process, both in terms of narrative and gameplay. As these reports were individual, we decided to conduct interviews with all of the students to see if this feeling was shared. Thus, the initial goal was to understand the relationship between immersion and the pervasive game, based on three axes: immersion and narrative; immersion and game activities, called "gameplay"; immersion and the collectivity. Haguette (1997) defines an interview as "a process of social interaction between two people in which one, the interviewer, seeks to obtain information from the other, the respondent."

The semi-structured interviews were composed of four main issues outlined from an open script:

1. Did you feel immersed in some of the games you played in the discipline? If so, Why?
2. Can you describe what you felt in that game?
3. Do you think that external elements (out of the game) helped or harmed your immersion?
4. Do you think the fact of it being a collective game helped or hindered your immersion? Do you think it would have been better if it was played alone?

In relation to the production of the game, some questions were asked concerning what motivated the intervention of the producer in the running game, and was it an attempt to drive or enhance the immersive state of the player? Therefore, two questions were developed for the producers:

1. Do you feel the need to intervene in the game you produced at some point?
2. Do you think that interventions would help or hinder the progress of the game and the player experience?

These interviews were conducted in September 2012. Nine graduate students were interviewed, and one of the players interviewed was not a student registered in the discipline. In other words, eight students had the experience of playing and producing the game, as this was one of the evaluations for grading in the discipline and was experienced only when playing.

We proposed a conversation on Facebook chat, a social network where all students were registered and where there is a relatively active group for the discipline. As some were embarrassed to have their identities exposed, we decided to choose anonymity of all respondents.

According to Duarte (2004),

> *Much of what we are told is deeply subjective, because it is the way that one observes, experiences, and analyzes its historical time, your time, your social environment etc.; it is always one among many possible points of view. So, taking testimony as a source of research involves extracting what is subjective and personal in them, which allows us to think the collective dimension, i.e., which allows us to understand the logic of relationships established (settled) within the social groups where the interviewee participate (participated) in a particular time and place (p. 219).*

We wanted to get elements of the interviewees' that helped in reflecting on issues that were in progress, therefore processing of data for analysis included selecting the constancy of lines and using them to support the study. Thus, some certainties were observed: all respondents claimed to feel immersed, but not quite; all said they felt immersed in some moments of certain games. Seeking the predominance of common words used by the respondents when asked about the causes they believed to have led to immersion, it was observed that six of the nine respondents attributed the phenomenon to the "narrative." Four mentioned the "mechanics," and two pointed to the narrative driving the "gameplay." Considering the most cited "feelings," curiosity appeared in eight of the nine responses. Then, "motivation" for completing a challenge in the game, which was present in four respondent answers.

The unanimous conclusion was that collectivity is essential for immersion, as was the environment, i.e., an external factor leading to an immersion state during the game, and that intervention is necessary for the production, but in fact, detrimental to the experience. Based on this discursive

dominance result, the following will be discussed: suspension of reality; curiosity and narrative tension; collectivity; and the influence of external elements on the immersion process.

IMMERSIVE PROCESSES IN PERVASIVE GAMES

In the words of Marie-Laure Ryan (2001), "the ocean is an environment where we cannot breathe; to survive the plunge, we must take oxygen from the surface, stay in touch with reality" (p. 97). This metaphor helps us to reflect on the need to be in continuous contact with reality during an immersive process. Taking into consideration that immersion can be conceptualized as an ability of a system to bring its users to another dimension of reality (Couchot, 2003, p. 175), we propose to reflect on how this phenomenon occurs in pervasive games. Thus, we seek to maintain focus on the issue of spatiality as an element in touch with reality that avoids diegetic "drowning."

The concept of immersion has been represented, from the second half of the 20th century, through various fields, such as literature, cinema, visual arts, and virtual reality. By immersion, we mean here, a phenomenon that involves the wishful thinking of penetrating the magic circle of the diegesis of the narrative. Regarding the "magic circle," we take as a basis of this concept, Johan Huizinga's premise that the games have their own spatial and temporal universe. This game space defines the boundaries of the game world and the ordinary world, or the rest of the world, as Juul defines (2003) the environment of concrete reality. Enhancing the design of Huizinga (1980), Salen and Zimermman (2003) use the concept of the magic circle to reflect on specific areas that separate the boundaries of what is ordinary (reality) and what is a game (fictionality).

Applying the concept of the magic circle for pervasive games, Eva Nieuwdorp (2005) proposes that this game genre creates a permeable membrane through which elements of the game can slip into the real world. It is not necessarily correct to consider the magic circle as something that necessarily encapsulates the player, eliminating the space-time issue and projecting it into a region of alternatives. We recognize that the spatiotemporal issue is much deeper than this statement. We observed that the spatiality of a game in the interaction with the ordinary world depends on the category, as will be explored later.

Instead, we would like to acknowledge here, the existence of the magic circle—the side that is inherent in the structure of the game—as an element

of mediation, which facilitates dialogue between the player and the game space and reality. Such mediation may occur as a fluid form—drawing blurred boundaries, in the sense that they cannot be clearly identified, which allow fiction and reality at the same time. And it can also be presented as a more solid shape—that actually allows the moving direction—the abolition of space-time—through an immersion process.

Brown and Cairns (2004) understand immersion as a degree of involvement with the game, and it varies according to the degrees of attention and thus involvement with the game. There are three levels of immersion: engagement, absorption, and total immersion. In the first level, players require an investment of time and attention to the field of operation of the game. At the second level, players have an emotional involvement. In the third level, the total immersion, the game is the only important element to the player, and he develops empathy with the characters and the virtual atmosphere.

It is possible to perceive preliminarily that this immersion varies according to player involvement in the game. There is another perspective on the immersive approach (see Laura Ermi & Mäyrä, 2005), especially in role-playing games, which describes the "imaginative immersion" effects:

> *We call this dimension of game experience in which the person becomes absorbed with the stories and the world, or begins to feel or identify with a character in the game, imaginative immersion. This is the area in which the game offers the player the chance to use their imagination to empathize with the characters, or just enjoy the fantasy game (p. 8).*

Games with characters and plots, where players have the possibility of identifying themselves with something, are more capable of providing imaginative immersion. Dominic Arsenault (2005) has already proposed a re-reading of the model structured by Laura Ermi and Frans Mäyrä, changing the concept of "imaginative immersion" to "fictional immersion." For this author, imaginative immersion is sufficient and only conditioned by fictional immersion.

Certainly, both concepts are interesting in diegetic pervasive games. The immersion proposed by Arsenault gives us the understanding of the construction of fictional universes in this game genre, especially the category of organization by the diegesis systems initially proposed. The imaginative immersion, proposed by Ermi and Mäyrä, is fundamental to these games, and implies role-playing, even from themselves, and is inherent to the theatricality that permeates the gameplay. That imagination is then increased by

identifying the roles, and together with the mental processes of imagination are parts of their "pretense" of reality for a maximization of their experiences. According to Jean-Marie Schaeffer (1999), fiction is a way to achieve the imaginary world of the interactor subject:

> *The means of fiction are the same as those of pretending, but its purpose is different. Given that, from the point of view of biological evolution, the activities of 'serious' pretending precede the development of recreational activities and shared pretense, it is undoubtedly permissible to go further and support the hypothesis of a genealogical relationship: the means of fiction are borrowed from the pretense. If this is so, the study of the specific situation of the ludicrous pretense shared is so susceptible as to enlighten us about the genesis of phylogenetic fiction, conceived as a cultural achievement of mankind (pp. 147–148).*

For Schaeffer, the playful pretense shared is inherent in fiction itself and is subject to the cognitive processes that allow decoding of the symbolic marks as agreed fiction. When there is no possibility of decoding these elements, there is a playful pretense shared. But a mistake may be caused by the extension of a pragmatic framework that defines the space where it operates through the representations of mimetic elements.

It can be stated that in this category of games, there is the possibility of playful pretense being withheld, causing misunderstanding in interactors. These interactors, in fact, are not players, since to act as a player in the game, it is necessary to be aware of one's performance. When the object passes through non-gamers who do not recognize the playful codes present in the action, it may be liable to a mistake that occurs not least in the sense of a farce of the game, and the difficulty of decoding the interactor. This mistake points to an immersion stage of the non-player, even if it does not reach the deeper levels of immersion.

Agreeing that the imaginative immersion would be conditional on the fictionality of the game, we argue that the imaginative immersion, proposed by Ermi and Mäyrä, should not be replaced by the idea of another kind of immersion, called fictional, as stated Dominic Arsenault. We defend that the imaginative immersion is connected to the fictional immersion, as a contingency for the event of immersive phenomenon within a fictional work. Further, because it is a genre of game that overflows the boundaries of reality and fictionality, we propose the existence of a mediating category, which we shall call "diegetic immersion". This kind of immersion has a dynamic space-time of its own, which may be at variance with ordinary space and time, as we will explore later. This category is the common thread that allows the construction of the fictional universe and has a relationship of

co-dependence of imaginative immersion. Due to this narration, the player's imagination is increased, allowing immersion in the game and the performance of the player as part of the narrative. Thus, we suggest that there are elements within and outside the game that help in the immersion of the player, which we will call "ectodiegetic immersion."

However, as in other fictional works, there are elements that are not properly incorporated into the diegesis, but are key to awakening the senses and emotions as interactors. In this game genre, in which ordinary spatiality and temporality are essential for driving the gameplay itself, we realize that these elements are external to the diegesis fundamental for immersive experience. And, there are elements within the game itself, which lead to an overflow of fiction, infecting the ordinary universe. Such elements are driven mainly by the interaction of the subject with the fictional work, as presented in Figure 4.1.

The diagram in Figure 4.1, besides showing the immersive elements that relate to the game world, also includes elements within the diegesis that allows the overflow of boundaries to the real world as well as the influence of the real world in the diegesis, as is discussed below. Such endonarrative and ectodiegetic elements, in other words that which exist inside and outside the game, assist immersive player experience.

OVERFLOW AND FICTIONAL IMMERSION IN TENSIONAL NARRATIVES

Bringing to the analysis some works, such as the fake biography of Marbot, the tale *Le Loup* and even the game *Tomb Raider*, Jean-Marie Schaeffer seeks to understand the fictional status of works overflowing with the real. In

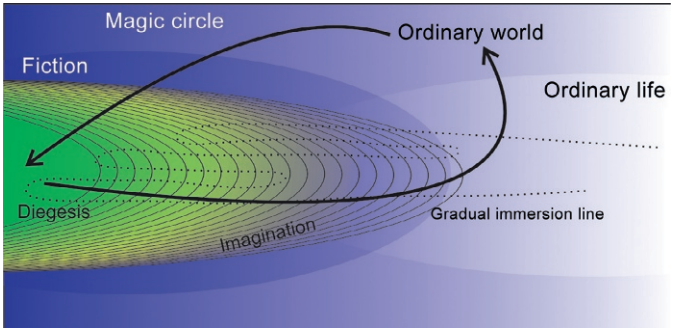

Figure 4.1 Diagram of immersive elements in pervasive games.

other words, he intends to investigate fictional works, especially when they exceed the limit of the ontological, beyond the intersubjective agreement implied between the work and interactor, though they form a sharing playful pretense introduced through mimesis. Defining elements that contributed to the condition of "fictional overflow," Schaeffer mentions four conditions that allows the fictional agreement to be suspended. They are: the authorial context; paratexts; formal mimesis; and contamination of the historical universe by the fictional universe.

For Schaeffer, the authorial context is not only the past experience of the place of which the author speaks, but also the challenge of reducing the fictional status of entities presented as real. The paratextual elements are at the service of fantasy and corroborate the effect caused by the actual formal mimesis. This concerns the demarcation of textual genres that are subject to perceptual and cognitive skills of spectatorial activity. This mimetic illusion, according to Schaeffer, can be attached to the "perversity of what is commonly called the hermeneutic circle." In other words, the concept of the understanding of the whole text through semantic markers that highlight the mimetic character variant itself. There is also, according to Schaeffer, another element capable of transgressing the work beyond the fictional status of what he calls "contamination of the historical world in the fictional world." For him, this contamination occurs through semantic strategies using historical characters or factual events to construct fictional universes through geographic referential elements, temporal, etc. Among the factors listed, the last is the semantic strategic element that has the most direct influence on the diegesis. This element was approached by Barthes in understanding the intra-textual mechanisms able to form a diegetic universe of fiction.

Roland Barthes identifies five elements of a text that introduce a space for meaning. Calling them codes and fields, Barthes presents a structural analysis of Sarrasine text, with the following elements: codes of narrative actions; proper semantic code; cultural codes; hermeneutic code; and symbolic field.

For Barthes, "hermeneutic codes and narrative actions are irreversible and together establish a logical and temporal order that leads to narrative itself" (Barthes, 1992, p. 89). Hermeneutic codes are all units that can "constitute an enigma and lead to its solution" (Barthes, 1992, p. 17). The code actions relate to the ability to rationally determine the outcome of a thread. The semantic and symbolic field codes are reversible and complement the narrative. The semantic code is significant for unstable meanings and allows the development of a theme throughout the narrative, while the symbolic

field contains connotative elements, which cannot be represented directly in the text. Regarding the cultural codes, Barthes refers to a "set of references, general knowledge of an era on which rests the speech" (Barthes, 1992, p. 88).

Based on Barthes' classification, Geoffrey Long proposes the expansion of new categories for the hermeneutic codes. Among others, the author suggests six possible classifications of hermeneutic codes: cultural; character; chronological; geographical; environmental; and ontological.

Long (2000) defines cultural hermeneutic codes as elements that refer to a larger culture within the diegetic universe of the narrative itself. Hermeneutic codes of characters are characters and/or motivations and characteristics of characters that do not appear in the plot, but are referenced. Chronological hermeneutic codes are logical and temporal narrative concerns. Geographic hermeneutic codes are important elements that indicate or refer to places "that either do not appear in the main story, or appear only briefly" (Long, p. 64). Hermeneutic environmental codes are constructions of the fictional world that act as hooks for additional stories. They differ from the geographic ones, since they need not appear in the story, and may overlap each other. To think about the transience between reality and fictionality, the main code is the ontological hermeneutic one, considered by the author as the rarest among their classification codes. For him, it has the ability to make the audience think "about the existential nature of history itself that is consuming" (Long, 2000, p. 65). Logically, both authors drew on these concepts to research the endonarrative field. Such concepts are initially concerned with the structure of the text, however, there is a tangency of the pragmatic field to which Schaeffer refers, to acknowledge the relevance of this for the conduct of the work, through the hermeneutic codes.

Raphael Baroni points to the merit of Barthes in recognizing hermeneutic codes, since they introduce elements of puzzles, uncertainty, and literally are completed within the narrative itself, giving the important role of surfactant in the decoding process. Assigning curiosity as the driving element in deciphering the puzzles, since Barthes introduces narrative as code, Baroni recognizes the pragmatic framework that reflects on the narrative tensions in fictional works. Thus, he uses the concept of tensional narrative to set intersubjectivities caused by an enigmatic narrative that provides the ability to rip or prolong the actions, to extend the narrative action until its completion, or compress scripts of everyday events. These statutes of tensional narrative manifested in the matrices of curiosity, suspense and surprise,

are caused by gaps in the narrative itself that allow your interactor to identify and anticipate the actions of the narrative axis.

Asked about the feelings caused by the interaction with the game, the interviewees said they felt curiosity and anxiety, which they attributed to a state of immersion. For example, the player JA said, "*something like an expectation of what might happen. The story began to matter to me the moment I started to imagine the characters.*" Player AR reported that, "*the narrative leaves quite a lot open; you're riding theories in your head about how the story fits, and is eager to know whether you've imagined right or wrong.*"

Through these reports, we found that, going back to what was proposed by Baroni, such interactional arrays are sensory-cognitive and affective skills not introduced in the work itself, but latent in the inter-relationship between the interactor and the environment surrounds. As the player DH said, "*the game gives the fantastic universe, the Wonderland, but to enter the rabbit hole is something we have to do on our own.*" This concept of Baroni includes elements beyond the narrative for understanding the relationship between the interactor, subject to the fictional work.

We now consider the ectodiegesis, in other words, the external elements of the fictional object, as a relevant factor for the phenomenon, immersion. We understand that weather, climate, ambiance, spaciousness, and the collectivity itself are factors, among others, that are part of this ectodiegesis and these will be discussed below.

ECTODIEGETIC IMMERSION: SPATIAL EXPANSIONS, TEMPORAL, AND SOCIAL

Markus Montola (2005) states that pervasive games allow social, spatial, and temporal expansions. The temporal expansions allow the player to interact in daily life itself, creating a parallel with the ordinary chronos time when owning a temporality itself, concatenated to the fictional diegesis. Thus, we recognize both time and space as ectodiegetic elements, in other words, outside of diegesis, which are key to the immersion process. Unlike the diegetic levels proposed by Genette (1995), the ectodiegesis is the influence of the external environment beyond the support of the narrative, building on the state reading under the diegetic level. We believe it is in ectodiegesis that lies in the fictional overflow, allowing the occurrence of unintended micro-suspension of disbelief.

During an ARG, which can last up to months, the player is in constant negotiation with the ordinary temporality. However, during live-action,

both temporality and spatiality, as well as other elements, are suspended during ordinary gameplay. In this temporary suspension, the subject imagines themselves as part of the narrative. This is part of the temporary suspension of disbelief (McGonigal, 2003) and the active creation of belief (Murray, 2003), where half a second is long enough to build succession plans and narrative possibilities, enabled by the fraying of narrative tension. Such tensions are caused mainly by the gap from the narrative tensions, where the suspense of the plot and curiosity, as the interactional state governs the cadence of experience (Baroni, 2006). Temporality, in this game genre, merges with the ordinary to cause the effects of; actual, expected, to experience – of TINAG.

In the interviews, we hear reports of such suspension, as the player DH says:

> *In this case, the investigation was connected to the suspension of reality, in the sense that even though they were the people who developed the game, gameplaying they were not someone hunting of truth.*

Staying with this theme, the player AR reported that it is "*as if it was 'real', as if it was not a real game …, but rather, something that was happening, a goal that really needed to be achieved because it was very important.*" Some players also reported that they felt like part of the narrative, as if they were active characters in the plot. For LC, "*it is like being very concentrated in a book, but better. Because you are with your friends and they are in the story and moving. It's not just reading. It's being part of it and participating in the history.*"

In this sense, we can say that performance, "not only binds to the body, but for him, to space. This bond is valued as sense, the theatrics. […]. What counts most is the recognition of space fiction" (Zumthor, 2000, p. 47). In other words, the role of the player, according to the fictional spaces built and based on a temporality itself, is one of the most important elements of the game. That crossing of the magic circle is natural, and does not violate the rules of ordinary space and time, even in their own spatial and temporal regiments. The theatricality is a transitive part of the genre of the game. The subjects do not act as they do in real spaces. They act in the fictional spaces governing the time in their own way and in the way of fiction, consistent with the expected manner for the game and for their peers, who perform together or attend the performance of the interactor(s).

We also value the understanding of the performative actions of players in pervasive games. Within the collective and collaborative inherent to the game, there exists a "third person" watching the show. The third person

may be the other player(s) who are interacting. As Murray (2003, p. 53) says "games are theatrical representations in a non-conventional (but exciting) way. The players are at the same time, actors and spectators of each other, and the events they enact often have the immediacy of personal experiences."

All players interviewed considered collectivity as an element that helped immersion. The player JO said that collectivity helped the immersive process, "*because everybody had the same goal, trying to solve the same puzzles and overcome the challenges*." And he concluded by saying that he thought it was "*unlikely, when playing alone, to have the same experience*." To AR, the collectivity was a positive factor for the immersion phenomenon, because "*when you see a person really immersed, you end up leaving involvement and watching your 'immersion', even if initially you are not so involved*."

Besides the players, the game producers can also become the element that supports and gives visibility to the players' performance, by aiding the conduct of players, as puppet masters, as the game does not lose its strength during the activity that can last from minutes to months. However, players reported that intervention was one of the basic elements that mostly damaged their immersion experiences.

The interviewees stressed that the environment greatly influenced the immersion. It is interesting to note that the greater the distance of the common spaces usually frequented, the more the environment became an important element for this immersion:

> *There were moments (for example, during the coffee break), I felt immersed even when I was not playing. I think it was the locus of the game and that lantern. The players were well engaged in the tasks and game location and time, that the game was connected just right with the narrative. And that last minute scenic element … the lantern! [F.B.]*

We can see here an important sense of immersion for the player, who in this case was an active observer of the game, having to be part of the team of puppet masters: the unpredictability of random events. In this case, the lighting was below that expected for the gameplay. However, one of the players had a flashlight in his backpack, which caused excitement in the group, and facilitated the task of the proposed challenge. JR also points to the importance of the external environment for the immersive process:

> *The environment itself influenced much … every time we were in places less common in the campus with increased immersion. Like in the boat. And whenever we went to the buildings and blocks, and the environment turned to be common, it means that the 'TINAG turned off', you know?*

Player LC said, "*being on strike and having the campus practically to ourselves was good and unexpected (…). Several times I felt within the narrative*." These reports show how the environment was important to the process of immersion for players. Despite being an element not always taken into consideration in the production of a game, given the unpredictability that the ordinary space is susceptible, as pointed out in the interviews, the environment, weather, space, light, collectivity, external factors, such as e.g., a strike, help the immersion of players.

FINAL CONSIDERATIONS

The aim of this study was to introduce a concept that goes beyond intradiegetic or endonarrative brands. We seek to recognize a pragmatic framework, which establishes not only the interactor of fictional objects, but also elements of—and beyond—the diegesis that corroborates immersion status in pervasive games. We note that the authors who substantiate this work sought to think in a pragmatic framework, based on the relations between the subject and the text, in its imaginary, sensory-cognitive and affective practices that go beyond the fictional world. In our discussion, we also recognized the interactor subject, but introduced a third sphere: the ectodiegesis, i.e., elements that are not part of the narration directly, but which are concatenated to it when mediated by the interactor subject. We also observed that these elements can help or hinder the immersion process and cause a breakdown in the process, depending on the agreements locked in by the inter-relationship with the subject. For example, in cases where there was interference to the "base" in the conduction of the game, even though puppet masters considered the intervention necessary for the cadence of the game, the players did not recognize it as an element of liaison with the diegesis, because its participation implied a temporary suspension of the experience lived within the game.

Recognizing these elements, it is possible to think that this ectodiegetic immersion occurs, not only in the game genre explored in this work, but also in others. Some may wonder how the movie theaters, the atmospheric sounds of theaters, panoramic projections, the spaces and enlightenment in museums or collective interactions of cheerleading at football stadiums, for example, can contribute to the immersion of the interactor. We recognize the environment, weather, collectivity, fictional or ordinary spatiality, and temporalities as ectodiegetic elements, which can influence the immersive process.

We have pointed out that the fictional works can offer imaginary constructions of geographic spatiality and temporality of diegesis itself. However, not as the possibility of creating a magic circle as a phenomenon that encapsulates the player suppressing spatiotemporal of the interaction in the game, but as a mediating element between the subject and the game. Thus, pervasive games in the temporal and spatial dynamics vary according to gender, and consequently, the players interactional conduct of subjects and objects.

We saw from the reports collected in the interviews, that the immersion phenomenon is a cognitive process, which, more than individually, is susceptible to the activities of the surrounding community, and suffers from interferences from the environment. Furthermore, we argue that rather than voluntarily suspending beliefs to enhance the fictional experience, in this game genre, there is involuntary micro-suspension of disbelief, which may last only a few seconds. Such micro-suspension is a phenomenon caused by overflowing of the fictional and penetration of the real that occurs through the phenomenon that we describe as ectodiegetic immersion.

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SECTION II

Emotions Tools and Ties

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CHAPTER 5

Gamers and Their Weapons: An Appraisal Perspective on Weapons Manipulation in Video Games

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INTRODUCTION

This chapter examines game players' emotions and their aesthetic evaluations during weapon manipulation, and proposes a framework for modeling this process. Modern research generally agrees that appraisal theories provide a powerful way of explaining the dynamics of emotional experience (see Schorr, 2001a, 2001b; Silvia & Warburton, 2006). Hence to understand the emotional appeals of the player during weapon manipulation, a social semiotics view, which modifies Martin and White's (2005) appraisal theory—specifically, the appreciation subcategory from their framework—is applied to this suggested framework. This model shows how players' emotions and aesthetic preferences contribute to their actions and decisions in relation to weapon manipulation. This chapter will be useful to researchers, industry professionals, designers, and gamers who are interested in the specific process through which players appraise their weapon(s) and tailor them to different strategies during gameplay or specific character roles in group play. The term weapon manipulation is used as a broader term to encompass (1) *weapon customization* performed by the player, (2) weapon upgrades *voluntarily performed* via the player's choices, and (3) weapon upgrades which are *performed solely by the game*. In this chapter, upgrades are a type of customization. In Section "The Categories of Weapon Manipulation," I will elaborate more about the differences between the three types of weapon manipulation in video games during the development of the proposed model.

The approach in this chapter is based on models and theories that combine frameworks from linguistics (Martin & White, 2005) and cognitive science (Damasio, 2005; Lankoski, 2012). Appraisal theory offers a useful perspective to understand how players' emotions are connected

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to the weapon customization process because appraisal research focuses on the structure of appraisal, the evaluations that collectively constitute the emotion (e.g., Smith & Ellsworth, 1985). Many theories express an emotion's appraisal structure as a set of elemental appraisal components (see Kuppens, Van Mechelen, Smits, & De Boeck, 2003). The common appraisal components include appraising events as relevant to a goal, evaluating resources for coping with an event, judging an event's congruence with a goal, and assessing whether an action falls short of personal standard (Lazarus, 1991b; Roseman, 2001; Scherer, 2001). These common appraisal components are applicable to the understanding of how game players become attached to their weapons emotionally and aesthetically by understanding how their goals, actions, and decision making are connected to gameplay.

Interestingly, a gap exists in game player research regarding players' emotions during gameplay and how these emotions affect players' aesthetic evaluations of their weapons. Lankoski argues that "if emotions are typical in aesthetic experiences, understanding how emotions and gameplay relate is relevant in understanding the aesthetic experience of playing computer games" (Lankoski, 2012, p. 39). Hence, extending this view to understanding how players' emotions during gameplay affect their choices, specifically in customizing their weapon(s), is relevant. To achieve this understanding, I combine linguistic and cognitive science approaches mentioned above to (1) provide an analytical framework with which to categorize the range of manipulation options available to the player (see Section "The Evaluation of the Player's Weapon") and (2) explain how the gameplay mechanics, events, and action possibilities contribute to their gameplay leading up to or following the manipulation of their weapon(s). However, it must be noted that emotions and aesthetic experiences that derive from aesthetic pleasure in weapon customization may be irrelevant to players who focus on the functional aspects of gameplay and who experience emotions from winning and losing the game.

The next section outlines Martin and White's (2005) appraisal theory and the use of their appreciation concept to explore the relationship between a player's aesthetic evaluation and the weapon(s) manipulation in different games. Following that, I propose the conceptual model and also demonstrate the transfer potential of the proposed model to different games, using components such as a player's emotions and goals and the age and attributes of the weapon. The final section will articulate the limitations and implications of the proposed conceptual model.

THEORETICAL DISCUSSION

Cognitive Theories of Emotion: Appraisal Theories

The term "appraisal" was first used in relation to emotion by Arnold in the 1960s. Arnold earlier became known for her "excitatory theory of emotion" (Arnold, 1945, 1950). She introduced the idea of emotion differentiation by postulating that emotions such as fear, anger, and excitement could be distinguished by different excitatory phenomena. In the 1960s, her new "cognitive theory" (Arnold, 1960) was based on the hypothesis that the emotional sequence in a person is first triggered by the appraisal of a situation, and that the physiological changes, while recognized as important, accompany but do not initiate the actions and emotional experiences. The proposed model, in this chapter, follows Arnold's (1950) cognitive theory, such that the initial appraisal for weapon customization is the player's aesthetic evaluation of the weapon (see Figure 5.2). However, the emotional process can sometimes also be initiated by gameplay events.

In Lazarus' cognitive-mediational theory (Lazarus, 1991a), he outlined two major types of appraisal. Primary appraisal is directed at the establishment of the significance or meaning of an event to the organism. Secondary appraisal is directed at the ability of the organism to cope with the consequences of the event. Additionally, Lazarus postulated two types of coping. The first coping mechanism is direct action, designed to alter the organism–environmental relationship. The second coping mechanism is the cognitive reappraisal process, through which emotional reactions can be aroused or reduced (Lazarus, 1968; Lazarus et al., 1970). In this chapter, the proposed model, aesthetic evaluation, is correlated with Lazarus' theory of primary appraisal. The first coping process in my framework involves the player's decision making. The player assesses the available gameplay choices that can be used to resolve negative emotions as a result of gameplay obstacles. The second coping process is the player's actions. Actions are made to change the state of the weapon to overcome game obstacles or fulfill the player's goal in gameplay. The player's actions can also be used as a coping process to understand the new functionality of the customized weapon in gameplay.

Scherer (1981) developed a "component process model of emotion," which was subjected to continuous updates and empirical testing. In this model, emotion is treated as a psychological construct consisting of several aspects or components, including cognitive appraisal, physiological activation, motor expression, motivational tendencies, and subjective feel states.

Emotions are differentiated by specific outcomes of continuous and sequential stimulus evaluation checks that drive the efferent response patterning. Evaluation during the appraisal processes allows for observation of stimuli and creates a step-by-step checking process (Scherer, 2001). The next section, will provide a brief overview of Martin and White's (2005) appraisal theory.

Martin and White's (2005) Appraisal Theory

Appraisal here refers to the "systematic resources used to negotiate emotions, judgments, and valuation,[1] alongside resources for amplifying and engaging with these evaluations" (Martin, 2000, p. 145). Martin and White's (2005, p. 35) framework is divided into three domains: attitude, engagement, and graduation. Attitude is "concerned with our feelings, including emotional reactions, judgments of behavior, and evaluation of things." Engagement "deals with sourcing attitudes and the play of voices around opinions in discourse." Graduation "attends to grading phenomena whereby feelings are amplified and categories blurred."

Attitude is itself divided into three regions of feeling: affect, judgment, and appreciation (Martin & White, 2005). Affect "deals with resources for construing emotional reactions." Speakers make use of affect to construct their stance, which is done through making explicit their emotional response toward a certain phenomenon. According to Martin and White's typology, we can group affect values into three major sets, which include un/happiness, in/security, and dis/satisfaction. Dis/satisfaction has been found to be an important category of engagement in digital games (Schoenau-Fog, 2011) and is incorporated as one of the emotions experienced during the weapon customization process.

Judgment is "concerned with resources for assessing behavior according to various normative principles" (Martin & White, 2005, p. 35). Judgment is subdivided into social esteem and social sanction. Judgments of esteem have to do with "normality" (how usual someone is), "capacity" (how capable someone is), and "tenacity" (how resolute someone is). Social sanction is concerned with "veracity" and "propriety." Capacity has been conceptualized as an important competence feedback mechanism in shooter games as

[1] In philosophical aesthetics, valuation is different from evaluation. Valuation is personal while evaluation is a judgment to be passed. In this chapter, I use both terms with the same meaning in terms of the player's judgment passed during the weapons' manipulation process.

the players receive new weapons when they advance (Rigby & Ryan, 2011) and proposed as one of the emotions experienced during weapon customization.

Appreciation "looks at resources for construing the value of things, including natural phenomena and semiosis (as either product or process)" (Martin & White, 2005, p. 36). "Aesthetic evaluation is not confined to inanimate objects and states of affairs. It may equally apply to human subjects" (White, 2005). Martin (2000, p. 160) organizes the system around three variables: reaction, composition, and valuation. Reaction is further subdivided into impact and quality. Composition is further subdivided into balance and complexity. These appreciation variables are used to develop the concepts for the player's aesthetic evaluation of their weapon during customization (see Section "How Emotions Affect Weapon Customization"). In the next section, I will discuss how appreciation is related to customization options in video games.

The Proposed Model for the Analysis of Players' Aesthetic Evaluation and Emotions During Weapon Customization

Martin and White's (2005) appreciation concept focuses on the entity's aesthetic impact. Values of appreciation are defined as those, which refer to the speaker's "evaluation of objects and products,…by reference to aesthetic principles and other systems of social value" (White, 2001, p. 6). Appreciation is concerned with positive and negative assessments of objects, artifacts, processes, and states of affairs rather than with human behavior. In this chapter, appreciation is used to analyze a player's aesthetic evaluation of weapons. Refer to Section "The Evaluation of the Player's Weapon" for a discussion of the appreciation framework and its modification for the aesthetic evaluation of a player's weapon.

The systemic diagram for appreciation is reproduced in Figure 5.1.

The gamer's aesthetic evaluation of his or her weapon(s) in the game world hinges on a few factors, namely, the gamer's goal, the weapon's age, and the weapon's attributes. The player's goal is an important factor because the utility of a weapon and the benefits that it bestows upon the player are dependent on the player's skills, and thus character builds that she/he chooses to make use of in game. The weapon's age is also important, because in online games, weapons become rapidly obsolete; when a new patch (software designed to update a computer program, to fix, or improve it) is released for the game, new weapons are released. In single-player games, as the player progresses in the game, his or her initial weapon has

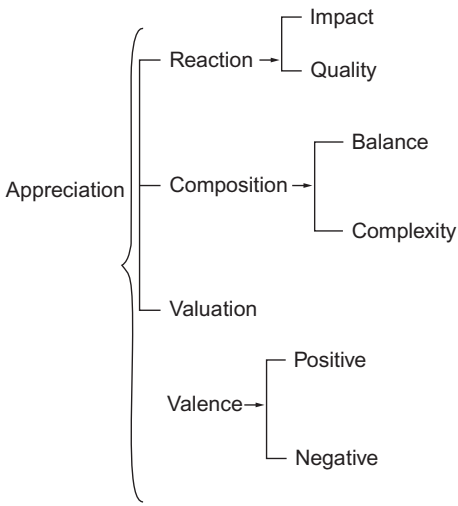

Figure 5.1 Martin and White's (2005) appreciation.

to be replaced with something better or manipulated to overcome new or tougher gameplay challenges. The weapon's attributes also influence how much effort the player will expend to upgrade or improve the item. Aarseth (2012) categorizes objects on a cline of "behavioral functionality" (Veli-Matti, 2012), ranging from inability to manipulate, static, modifiable, and destructible to creatable and inventible objects. The greater the degree of weapon manipulability, the greater its quality, complexity, and balance manipulability can fit a player's functional needs during gameplay.

When players are able to make a weapon that fits their play style or that enables them to fulfill the various character roles in an online game, such as a healer, damage dealer, or damage absorber, she/he will be able to identify with the weapon when it increases effectiveness in group gameplay. The ability to customize weapons also allows players to personalize their equipment. Personalization is carried out through the notion of choice to the players (Adams, 2010; Ducheneaut et al., 2009; Klevjer, 2006; Taylor, 2002; Thurau & Drachen, 2011; Trepte & Reinecke, 2010; Waggoner, 2009; Wilson, 2003). Personalization increases the players' valuation of the weapon in the game world, especially because the weapon's functional utility or aesthetical appeal increases. The concept of personalization is incorporated into the valuation subcategory of my proposed framework (see Figure 5.3). The weapons' properties can also be distinguished in terms of their virtual and fictional difference (Veli-Matti, 2012). A weapon is

virtual if it can be manipulated by configuration, or if its behavioral property is functional in a diegetic context (ibid.). In contrast, a weapon is purely fictional if it does not have an additional dynamic model "that will specify [its] behavior and respond to our input" (Aarseth, 2007). Fictional properties include those, which do not have any gameplay function, such as decorative colors.

These factors and how they impact a player's aesthetic evaluation of a weapon are depicted in Figure 5.2. As shown in Figure 5.2, the player's aesthetic evaluation (appreciation) of the weapon will contribute to his or her

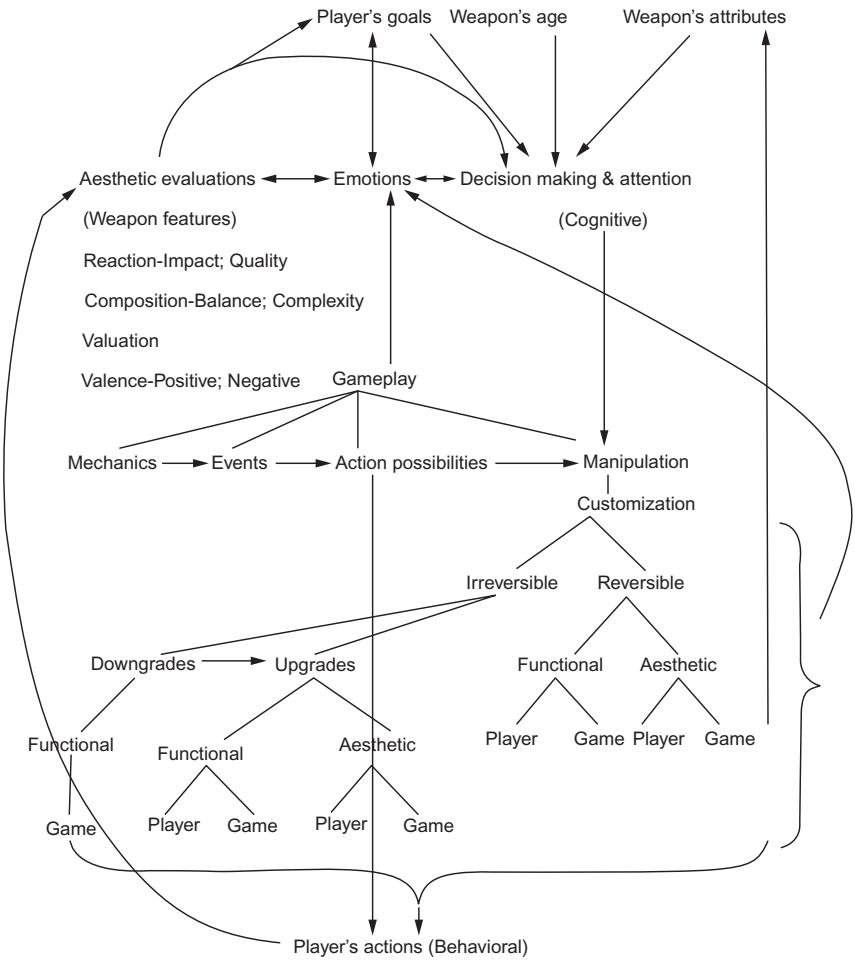

Figure 5.2 The relationship between aesthetic evaluation and emotions in the player's appraisal of in-game objects.

emotions (affect). The placement of aesthetic evaluation before emotions follows the argument made by Carroll (2006) in the context of literature and film that many aesthetic experiences provoke emotions. Damasio (2005, p. 173–77) suggests that the important function of emotions, in general, is to guide decision making and attention. Thus, the player's emotions may contribute to decision making regarding the weapon. If a player experiences a negative emotion due to gameplay or because of his or her aesthetic evaluation of a weapon, a cognitive decision where the player thinks of what to do to reduce the negative emotion will result. The player may attend to the gameplay surroundings and review his or her progress in the game, and decide whether she/he can progress despite the lack of specific weapon attributes. "In addition to emotions, the player's decision making is guided also by the goals because they give means to reason and determine which [action] is more advantageous in a given situation" (Lankoski, 2012, p. 39–40). This is also shown in Figure 5.2.

Emotions and aesthetic evaluations could also influence players' goals. The valence of the emotions experienced may change players' goals if they are incongruent. Aesthetic evaluation could also influence players' goals, especially as it relates to the goal of customizing a weapon. In the context of the video game, I argue that the weapon's age (refers to the length of time that a player has a particular weapon) and attributes also factor into a player's decision-making process about his or her course of action. While a weapon's age and attributes are "inputs" because they factor into the decision-making process, players' goals are both inputs and outputs. Players' actions should also feedback directly into a weapon's attributes. Once the weapon has been upgraded, its attributes have been changed. Decision making, players' actions and manipulation might also elicit emotional responses from the player.

While Carroll (2006) argues that for literature and film, emotions are not necessary for all aesthetic experiences, I argue that in video games, emotions are crucial to the players' aesthetic evaluation of their weapons. Emotional involvement in not only the fictional world, but also the gameplay in terms of weapon manipulation will also "add a great deal of interest and richness to the gaming experience" (Tavinor, 2009, p. 129). The reason is that a player's weapon is a core item that enables him or her to progress in the game. As such, a player's emotions during gameplay may directly lead to the player's aesthetic evaluations of his/her weapon. The player may evaluate the weapon's effectiveness in terms of its function in overcoming the game world's challenges. Thus, in addition to the above, emotions may also precede the player's aesthetic evaluations of his/her weapon (see Figure 5.2).

In the next sections of this chapter, a discussion on the categories of weapon manipulation and explanation of three components of the model using different game examples are presented to show how the model can be used for the analysis of weapon customization. The components are the player's goals, the player's emotions, and the aesthetic evaluations of the player.

The Categories of Weapon Manipulation

Weapon manipulation[2] encompasses (1) the player's customization, (2) the player's upgrades, (3) the game's upgrades, and (4) the game's downgrade.

Customization and *upgrades* are distinguished by their different mechanics. Depending on the context, customization may involve manipulating a weapon to a greater degree than upgrades. The player's weapon *customization* is commonly found in role-playing games such as *The Lord of the Rings Online* (*LOTRO*) (Turbine, Inc., 2007) and *Skyrim* (Bethesda Game Studios, 2011). First, customization choices are *reversible*. In *LOTRO* (Turbine, Inc., 2007), players are able to customize their weapons with specific relics, which provide positive benefits to the players' characters. These relics can be removed at a future time with a relic removal scroll, and the player can then apply the relics to another weapon: this provides the player choice. Second, with customization, players can choose the type of weapon that they would like to create that suits their play style. In *Skyrim* (Bethesda Game Studios, 2011), there are hundreds of different weapons that the player can create and then customize at the non-player characters (NPCs) in town.

An *upgrade* is making the weapon better and it is also a form of customization. Harris (2011) analyzed the character creation in *World of Warcraft* (*WOW*) (Blizzard Entertainment, 2004) and found that the players have little control over how their characters look. The majority of individualization and character upgrades are done through later gameplay activities, for example, finding or buying armor and items (Harris, 2011, p. 30). I incorporate Harris' (ibid.) discussion of upgrades into the proposed framework for analyzing players' weapon manipulation. These customization options available during gameplay are included in the proposed frameworks as "gameplay events," "players' action possibilities," and "players' actions." Leino (2010, p. 259), suggests "the possibility to upgrade [an in-game object],

[2] In some games, weapons may be created (crafted). However, this chapter focuses on the manipulation process after the weapon is created, such as the process of the player's weapon customization.

and thus maintain the particular [object's] relevance across [gameplay progress], facilitates emotional investment." The player can upgrade the weapon by finding items or buying and bartering for them (see Section "A Weapon's Speed"). The upgrades are irreversible customizations. Once chosen, upgrades cannot be removed. The reason for making the distinction between upgrades and customization is that having an irreversible choice for manipulating the weapon may lead to different types of emotional investment in a weapon. For instance, irreversible upgrades are a feature in *Bioshock Infinite* (Irrational Games, 2013).

In games such as *Tomb Raider* (Crystal Dynamics, 2013) that allow the player to upgrade but not to reverse the upgrades applied to the weapons, the player also cannot create their own weapons as these weapons are either found or given to him/her[3] during gameplay. Thus, the player is provided a lesser degree of options to choose among weapons. They have to make careful decisions in relation to their goals to choose which upgrades to apply to which weapon. These might make the player emotionally invested in the weapon because the limited choices might contribute to tough decision making. If they make a correct decision a positive emotion might ensue or a wrong choice might contribute to a negative emotion. On the other hand, in games where players are given many customization and freedom in choosing weapons, they might have easier choices and less emotional engagement when those choices are not binding. However, players might emotionally invest in their weapon when they have multiple choices to create a weapon that suits their play style. For instance, in *LOTRO*, the player's legendary item is highly customizable, and they need not discard this type of weapon to look for new ones; rather, they continuously build on it to improve or focus the weapon's attributes to their goal, for example, play style. The wide difference in the types of decisions, emotional experience, and aesthetic evaluation is what distinguishes between customizable weapons and upgradeable weapons.

An *upgrade* can be distinguished between *player upgrades* and *game upgrades*. Player upgrades are voluntary. Players are provided options to choose the specific type of upgrade that they want for the weapon. For instance, in *Tomb Raider* (Crystal Dynamics, 2013), when the player has found enough salvage materials during gameplay, she/he is able to upgrade

[3] The video showing the compound bow being given to Lara Croft in *Tomb Raider* (Crystal Dynamics, 2013) can be seen at time 11:40 from this link: http://www.youtube.com/watch?v=lHSOcvaXJ5I.

the weapon by choosing from the available upgrade choices at the base. Game upgrades are performed solely by the game and can occur during scripted gameplay events. An instance of this occurs in *Tomb Raider* (Crystal Dynamics, 2013) when Lara Croft finds specific gear in a scripted gameplay event in the Cliffside Village, and the game upgrades her bow.[4] The player is not given any choice to select the specific upgrades that she/he desires. Game upgrades are thus the least interactive.

Another category of customization is weapon downgrades which are irreversible. Players may not be given options to reverse the degradation of the weapon. For instance, in *Diablo II* (Blizzard Entertainment, 2000), an ethereal weapon's durability cannot be repaired, and the weapon will become useless and have to be discarded once its durability has reached zero. However, irreversible downgrades can be turned into irreversible upgrades. The player is able to change the downgrade into an upgrade by inserting runes or gems into the weapon to make it indestructible.

If all upgrades are a type of customization, player choice exists on a continuum. Some types of customization, especially the player-chosen types, involve more player choice and the other types of customization; especially the game-chosen types involve less player choice.

The Player's Goals

Goals are an important part of games and a core feature to understand the player's emotions during weapon manipulation.

Goals can be subdivided into the player's goals or the game goals. In games with more structure, players have to adhere to the game goals to progress. In the arcade game *Donkey Kong* (Nintendo, 1981), players must bypass the titular gorilla at the top of a construction site before they can proceed to the next game level. In more open game worlds, such as *Skyrim* (Bethesda Game Studios, 2011), players can choose to ignore the game's regulating goal structure without much penalty and also generate their own goals. Players can choose to socialize with other players with the multiplayer modification of the game or complete the exploration of the game world without engaging in quests provided by NPCs.

There are also player sub-goals and game sub-goals. In *Tomb Raider*, tomb quests provide optional player sub-goals. Completing the puzzles in the tombs rewards the player with treasure maps as well as salvaged parts

[4] The scripted gameplay event can be seen at time 1:00 from this link: http://www.youtube.com/watch?v=tD3_0ziHf8s.

for him/her to upgrade the weapon. These optional sub-goals (which are similar to side quests) facilitate the player's main goal of progressing through the game by enabling the player to upgrade his/her weapon faster. The system of upgrading weapons may also provide the player a sub-goal to complete other than the story.

Game sub-goals are obligatory actions the player has to take in order to progress gameplay. In American McGee's *Alice: Madness Returns* (Spicy Horse, 2011), the player has to adhere to a series of steps to reach a specific game goal, for example, getting to a reachable platform obstructed by flowing lava. The player first has to complete a game sub-goal, such as jumping to reach a specific lever to deactivate the lava flowing on the floor. Only then can she/he reach the game goal.

In the proposed model, aesthetic evaluation of the weapon can influence the players' goals. Players may find that the gameplay progress is obstructed and they may evaluate the weapon. During the evaluation, the player may find that the weapon lacks specific attributes, which may directly contribute to a change in his/her goal or indirectly contribute to a change of the goal through his/her emotions. The player's goal may be changed to focus on gameplay actions after making a decision about weapon manipulation in order to fulfill other goals, such as overcoming a gameplay challenge; this challenge may require specific weapon attributes that the player may not currently have.

How Emotions Affect Weapon Customization

In this section, I integrate cognitive and linguistic theories to propose a model for the analysis of the player's emotions (see also Leino, 2010) during weapon customization. The term "emotion" covers a wide range of phenomena. Damasio (1994) divides emotions into primary and secondary emotions. Primary emotions are innate and stem from the rapid pre-organized processing of certain features of stimuli in the world or in our bodies. Secondary emotions occur once humans begin experiencing feelings and forming systematic connections between categories of objects and situations, and also between primary emotions. Secondary emotions are acquired and embody a person's unique experience of the relation between a type of situation and emotion.

Oatley (2004, p. 78) proposes two components of an emotion. He suggests that when "we experience an emotion because of an event in the world we are affected by the first, rather non-specific, signal, and we know by perception what happened to cause it." A second movement and its evaluation occur during the attempt to understand an emotion. Oatley relates four of the most basic emotions—happiness, sadness, anger, and fear to event goals that trigger them. He cautions "although each of these four emotions

typically arises in relation to a goal, it can also take place in a free-floating form without anything in the world having triggered it" (p. 79). Oatley's emotions and the goal-related events are reproduced in Table 5.1.

Lankoski (2012) further builds on Oatley's (2004) emotion framework by integrating Power and Dalgleish's (1997) goal status evaluation, physiology/action tendency, and the addition of negative emotions such as disgust into the emotion framework for analyzing computer games and emotions. Lankoski's (2012) integrated emotion framework is reproduced in Table 5.2.

Table 5.1 Oatley's (2004: 79) emotions and goal-related events

Emotion	Goal-related event triggering emotion	Plan, second emotion movement
Happiness	Goals being achieved	Continue, engage in plan
Sadness	Loss of goal	Do nothing, withdraw interest
Anger	Active goal frustrated	Try harder, strive forcefully
Fear	Danger or goal conflict	Freeze, survey environment, and escape

Table 5.2 Basic emotions, goal status evaluations that the basic emotion is linked to, and typical physiology/action tendency of the emotion (Lankoski, 2012)

Basic emotion	Goal status evaluation	Physiology/action tendency
Happiness	Progression toward or reaching a goal	Low heart rate, tendency toward risk avoidance, or to continue with the goal
Fear	Physical or social threat to a self or where a current goal is in danger	Tension in muscles, dry mouth, high heart rate, low skin temperature, vigilance, avoidance behavior, raised action readiness, or freezing
Sadness	The loss or failure of a valued goal	High heart rate, low skin temperature, no typical action tendency
Anger	A goal is blocked or frustrated	High heart rate, high skin temperature, tendency toward revenge
Disgust	A refusal of a concrete or abstract thing that is repulsive in relation to a goal, as the refusal seems to cause physical or psychological contamination	Nausea, increased salivation, low heart rate, avoidance behavior

In this chapter, I integrate Martin and White's (2005) appraisal theory into Lankoski's (2012) integrated emotion framework by adding security/insecurity and satisfaction/dissatisfaction from Martin and White's (2005) affect category, and capacity/incapacity from their judgment category. I also incorporate Roseman's (1984) cognitive theory of emotion to distinguish between the different proposed emotions. The additions to the framework are shown as in Table 5.3:

Table 5.3 The proposed emotion framework for weapon customization

Basic emotion	Goal status evaluation	Physiology/action tendency
Security	Certainty in the progression toward a goal due to the possession of a (quality) weapon with (impact)	Low heart rate, tendency toward risk taking, or to continue with the goal
Insecurity	Uncertainty in the progression toward a goal due to the possession of a (low quality) weapon with (low impact)	High heart rate, vigilance, tendency toward risk aversion, or to take precaution in the progression toward the goal
Satisfaction	Weapon providing the required (attributes) to assist the player in reaching the goal or overcoming the environmental obstacles	Low heart rate, tendency toward continuing with the goal
Dissatisfaction	Weapon lacking the required (attributes) to assist the player to reach the goal or overcome the environmental obstacles	High heart rate, high skin temperature, tendency toward problem-solving behavior
Capacity	Weapon possessing (impact) and (quality) to enable the player to reach the goal or overcome the environmental obstacles	Low heart rate, tendency toward risk taking, or to continue with the goal
Incapacity	Weapon lacking (impact) and (quality) preventing the player from reaching the goal or to overcome the environmental obstacles	Low heart rate, low skin temperature, no typical action tendency unless engaged in other activities till (incapacity) emotional state is resolved

In the emotions proposed above, it is noted that while the emotions of in/capacity, dis/satisfaction, and in/security are similar to each other in terms of the player's in/ability to progress toward his/her goal, there are subtle differences. For instance, while capacity indicates that the weapon possesses impact (see Section "Appreciation—Reaction: Impact"), which may include weapon damage (see Section "A Weapon's Damage Potential"), and quality (see Section "Appreciation—Reaction: Quality"), along with functionality (see Section "Functionality"), satisfaction involves a deeper aesthetic evaluation of the weapon by the player: that of specific attribute combinations (see Sections "Reaction: Composition—Balance" and "Reaction: Composition—Complexity"), like type of weapon damage in relation to the specific functionality of the weapon. For example, some weapons in *Diablo II* (Blizzard Entertainment, 2000) are effective against certain enemy types, such as those that deal additional damage to undead creatures. Roseman's (1984, p. 20) third hypothesized cognitive dimensional determinant, "probability—certainty and uncertainty," is used to distinguish in/security from the other emotions. The emotion of in/security involves the cognitive interpretation of un/certainty. Although "certainty" can also be argued to be present in satisfaction and capacity in relation to the player's goal, certainty is less relevant for satisfaction and capacity, as these emotions arise as a result of the player's aesthetic evaluation of the weapon's attributes and the combination of various attributes respectively.

Here, I draw upon Oatley's (2004) discussion of the complex emotion of attachment to understand a player's attachment or detachment to their customized weapon. Oatley (2004, p. 87) suggests that "the overall social goal of attachment is protection." In relation to weapon customization, the prototypical feeling of attachment involves the emotion of trustful security when the attachment partner, the weapon, is present. This presence also involves the emotion of being satisfied with the weapon, which subsequently produces the emotions behind capacity to explore the world. On the other hand, if the player's weapon is absent or insufficient due to a lack of customization, upgrading potential, or choice, then insecurity of the most intense kind arises, and capacity is drained.

Power and Dalgleish (1997, p. 415–27) propose two routes to emotion. The first includes the appraisal of a goal-related event that is external,

internal, or propositional. The second involves an event triggering an emotion because of habituation. This direct access is incorporated into my proposed model in Figure 5.2, where the gameplay directly instigates or stimulates the player's emotion.

The Evaluation of the Player's Weapon

In this section, a discussion on how each component of Martin and White's (2005) appreciation framework can be used to understand the player's aesthetic evaluation of his/her weapon during customization is presented.

Leino (2010, p. 246) describes the conduct of *emotional investment*, which refers to how the player elevates certain parts of the game's content from the game to enable these parts to be experienced as objects of emotions. I propose that during the weapon manipulation process, specific features of the player's weapon are elevated by the player for its aesthetic evaluation. The player's evaluation of the weapon features discussed in the following sections might contribute to the player's emotions or *vice versa*.

Appreciation—Reaction: Impact

Martin and White (2005) define appreciation as "the evaluation of objects and products by reference to aesthetic principles and other systems of social value." According to Rothery and Stenglin (2000), reaction is "interpersonally tuned. It describes the emotional impact of the work on the reader/listener/viewer." Under reaction, the product/process is evaluated in terms of the impact it makes.

In weapon manipulation, the weapon's impact can be aesthetically or functionally evaluated according to various aspects, including the weapon's damage potential, the weapon's speed or rate of fire, the weapon's range, its status as the main or secondary weapon, and its primary and alternate mode of damage. These weapon attributes will be defined below.

A Weapon's Damage Potential A weapon can be functionally evaluated by the amount of damage it inflicts. Some weapons' damage cannot be upgraded. These include common weapons without sockets and empty slots players may fill with other in-game objects to modify the weapon's attributes, as are found in *Torchlight II* (Runic Games, 2012) and *Diablo III* (Blizzard Entertainment, 2012). According to Aarseth's (2012) categorization, these weapons are static objects that cannot be modified. Static

weapons create insecurity in the player because these weapons cannot be upgraded to deal with tougher challenges as the gameplay progresses. The damage of customizable weapons, however, can be increased.

In *Torchlight II* (Runic Games, 2012), socketable weapons' damage can be increased by inserting special randomly found in-game objects, such as unique skulls. For example, the gameplay object such as the skull of Samadow, when socketed into a weapon, increases the weapon's damage to secondary targets by 100%. Customizable weapons create a greater sense of capacity in the player as the weapon's attributes can be improved during gameplay.

Aarseth's (2012) category of creatable objects includes crafted weapons. In *LOTRO* (Turbine, Inc., 2007), legendary items are creatable objects. Legendary items are special class-specific items that players can craft or obtain as quest rewards. Legacy points are specific bonuses to character skills and can be added to increase weapon damage. Furthermore, other in-game objects, when added, such as the scroll of empowerment and the star-lit crystals, further increase the weapon's damage. Creatable weapons create both capacity and security as the weapon can be customized to the player's play style.

A Weapon's Speed The attack speed statistic of a weapon determines how fast a player can attack. The faster the attack, the more damage per second the player generates because she/he can land more hits in a shorter time. Therefore, the weapon's attack speed or rate of fire is directly related to the weapon's damage. Typically, the attack speed of a two-handed weapon is slower than that of a one-handed weapon. The attack speed of customizable weapons can be increased through the use of other items or by purchasing upgrades. In first-person shooters such as *Bioshock Infinite* (Irrational Games, 2013), the player can upgrade the weapon's rate of fire with the Minuteman's Armory machines scattered throughout the game world by spending in-game currency. The fire rate boost enables the player to upgrade the sniper rifle's firepower by 100%. Upgrades that increase the weapon's speed create a sense of security in the player due to its improved capacity.

A Weapon's Range of Fire A weapon's range of fire contributes to the weapon's impact. Increasing the weapon's range enables the player to attack enemies from a safer distance. This attribute contributes to the players' emotion of security (see Section "The Player's Goals") as the players would be able to kill the enemies before they reach them. In *Bioshock* (Irrational Games, 2007), the player can customize his/her weapons by purchasing

weapon upgrades using the "Power to the People" vending machine, for example, to increase the Chemical Thrower's range. Upon purchasing this upgrade, the player is able to unleash a stream of fire from one end of a room to the other.

Main and Offhand Weapons A weapon's impact can be evaluated by its distinction as either a main or offhand weapon. Offhand weapons typically possess less damage potential than main hand weapons. In *WOW* (Blizzard Entertainment, 2004), offhand weapons inflict 50% of the damage that they would if they were equipped in the main hand. However, a player's evaluation of the lesser impact of the lower offhand weapon damage is offset by other considerations such as a faster weapon attack speed. Furthermore, for most classes able to dual wield in *WOW* (Blizzard Entertainment, 2004), there are talents from "Dual Wield Specialization" that can be used to increase the effect of the offhand weapons' damage. As an offhand weapon complements the main hand weapon, possessing both of these weapons results in the player's satisfaction when the attributes found in the offhand complements the main hand's attributes.

Primary and Alternate Modes of Fire Finally, a weapon's impact can be evaluated by its primary and secondary/alternate modes of damage. In *Tomb Raider* (Crystal Dynamics, 2013), several weapons have primary and secondary fire modes. For instance, the short-range shotgun can be upgraded to produce an alternate firing mode known as the "full choke." This alternate firing mode serves to preserve the power of the shotgun when its range is improved. The alternate firing mode has a specialized function, which results in the player's emotion of capacity when the player is able to formulate alternate strategies based on the weapon's alternate attributes to overcome tough challenges in the game world.

Appreciation—Reaction: Quality

Under reaction, the weapon may also be evaluated in terms of its quality. The following qualities are outlined below: relationship to reality, the aesthetics of the weapon, and the functionality of the weapon.

Relationship to Reality The representation of a weapon can immerse the player in the game world if it simulates the weapon's properties in the real world. Lukas (2010) calls this "fidelity": [In] games which reference the real world, such as *Brothers in Arms: Road to Hill 30* (Gearbox Software, 2005), fidelity is increased by design details, such as virtual weapons modeled

on the originals. Some of these properties include durability, limited ammunition, and reloading time. A common feature of weapons in many games is that they experience wear and tear, and will break after so many uses. This is a common feature in some games such as *Fallout 3* (Bethesda Game Studios, 2008), *Fallout: New Vegas* (Obsidian Entertainment, 2010), and *Diablo II* (Blizzard Entertainment, 2000). In *Diablo II* (Blizzard Entertainment, 2000), weapons which possess the ethereal attribute cannot be repaired and have a lower durability. These negative attributes are offset by the weapon's higher damage percentage. The combination of these attributes contribute to a temporary period of player's satisfaction but will result in the player's incapacity once the weapon has worn down completely whereby the player will have to find a new replacement weapon. Some weapons' durability can be customized. For example, in *Diablo II* (Blizzard Entertainment, 2000), a player can socket a "Zod rune" into specific weapons so that the weapon will become indestructible. This enhances the player's emotion of capacity as the weapon's quality improves.

In shooter games and the survival horror genre, most weapons have limited ammunition, so the player needs to keep replenishing his/her weapon's ammunition by finding ammunition piles situated throughout the game world. *The Last of Us* (Naughty Dog, 2013), *Bioshock* (Irrational Games, 2007), *Tomb Raider* (Crystal Dynamics, 2013), the *Half-Life* series (Valve Corporation, 1998, 2004), and the *Resident Evil* video games (Capcom, 1996–2014) exhibit this kind of game mechanic. Due to the limited ammunition, the player will experience an emotion of insecurity as the ammunition is almost depleted if she/he does not have an alternate strategy to overcome the gameplay's challenges. In some games, players can upgrade weapons to increase the amount of ammunition the weapons can hold before the player needs to reload. In *Bioshock Infinite* (Irrational Games, 2013), for example, the player can upgrade the Repeater's clip size, doubling the ammunition from 35 rounds to 70 rounds per magazine. As the weapon is upgraded, the player experiences an increased emotion of capacity. In other games such as *Mass Effect* (Bioware, 2007), ammunition is unlimited and instead of reloading, the weapon builds up heat until it overheats, and it cannot fire again until it has sufficiently cooled down. Although this contributes to a feeling of capacity, the player will need to master the aiming mechanic so that she/he will not need to shoot too frequently which overheats the weapon.

Reloading is a gameplay mechanic most often found in first- or third-person shooters. Besides adding a touch of realism, it also creates a certain

amount of tension and causes the player to experience the emotion of insecurity when she/he is forced to reload while under fire. Reloading consists of two different modes of reloading: some games, such as *Bioshock Infinite* (Irrational Games, 2013), automatically reload for the player, while other games, such as *Virtua Cop* (Sega AM2, 1994), require the player to manually reload his or her weapons. Different weapons in the *Resident Evil* (Capcom, 1996) and *Halo* series (Bungie, 2001) require different reloading times. Generally, more powerful weapons take longer to reload. Some games allow players to purchase upgrades to decrease the reload time or to increase the reload speed. In *Bioshock Infinite* (Irrational Games, 2013), for example, the player can purchase upgrades for the hand cannon to increase its reload speed by 50%. This relieves the tension in gameplay and contributes to an emotion of security.

The Aesthetics of the Weapon Weapon quality can be evaluated based on a player's ability to customize the weapon's appearance. However, non-customizable weapons can also be evaluated, when there is a lack of choice in changing a weapon's appearance. First, the player's evaluation is based on the ability to personalize the weapon via dyeing, painting, or otherwise modifying the look. In some shooter games, such as *Battlefield 4* (EA Digital Illusions CE, 2013), players can choose from 130 camouflage patterns to customize their weapon. Other types of weapons have a set look, and getting a new weapon results in a new look for the character. Having the right combination of weapon attributes for the weapon's aesthetic appearance results in the player's emotion of satisfaction when the weapon is able to reflect the player's identity in the game world.

In some games, customized appearances are not only aesthetic (and often update on the character's profile screen and in the game) but also functional. In *LOTRO* (Turbine, Inc., 2007), when the player applies specific weapon damage scrolls to his/her weapon, such as Beleriand damage, the weapon glows with a pale blue light whenever enemies that are susceptible to that damage type are nearby (Olivetti, 2012). To players who are familiar with *The Hobbit* book (Tolkien, 1937) and film (Peter Jackson, 2012), they will be able to draw an intertextual relationship between the game and the other media. This is because they possess the additional knowledge that Bilbo Baggins' short sword *Sting* shines with a blue light whenever orcs or goblins are nearby. This intertextual knowledge immerses the player in the game world and contributes to their attachment to the weapon. Although this knowledge is exclusive to these players, the game makes it known as a property

of the sword during the fights when it glows. In general, any special features of the weapon (regardless of whether these are known beforehand from other media), rated by players in degrees (some weapons and their special features would be more coveted than others), would make players feel attached to their weapons.

Functionality The efficiency of a weapon can be evaluated according to its functionality. Functionality is subdivided into the weapon's ability to enable the player to overcome environmental obstacles; the general nature of the weapon; its versatility; and the specialized nature of the weapon. In *Tomb Raider* (Crystal Dynamics, 2013), weapon upgrades such as the bow that can be improved with salvaged parts enable Lara Croft to overcome environmental obstacles. When a player upgrades the bow to incorporate the "rope arrow," he or she gains the ability to use the weapon to pull on rope-tied targets and open doors which increases the player's emotion of capacity in the game world. General weapons are "all-rounder" types; for example, the ACE 23 is a weapon featured in *Battlefield 4* (EA Digital Illusions CE, 2013) which has no specialized features, so it can be used in general situations. Some weapons have specialized functions. In *Tomb Raider* (Crystal Dynamic, 2013), the shotgun is a specialized weapon used to clear out enemies packed in a tight space in front of the player in close quarters. The shotgun can also be upgraded at the base camps to increase its specialized function. The incendiary shells upgrade modifies the shotgun's barrel tip to apply ignitable fuel to outgoing pellets, which does more damage to enemies and can set flammable objects on fire. Improved functionality generally increases the player's emotion of capacity.

Appreciation—Reaction: Composition

"Under composition, the product or process is evaluated according to its makeup" (White, 2005). This subcategory looks at whether the product conforms to various conventions of formal organization. As Rothery and Stenglin (2000) state, "Composition is textually tuned. It describes the texture of a work in terms of its complexity or detail." Under composition a product may be evaluated based on its *balance* and *complexity*.

Reaction: Composition—Balance In gameplay, the notion of balance "is the sense that your circumstances or your chosen means of playing the game are roughly equivalent to everyone else's, in terms of giving you a fair shot at winning" (Newheiser, 2009). A balanced weapon in video games is thus a weapon that neither confers an unfair advantage to the player by

means of high impact (e.g., high weapon damage) nor causes the player to suffer a severe disadvantage in the gameplay due to its low impact (low weapon damage). An example of an unbalanced weapon is the AWP sniper rifle in *Counter-Strike* (Valve Corporation, 1999). It is a long-range sniper rifle that can be used by the player to kill another player in one shot. The use of such weapons thus reduces the quality of gameplay, and also reduces the element of choice in gameplay, as most players would then use this weapon over other weapons or strategies in gameplay. Although it reduces the quality of gameplay, players still use it as they feel more capable and secure due to its high damage which enables players to dominate maps in *Counter-Strike* (Valve Corporation, 1999).

In evaluating the balance of a weapon in gameplay, the player decides what attributes to focus on when crafting the weapon based on his or her goal in the game. In single-player games, a balanced weapon consists of a combination of attributes which function together to enable the player to create various strategies during gameplay in order to overcome challenges. More importantly, a customizable weapon enables the player to continually improve his/her weapon to keep up with tougher challenges, which contributes to the player's satisfaction. In multiplayer games, a balanced weapon enables the player to fulfill his/her role within group play. For instance, a player performing the role of a healer would use a weapon primarily with attributes that support the player's healing and defensive capabilities that confers both the emotions of capacity and security.

Reaction: Composition—Complexity Highly customizable weapons, such as "creatable objects" (Aarseth, 2012), are more complex, as they provide the player even more choices to modify the weapon to suit his or her goal.

LOTRO's (Turbine, Inc., 2007) "legendary item" system is a complex weapon customizing system. The player is able to customize the types of legacies that she/he intends to have on the legendary weapon. Legacies are specific bonuses to specific character skills that are applied to the character when she/he has the legendary item equipped. If the legendary item has legacies that the player does not need for the character build, she/he can obtain the desired legacies by extracting them from other legendary items that possess the required legacies. The extracted legacies can be used to replace the unwanted legacies on the player's main legendary item. When the player is able to obtain the desired combination of weapon attributes, which suits the play style, she/he experiences an emotion of satisfaction.

Reversibility (see Section "The Categories of Weapon Manipulation"), when players can reverse a customization to a weapon if needed, is another attribute, which determines the complexity of the player's weapon. This feature is present to a limited extent in *The Lord of the Rings Online*'s (Turbine, Inc., 2007) legendary weapon system. It allows the player to feel more attached to the weapon because they need not discard it if they make a customization they regret. In some games, such as *Bioshock Infinite* (Irrational Games, 2013) and *Tomb Raider* (Crystal Dynamics, 2013), modifications to the weapons are permanent. Therefore, the player can choose to upgrade only a limited number of weapons, because of the limited in-game currency the player possesses. With less choice, the player is forced to make careful decisions when deciding which weapons to upgrade. When the player makes a wrong choice, she/he may experience incapacity if she/he upgrades a weapon that she/he is less proficient with.

Appreciation—Valuation

Under the subcategory of social value, an object, product, or process is evaluated according to various social conventions (White, 2005). This domain is tied closely to field, as the social valuation of one field will not necessarily be applicable or relevant to another. In video games, the valuation of the player's weapon depends on the player's goal(s) in the game world. Achieving the player's goal depends on the weapon's age and attributes. In online games, as new content is released and the original weapon's value depreciates due to the release of more powerful weapons and enemies, the possession of the older weapon with low impact and low quality will hinder the player's goal. In single-player games, a player who does not customize his weapon or upgrade it continually will face severe disadvantages, as the older weapon will be ill-suited to handle new, tougher challenges. A corresponding emotion of incapacity will ensue. Valuation also depends on the degree to which the weapon can be tailored to the player's play style. The weapon is "an extension of [the player] (character's skill set) that exists to make accomplishing objectives easier" (Lukas, 2010, p. 80). Many games are able to adjust to the player's expectations and aesthetic preferences. For instance, in *Borderlands* (Gearbox Software, 2009), the choice of character defines what type of weapons (heavy, light, long-ranged) the player can use. Therefore, the player's character choice is intimately tied to his/her weapon preferences. The more weapon customization choices provided to the player, the more tailored the weapon can become both to the player and their gaming style, that corresponds to the player's emotion of capacity.

The ability to name the weapon will also increase the player's valuation of the weapon. Weapon naming is possible in *LOTRO* (Turbine, Inc., 2007) in terms of the legendary items. "Weapon binding" is another feature that increases attachment of the player to his or her weapon. It is included in many online games such as *Diablo II* (Blizzard Entertainment, 2000) and *WOW* (Blizzard Entertainment, 2004).[5] Weapon binding happens when the player equips an item that she/he either finds in the game world or creates. At this point, the player can no longer trade or sell the weapon to other players and can use it only for his/her own character. When the weapon becomes bound, the player can personalize specific attributes of the weapon during the customization process. On the other hand, players can also create (unbound) weapons to trade or sell. The ability to create weapons also increases the social capital of players (Chen, 2009), as they now possess expertise to offer to other players who are unable to make their own weapons through crafting. Both this and weapon binding offer value to weapons. The proposed framework for the player's aesthetic evaluation of the weapons during customization is summarized in Figure 5.3.

LIMITATIONS

The present chapter proposes a conceptual model by building upon Martin and White's (2005) appraisal theory to understand the player's emotions during the weapon customization process. However, the proposed model might be limited to certain video game genres which include role-playing games, shooter games, and massively multiplayer online games as not all games incorporate weaponry or even use weaponry in a similar fashion, as what I have discussed in this chapter.

The proposed conceptual model might not accurately predict the process in which different players experience the emotions listed in the model. For instance, after the players experience an emotion, they might not necessary pay attention to it which contributes to decision making. The process of appraisal might not equate (or follow-up) with conscious reasoning as no appraisal theories assume that appraisals must be conscious and controlled (Roseman & Smith, 2001). Appraisal processes might be typically non conscious and automatic (Smith & Kirby, 2001) as they need to be fast because the environment can change quickly (Lazarus, 2001).

[5] For a more in-depth discussion on different types of weapon binding, see http://www.wowwiki.com/Bind_on_Equip.

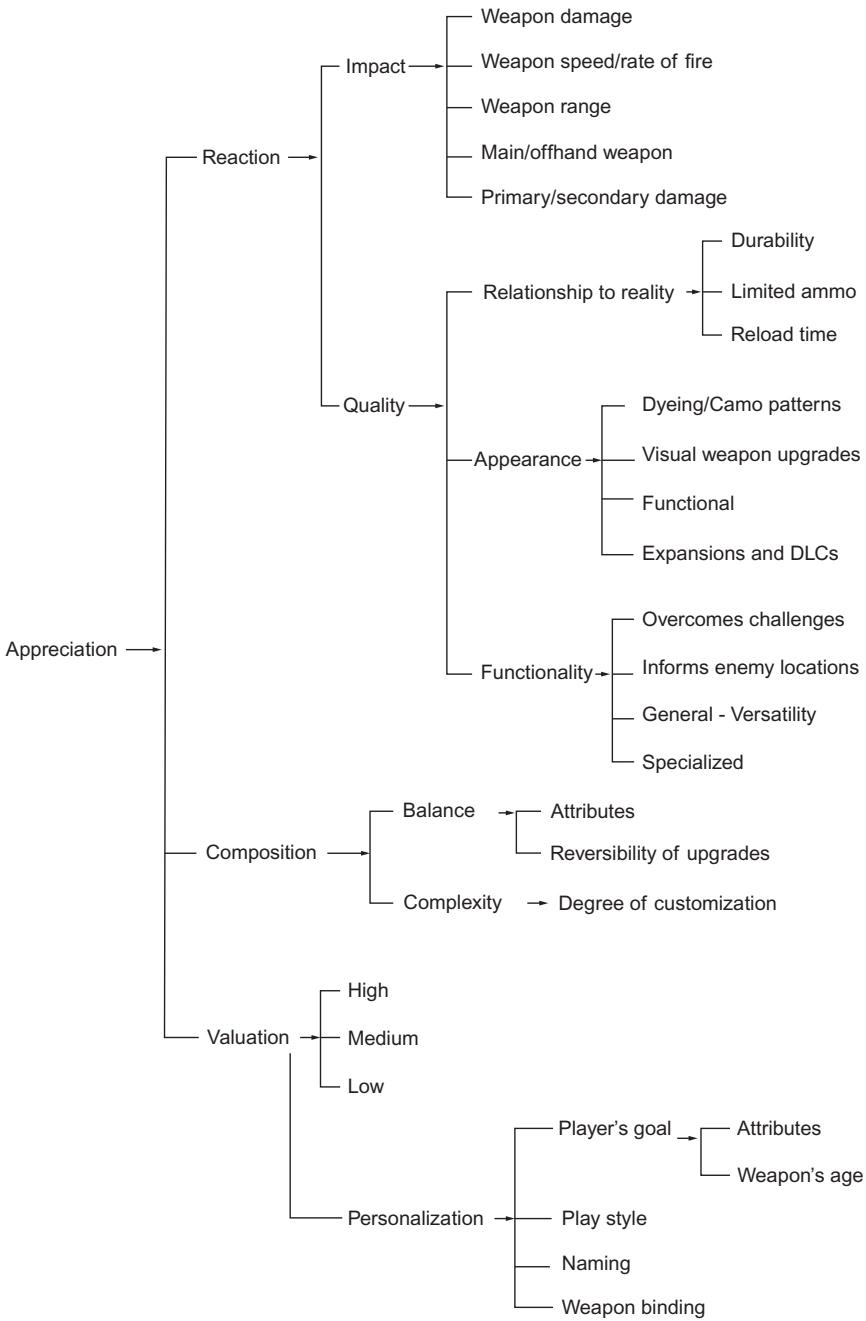

Figure 5.3 Aesthetic evaluation during weapon customization (Martin & White, 2005).

Another limitation involves the different ways in which the different personality types of players influence how they identify with the weapon customization experience. The players might not experience the basic emotions proposed in the model for weapon customization. Perhaps a future empirical study may use the Myers-Briggs model as a starting point to gauge how different players respond to different gaming elements related to weapon manipulation. To apply a set of emotions to all gamers and how they experience weaponry in a game would be too inaccurate at the outset. A game may be the same for all the players, but the players themselves are the greatest variable in a gaming experience.

IMPLICATIONS

An appraisal theory of aesthetic and functional emotions for weapon customization in video games has many implications. Some of the more important implications are discussed in this section. First, the conceptual proposal of the types of emotions experienced by the video game players using Martin and White's (2005) appraisal theory would expand the number and types of emotions studied by researchers in video games. It builds upon the basic emotions proposed by Lankoski (2012) to enable researchers to better understand the players' emotions in certain video game genres. Compared to Lankoski's (2012) categories of basic emotions which are more general, the proposed emotions in my conceptual model might be more functional and to a lesser extent aesthetic as they are developed for the analysis of the players' weapon customization. My proposed categories of emotions complements Lankoski's (2012) model as his model has little to say about the types of emotions that can be experienced during the functional customization process of video game players.

Second, appraisal theories offer new predictions for when and why individual differences affect emotional responses to the weapon customization process of the players. Appraisal theories can trace individual differences in emotional experience to individual differences in patterns of appraisal (van Reekum & Scherer, 1997). For instance, a player who is more focused on the aesthetic appearance rather than the functional aspects of the weapon might be more inclined to experience emotions of (dis)satisfaction rather than (in)security or (in)capacity. Hence, the proposed conceptual model might be used to understand or predict how different players' personality types are correlated to the types of emotions that they experience during the weapon customization process. The conclusions, in this chapter, may

be used by game designers to create and target different features of weapon customization choices (aesthetic *vs.* functional) in different video game genres to different types of players with different personalities.

CONCLUSION

This chapter does not present a complete theory of how emotions and aesthetic evaluations are involved during weapon customization. Including more games in would help to further develop the proposed model. For instance, the types of emotions involved and the player's aesthetic evaluations during weapon customization could be expanded and tested. Furthermore, I have not discussed how the framework enables the player to form a strong attachment to the weapon. A better understanding of the relationship between the player and his/her attachment to their weapon could be done by providing more analysis of games and gameplay, or a comparing two scenes in the same game. The argument that a highly customized weapon contributes to the player's attachment can be strengthened by the analysis of different gameplay scenes that follow one another, which would highlight the player's increased attachment to his or her weapon due to greater opportunities for strategy and customization. A late gameplay scene in which the player's weapon is lost or destroyed and only lesser weapons are available can be examined in contrast to an earlier scene in the game, in which the player begins without any weapons. When the player's weapon is absent or of lesser quality than needed or desired, the player may experience the emotion of insecurity because, at the very least, fewer options are available. She/he has to resort to an alteration in strategy such as the use of stealth in gameplay.

Understanding how emotions and weapon customization relate is important for understanding the gaming experience of weapon customization. In this chapter, I have mapped out how weapon manipulation contributes to that experience. I have argued that multiple perspectives are needed to understand this relationship, and have thus integrated social semiotics and cognitive theories to propose an integrated theory. When using the proposed model to analyze weapon customization during gameplay the analyst will be able to understand how the player's emotions, aesthetic evaluations of the weapon, and gameplay are connected. I have also shown how the player's goals, weapon's age and weapon's attributes contribute to the weapon customization experience. All these elements shape the player's emotional experience during weapon customization.

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CHAPTER 6

Emotional Response to Gaming Producing Rosenblatt's Transaction

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INTRODUCTION

The world of literacy has expanded alongside technology, and new literacies are being used as an alternative or an addition to traditional text. By including video gaming as literacy, the connection can be made between students' multimodal world outside of school with the world of literacy they encounter in school.

Louise Rosenblatt points out that, "absorption in the quality and structure of the experience engendered by the text can happen whether the reader is enthralled by the adventures of the Hardy Boys or by the anguish of King Lear … in either case … the text has given rise to a literary work of art" (Rosenblatt, 1978, p. 27). This level of emotion, which leads to being enthralled in a text, may be common with readers, but little is known about the same type of connection gamers have when playing video games. The emotion that is present during gameplay can help illuminate the understanding of the gaming experience.

LITERATURE REVIEW

Transactional Theory

Louise Rosenblatt's transactional theory is one theoretical lens that can be called upon when viewing the reader's response to various new literacies. Rosenblatt (2005) chose the term "aesthetic" within her landmark term, "the aesthetic stance," because of the word's Greek roots of "perception through the senses, feelings, and intuitions" (p. 11). In contrast, the "efferent stance" is focused primarily on what can be gleaned from the reading, to use afterwards: "the information to be acquired, the logical solution to a problem, the actions to be carried out" (Rosenblatt, 1978, p. 23). The distinction

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between *aesthetic* and *efferent* reading is based on the reader's particular stance; for instance, in the pure efferent stance, the reader is concerned with the knowledge or information she/he will have *after* the reading; the pure aesthetic stance allows the reader to have an actual experience with the text *during* reading (Rosenblatt, 1978).

Typically, Rosenblatt's reader-response theory has been used in relationship to print text, yet Hancock (2008) suggests that additional insight into Rosenblatt's work can be made through "technological reading, writing, and conversations about literature" (p. 103). The complement of the image to composition can add to the overall experience for the reader/viewer, as Rosenblatt describes in her theory. That experience can include learning from the visual accompanying the text, as well as the visual helping increase the overall experience.

Additionally, a connection must be made to the text/video game in this study. Rosenblatt (2005) discussed the merit of literature and explained, "a strong emotional response to a book does not necessarily prove its literary merit" (p. 70). Whatever framework is employed to determine or evaluate literary merit, Rosenblatt believes that we must also include one fundamental aspect: "the problems should be phrased in terms of the transaction between the reader and the book" (p. 71).

Gaming Experience

Preece, Rogers, and Sharp (2002) define experience as how the play feels to the gamers. Such a definition is too broad and vague, yet Dewey defines experience as the result of the interaction between an individual and the environment at a given time. Dewey's (1938) definition is much more in line with Rosenblatt's view of the transactional experience. When discussing the meaning of experience with gaming, Dewey's (1938) perspective of experience is the most applicable, in that the experience occurs when the individual interacts with the environment. In gaming, the player *must* be involved in interaction with the game. Rosenblatt's transactional theory is key to understanding the reader's engagement with literary texts, as well as providing the reason why such responses are significant (Soter, Wilkinson, Connors, Murphy, & Shen, 2010). The video game is vital to the experience, just as a piece of text is vital to the transactional experience. Similarly, the gamer is also essential in the experience. A connection with reader-response theory exists because as Rosenblatt (1995) explains, the transactional experience is personal and varies for each individual, based on what the individual brings to the reading experience. The gaming experience operates similarly by combining the player and the context of the game; thus, the experience is formed

once the different pieces are put together, with the player finally deciding if the experience was positive (Dix, 2003; Hassenzahl, 2003).

Calvillo-Gámez, Cairns, and Cox (2010) define experience as it directly relates to gaming, as: "the experience of playing video games on a one-to-one basis of the interaction between player and game" (p. 48). Their work is based on Dewey's definition of experience: "Experience is both the process and outcome of the interaction of a use with the environment at a given time" (p. 50). When studying the gaming experience, Calvillo-Gámez et al. (2010) look specifically at the relationship between the gamer and the video game and the elements "present in the process of the interaction" (p. 51).

The theory for this study is built around the core elements of the gaming experience (CEGE). Using value codes with questions, this instrument is used in the study to help understand the gaming experience. The CEGE are the foundational elements that must be present in a video game in order for the gaming experience to be positive. The CEGE do not detail how positive an experience the gamer will have, but if the CEGE are present, the gamer will not have a negative experience (Calvillo-Gámez et al., 2010). The main areas of the CEGE are puppetry and the actual video-game details (game play, rules, scenario, environment, graphics, and sound). From the CEGE, the Core Elements of Gaming Experience Questionnaire (CEGEQ) was developed, and these questions help to determine if the CEGE are present during the gaming experience.

Calvillo-Gamez (2009b) created the CEGEQ due to the need for an instrument to measure the gaming experience. He developed the CEGE and CEGEQ after conducting a series of exploratory pilot studies, where the participants were asked to play video games using different devices or methods. The first two studies asked participants to play games using different devices, and the third study focused on the different experiences between playing a video game and watching it being played (Calvillo-Gamez, 2009a). The three studies led to finding key elements within the gaming experience. The CEGEQ identifies the differences in players' experiences, by showing which of the CEGE are missing. There is no overall score for the CEGEQ; instead, it provides an understanding of which elements are present and which are missing, during the experience.

Puppetry

The metaphor of "puppetry" is used in the CEGEQ. The gamer has control over the game, much like a puppet master has control of a puppet. When used in reference to gaming, puppetry consists of control (basic game actions); ownership (responsibility for actions); and facilitators (external

Table 6.1 Elements of puppetry

Elements	Description of elements
Control	Mechanical: controllers, memory, point of view Virtual: small actions, goal, something to do
Facilitators	Aesthetic value, previous experiences, time
Ownership	Big actions, rewards, personal goals, "you but not you"

Note. Elements of puppetry.
Adapted from *Pulling the strings: A theory of puppetry for the gaming experience*, by Calvillo-Gamez and Cairns (2008).

factors in the game). Each of these three elements has multiple aspects (see Table 6.1) that, when working in concert, produce a positive gaming experience (Calvillo-Gamez & Cairns, 2008).

Assessing Response

Rosenblatt's (1978) theory looks at how the aesthetic experience with the text helps form meaning; thus stance and transaction are key principles of the theory. When viewing responses with reader-response theory and understanding the meaning, great importance must be placed on the relationship between the text and the reader (Rosenblatt, 1995). Soter et al. (2010) conducted a study of over 300 "scholarly products … to identify parameters of productive small-group discussions" (p. 204). Rosenblatt's aesthetic and efferent stances were included in the parameters for understanding descriptors in the responses, to enable identification of the stances in readers' responses to text. The reason for such a study was to gain clarity when looking at readers' responses: "appropriating Rosenblatt's concept of 'aesthetic response' to account for the personal connections that readers make to literary texts was, and still is, not without difficulties, one of which is the enduring debate regarding the nature and qualities of response" (Soter et al., 2010, p. 209). Not all responses include a reflection on the role the text has played in their response, but Rosenblatt (1978) is clear that this should exist for the aesthetic response. Rosenblatt (1978) explains that when the reader is in an aesthetic stance, a reflection on the personal response to the literature will occur, which is what she calls the poem: "Sensing, feeling, imagining, thinking under the stimulus of the words, the reader who adopts the aesthetic attitude feels no compulsion other than to apprehend what goes on during this process to concentrate on the complex structure of experience that he is shaping and that becomes for him the poem, the story, the play symbolized by the text" (p. 26).

Rosenblatt cites Ingarden (1973) in *The Reader, The Text, The Poem* as insisting on knowing how the text affects the aesthetic experience. Soter et al. (2010) detail the primary features between aesthetic responses and expressive responses to literature (Table 6.2). Expressive responses are in response to the text, but they do not meet the definition of an aesthetic response that occurs during the transactional experience. A true aesthetic response is going to "describe responses in which students relate[d] events and characters they read about to incidents and people in their own lives" (Soter et al., 2010, p. 218).

Classification systems, designed by Cox and Many (1992b), attempt to chart responses as more aesthetic or more efferent, and the descriptions used for the assessments echo the findings of Soter et al. (2010). Cox and Many (1989, 1992b) assert that the case study format of reader-response theory should be expanded to include a more systematic way of "analyzing responses in terms of the degree to which responders demonstrate a particular stance" (1992b, p. 40). Even though much research has been conducted using Rosenblatt's theory, Cox and Many (1992b) establish there is "a need for research which examines Rosenblatt's concepts of efferent and aesthetic through a systematic analysis of students' responses to literary works of art" (p. 40). The classification system they created (the 5-point efferent/aesthetic continuum) was based on Rosenblatt's work as well as Corcoran and Evans (Cox & Many, 1989). Corcoran and Evans's (1987) work describes mental processes at work during a reading with an aesthetic stance. Responses could then be charted as falling somewhere on the continuum between fully

Table 6.2 Distinguishing features of an aesthetic and an expressive response to literature

Primary features of an aesthetic response to literature	Primary features of an expressive response to literature
A sense of the work as well as one's response to it	The work sparks a personal connection or memory
An appreciation of the craft of the work	Personal experience parallels or takes off from the connection
Interaction between the perceived and the perceiver	The response is primarily in terms of content, as opposed to form, or even a mix of content and form
Engagement with the work	Engagement with the work is "translated" into personal experience

Note. Distinguishing Features of an Aesthetic and an Expressive Response to Literature.
Adapted from *Deconstructing 'aesthetic response' in small-group discussions about literature: A possible solution to the 'aesthetic response' dilemma,* by Soter et al. (2010).

efferent and fully aesthetic. The second system of classification (levels of personal understanding) was "devised to characterize an individual's creation of an interpretation of a personally meaningful literary experience" (Cox & Many, 1992b, p. 44). This chart was based on the work of Ricouer (1976) about interpretation theory, and Applebee (1978), which discusses the level of meaning (Cox & Many, 1989). The two classification systems were created to provide a way of describing and analyzing the differences between stances, as well as responses; additionally, they provide a helpful vocabulary to use when analyzing responses with the reader-response theory (Cox & Many, 1989, 1992b).

Cox and Many (1992b) conducted a study for 1 year, with 38, 5th-grade participants. The 5-point efferent/aesthetic continuum used for measuring reader stance (Cox & Many, 1992b) was created for use with their participants' responses to nine pieces of fiction (both text and film). Participants read four novels and viewed five films and wrote responses to open-ended prompts twice a week. Cox and Many's (1992b) participants had a primarily aesthetic response to the literature. Over half of the participants were able to go beyond the literal level of understanding. The comparison of mean percentages between books and film for the levels of understanding demonstrated similar results, suggesting both have potential as forms of literacy: "If film or other media will offer students the same potential opportunities to expand their understandings about themselves or the world, they should have experiences with them as well" (Cox & Many, 1992b, p. 62). A cross-tabulation of stance and level of understanding offered further evidence of differences between the continuum of aesthetic and efferent responses with levels of understanding. Higher levels of understanding were reached when operating with an aesthetic stance. When reviewing responses, Cox and Many found that aesthetic responses to literature contained three characteristics—students' tendencies to: (1) picture a story in their heads; (2) extend the story or hypothesize about it; and (3) relate associations or feelings evoked while reading and responding. These characteristics all trace back to Rosenblatt's insistence on the clear connection to the text in the response.

An additional study by Many (1991) explored differences in stance according to age level (4th-, 6th-, and 8th-grade levels) using the same instrument. Responses were not necessarily uniform; thus detailed characteristics were provided within the systems of classification. The descriptors used in the classification systems had to accommodate varied responses (Cox & Many, 1992a). Many (1991) had participants read three stories and write a free response. The responses were classified according to the levels of

understanding and the 5-point continuum. Means and standard deviations were reported in grade level for each story read. Higher levels of understanding were demonstrated with a primarily aesthetic stance.

Nance (2000) conducted a case study of four adult readers enrolled in an English course and used the 5-point efferent/aesthetic continuum and levels of understanding charts as a way to help demonstrate the readers' transactions with text. The participants were given texts during each class meeting, and they each completed a personal reflection after reading. After the class discussion, participants were asked to write another reflection. As a way to look closely at the specific responses, Nance (2000) chose Cox and Many (1992a, 1992b) assessment charts: "this analysis provided better understanding of the effects of text and task upon the response of the readers" (p. 12).

Other studies using these classification systems show similar results. Penn (2000) used the classification systems with responses from 5th-grade students responding to picture books and a novel. Responses were collected orally through journal writings and categorized by stance and level of understanding. Results showed that stance is significantly related to level of understanding. Hanson (1993) used Cox and Many's (1989, 1992b) instruments with special education students to find a connection between aesthetic stance and a higher level of understanding. Davidson (2000) used only the continuum with Grade 12 students to chart responses to questions about literary preferences and personal writing, and found that the aesthetic stance increased written responses.

METHOD

A collective case study was used to examine the gaming experience of participants with three commercial video games of three separate genres: *Sims FreePlay* (simulation); *Halo 1* (first person shooter (FPS)); and *World of Warcraft* (role-playing game). A total of 15 gamers were placed into three sets of five participants for each video game, and interviews were conducted to explore the gaming experience in relation to the transaction, which is a major component of Louise Rosenblatt's reader-response theory. Limited research has been conducted regarding reader-response theory and the new literacies; by using the reader-response lens, the gaming experience was compared with the reading experience to add the new literacies to the existing literature on reader-response. This analysis of the emotions connected to the gaming experience demonstrated substantial parallels between the gaming experience and the reading transaction, as well as looking at the viability of understanding the literacy value of video games.

This study examined how participants perceived their gaming experiences during video-game play, in order to evaluate the response to gaming as connected to Louise Rosenblatt's concept of reader-response theory. The gamer and the video game were studied to understand the transaction, which becomes the "gaming experience." Emotion is a key component in understanding how the transaction and gaming experience are related. The gamer's experience with playing the video game may be parallel to the transaction in reader-response.

Since this study examined participants' gaming experiences, a qualitative design was judged appropriate to understand variables that, at this point, cannot be quantified, although certain variables in the study are presented objectively. This study is most closely related methodologically to Merriam's (1988) definition of a qualitative study in that assessing the gaming experience cannot be measured fully in the format of the positivist quantitative inquiry. This study addresses an understanding of the gaming experience, as described by the participants and is approached without a measurable hypothesis. Ultimately, this research documented and examined the participants' gaming experiences, which falls in line with Stake's (1995) view of qualitative research as, "not necessarily to map and conquer the world but to sophisticate the beholding of it" (p. 43). I constructed a descriptive case study showing, "all its particularity and ordinariness" (p. 445).

PARTICIPANTS

Participants ($n = 15$) ranged in ages 18-25 and were self-identified as gamers. The 15 participants were placed into three sets of five participants for each video game, based on the game they played most frequently. The case study (Baxter & Jack, 2008) was divided into three cases, in accordance with the gaming groups.

DATA COLLECTION

Data were gathered from various sources to support the construction of an understanding of what occurs during the gaming experience. Data collected included results from the core elements of the gaming experience questionnaire (CEGEQ) and transcripts from interviews. Additionally, participants completed the CEGEQ and participated in a recorded interview about their gaming experience.

CEGEQ Process

Participants rated the statements on the CEGEQ on a Likert-scale of 1-7, with 7 being Total agreement with the statement. This method illuminates participants' own perceptions of their gaming experience: "Values coding is the application of codes onto qualitative data that reflect a participant's values, attitudes and beliefs representing his/her perspectives" (Saldana, 2009, p. 89). Each question on the CEGEQ was labeled as Value, Attitude, or Belief, based on the definition.

As a second layer, transcript texts were also labeled with emotion codes (Goleman, 1995). Emotion coding is appropriately used when participants are discussing their experiences (Saldana, 2009). When using emotion codes, the emotion recalled by the participant when discussing an experience is recorded. Emotion codes were used to put the descriptions of the gaming experience into a related context between participants: "One can't separate emotion from action; they are part of the same flow of events, one leading into the other" (Corbin & Strauss, 2008, p. 7). When a participant recalled an emotion, I marked the transcript accordingly. I used emotion coding to analyze the emotional responses that participants gave, regarding their gaming experiences, to view patterns in participant responses, and descriptive coding analysis was used to report the results of the theme labeled emotional response to the game.

RESULTS

The data from the interviews were grouped into three cases, according to each game, and then viewed through the reader-response lens in order to see if the gamers were engaging in a gaming experience consistent with the reader-response approach. The three cases consisted of players in the following gaming groups: *Halo 1*, *WoW*, and *Sims FreePlay*. In the analyses of interview data, as coded discourse was added to each theme, the parameters of each theme were continually analyzed. The list of themes were identified and then reduced to those with the most data supplied from the transcripts of the interviews (as seen in Table 6.1). The results were reported according to the emergent themes as they were found within each gaming group. Each case was grouped according to the chosen video game. After the themes were identified, the events listed in each category were reviewed to evaluate any possible connections with the key components of transactional theory. The themes were then divided into a list of two major concentrations of themes (*stance* and the *transaction*) relating to Rosenblatt's transactional theory.

Descriptive codes were used for each line of the interview transcripts. The transcripts were then coded for connections to stance or the transaction and grouped accordingly. All the themes found after coding the transcripts related to Rosenblatt's reader-response theory. To be able to exhaust all possible themes that could be connected to either stance or the transaction, each text was read three times to code specific references related to each theme. In another layer of coding, the transcript texts were also labeled with emotion codes (Goleman, 1995). By connecting the emotion and the action, the emotional coding enhances the understanding of both the stance and the transaction. The stance is important because it leads to the transaction.

Emotional Response to the Game

Three themes emerged that all focused directly on the emotional responses to the game being played. The results, as shown in Table 6.3, demonstrate several groupings of themes, but this chapter will focus specifically on the area of themes connected to emotion.

Memories

The *WoW* participants had many similarities in their emotional responses to the game. The emotion codes present throughout all of their responses were "joy" and "happiness." Lisa discussed that she recalls memories from childhood when she plays *WoW*; the different areas that she explores within the game make her think of the fairy tales she read and enjoyed as a young child.

Table 6.3 Themes related to Rosenblatt's transactional theory

Themes found in transcript texts	Transactional theory key tenets
Personal connection to video game	Efferent-aesthetic stance
Choice of genre	
Relationship with the game	
Game completion	
Distance from reality	
Gaming experience	Transaction
Lived-through experience	
Describing the experience	
Watching as experience	
Cheating the experience	
Emotional response to game	
Memories	
Sympathy with characters	
Feelings while playing	

All of the *WoW* participants except Lisa talked about memories of playing with friends, when they are playing. They remembered playing with their first group of friends that played *WoW*, and these were special memories for each of them. Mark talked about how he thinks of a former room-mate and good friend, who has recently moved away, when he plays. He and this friend played for hours together, and their connection through *WoW* helped them survive a bad room-mate situation with a former friend. He explained that playing *WoW* now is bittersweet at times, because he recalls their good times and misses his friend. The other participants talked about how they always think of the fun times they had in the past playing with their first group of *WoW* friends.

Halo 1 participants also recalled memories of playing with friends. Their responses demonstrated positive emotional codes of "fun" and "joy" when describing their memories when playing. Sherry explained that she automatically thinks of her first years of college when she plays *Halo 1* because she had a close-knit group of friends that always played the game together. Iris was a part of that group of friends, and she also described how she always thinks about that time period of playing *Halo 1* with friends is a memory she always thinks about when playing. Brett reported always thinking about a high-school computer class where he and a group of friends played *Halo 1* together. Three of the *Halo 1* participants (Brett, Anne, and Iris) discussed how playing *Halo 1* made them think of playing with a sibling. Alex explained that he started playing *Halo 1* to have a common interest with his sister, Iris, who was already an avid player: "I almost always think of good times bonding with my sister when playing it."

Danielle was the only *Sims FreePlay* participant to discuss having memories of playing with her brother and father when she was a child: "Anytime I play a game in general, but especially when I play Sims, I remember my dad because he got me and my brother into playing forever and a day ago, and he's not here anymore." The other *Sims FreePlay* participants reported having positive memories of playing various games as children, but they did not recall specific situations. The emotion code of "happiness" was present only in Danielle's responses. The other *Sims FreePlay* participants described their game play as an escape and did not use emotional descriptions.

Sympathy with Characters

Jordan described a connection with the characters, due to the time he spent developing them, by saying, "You work so hard for everything that you don't want to lose it." Mark explained that he does not see his characters

as unique but as different extensions of himself—different roles for him to play. Jordan said, "I feel like I become them, and that's my identity online." All of the *WoW* participants discussed this same connection with their characters.

Halo 1 players all felt sympathy with the main character of Master Chief. Anna explained that "everyone sympathizes with him" since he is the main character of the game, and it is the shoes of Master Chief that the player fills when playing. Iris said, "You play as the Master Chief and so, therefore, I mean that's who you become one with." Iris and Sherry commented that they also felt some sympathy for the grunts because they seemed to be expendable characters in the battle. But their sympathy only went so far because both reported they would not hesitate to kill the grunts. Even though *Halo 1* is a very action-packed game, Brett explained that there is something more than just action that holds his attention: "When the story mode is really good, then it's like reading a good book and you get emotionally attached to the characters."

All of the *Sims FreePlay* participants reported having a self-based character, and that character garnered the most sympathy from them. Most commented that they spent the most time, resources, and attention, on this particular character. Overall, they did not discuss strong sympathy or connections to their characters. Rhonda commented, "I base my people on their jobs, so I don't have a lot of personal connections to them." When discussing a possible connection to characters in the game, the *Sims FreePlay* participants simply detailed the storylines associated with their characters instead of discussing any emotional connections.

Feelings while Playing

All of the *WoW* players reported feeling frustrated while playing, due to the difficult challenges they faced, but they all described this frustration as a positive feeling. Several expressed fear of making mistakes while playing and looking foolish in front of other players. In spite of this fear, they all pointed out the extreme happiness they felt once they had achieved their accomplishments within the game. *Halo 1* participants reported these same feelings with the addition of a strong feeling of achievement in their gaming. Additionally, all of the *WoW* players described having a feeling of camaraderie while playing because they had to connect to other players and work with them; these other players became their good friends over time, and when they played, they talked about how the bond of friendship is present. *Halo 1* players did not report feelings of camaraderie, but their chosen game did

not have the same element of teamwork present in it as in *WoW*. Unlike both *WoW* and *Halo 1* players, the *Sims FreePlay* participants said the only feelings they had while playing were based on escape and fantasy, and Laura remarked, "I'm doing it for fun, and I don't feel emotionally invested in the game." The emotion codes present in all responses were "happiness," and "frustration." "Fear" and "accomplishment" were also present in the *Halo 1* and *WoW* responses. "Camaraderie" was the only emotion code used only in the *WoW* responses.

CEGEQ Data

Additionally, value coding was used with the CEGEQ responses, and the results are reported here as an additional layer to the descriptive coding results, in order to point out discrepancies or offer validation. The analysis of the responses as categorized through the value codes, demonstrates the participants' values regarding their gaming experience. Each question on the CEGEQ was labeled with a value code of Value, Attitude, or Belief based on the definition derived from Saldana (2009). Definitions for each code are as follows:

- *Value*: attributed importance toward oneself, another person, thing, or idea
- *Attitude*: the way we think and feel about oneself, another person, thing, or idea
- *Belief*: part of a system that includes values and attitudes plus personal knowledge, experiences, opinions, prejudices, and morals.

The CEGEQ data show that *Halo 1* and *WoW* participants have a positive gaming experience and enjoy the game and its challenges. *Sims FreePlay* players report enjoying the game but do not feel challenged or have a high frustration level when playing. All players report enjoying their game and spend a lot of time playing, but *Sims FreePlay* players report they would often choose another game to play. These results provide insight into the basic experience of the video game. Calvillo-Gámez et al. (2010) want to see what is "present in the process of the interaction" (p. 51). When the foundational elements are present, then the gaming experience will not be negative. *Sims FreePlay* participants experienced boredom, yet they report enjoying the game play; all participants felt in control of their gaming; and only *Halo 1* and *WoW* participants experienced frustration while playing. Even though the players felt some frustration, the *Halo 1* and *WoW* participants overwhelmingly enjoyed the game play and classified it as their favorite type

or genre of video game. Rosenblatt (2005) discusses how the reader must be able to relate to the text before the individual can have an experience with the text. The CEGEQ data show that the players are relating to the video game and having a positive experience. Such experience must exist, according to Rosenblatt, for the piece to be considered literary.

Aesthetic and Efferent Stance in the Gaming Experience

Rosenblatt explains that to look only at the elements within the text to understand the difference between aesthetic and efferent, will miss the mark because we must incorporate the reader's relationship to the text to avoid "partial or arbitrary answers" (1978, p. 23). Different events occur during efferent and aesthetic stance readings, with the efferent stance more focused on the information that will remain after the reading, while the aesthetic stance is concerned with what is happening during the reading event. Cox and Many's (1992a) efferent/aesthetic continuum helps to define how responses to text are more efferent or more aesthetic; this continuum is not used as an instrument in the study but as a way to provide additional insight. Cox and Many (1992a, 1992b) designed the 5-point efferent/aesthetic continuum as a 5-point continuum based on Rosenblatt's work. Responses can fall either at one end of the continuum, indicating a purely efferent stance, or the other end, as a purely aesthetic stance.

The continuum consists of five points:

- The first point is the most efferent stance focusing on what was learned.
- The second point is a primarily efferent response with a retelling of the story.
- The third point allows for both the efferent and aesthetic stance to be evident in the response.
- The fourth point is a primarily aesthetic response, and elaboration of the story or story details contains judgment or preference.
- The fifth point is the most aesthetic stance demonstrating a connection with the text and a lived-through experience that connects emotions and associations with the transaction with the text.

This description shows the broad categories that are used with the instrument. The categories of the continuum can be used with a variety of responses and allow the reader to incorporate past experiences with the text in order to make meaning (Cox & Many, 1992a). Cox and Many (1992b) use this classification system in their study of responses to both printed text and film. As a further implication of their study of reader-response with text and film, Cox and Many (1992b) suggest the scope of the literary world will broaden to include formats other than printed text.

Rosenblatt believes that a piece of text cannot merely be assigned to one end of the spectrum or the other; "we should think rather of most reading as hovering near the middle of the continuum" (Rosenblatt, 1978, p. 37). As readers respond to a piece of text, their response can range from the middle toward one end of the continuum to the different ends of aesthetic and efferent. Rosenblatt (1978) cautions "we are not always 'enthralled'" when reading because different aesthetic transactions (even with the same text) can "produce different kinds or levels of experience, depending on the nature, state of mind, or past experience of the reader" (p. 27). In fact, moments of an efferent stance may appear during a primarily aesthetic stance, but the reading experience must be evaluated as a whole experience. An overall evaluation of the gaming experience is provided to answer the research question by examining the reoccurring themes related to both stance and the transaction.

When in the aesthetic stance, the "reader's primary purpose is fulfilled *during* the reading event, as he fixes his attention on the actual experience he is living through" (Rosenblatt, 1978, p. 27). In this study, players' CEGEQ statements consistently reflected the enthusiasm *WoW* players portrayed in their interviews about how greatly they value playing this game. Attitude statements on the CEGEQ about challenges present in the game showed overwhelmingly agreement among *WoW* participants—more so than the other two groups. The *Halo 1* players pointed out that the reason FPS is their favorite genre, is that they are able to completely step inside the main character and play from that viewpoint. The CEGEQ statements connected to how *Halo 1* players value playing the game and spending time playing the game, demonstrated very high scores. These players consistently rated favorably all attitude and belief statements in the CEGEQ. Each of the participants who prefer FPS games liked the ability to play in first person because this viewpoint helped them actually live through the experience of the game, suggesting that these players have a stronger aesthetic than efferent stance.

The results from the CEGEQ show that *Sims FreePlay* participants have a stronger belief than the *Halo 1* and *WoW* participants, that they choose other game genres over simulation. Even though it is not their favorite genre, *Sims FreePlay* participants do enjoy the game and value it enough to want to spend time playing, although the value they place on playing the game could be directly related to the desire for an escape, as shown by the CEGEQ responses. In fact, the *Sims FreePlay* participants' responses demonstrated they are not continually enthralled, even when playing. Their inability to

have an application of the game to their lives could explain why they do not choose simulation as their preferred gaming genre.

Just as in the reading of traditional printed text, the aesthetic stance provides the gamer with a sense of being connected to the video game through a relationship with the text. The *Halo 1* and *WoW* gamers participating in this study highlighted, through discussing their experiences, that they have a relationship with the game and thus a strong connection. The existence of outside connections to the game through researching and additional reading demonstrates the participants' relationship to the game. By participating in a level of outside research and/or reading, the players are creating a deeper relationship with the game. This relationship that the *Halo 1* and *WoW* players have with the game shows that they have a primarily aesthetic stance, while the *Sims FreePlay* participants do not demonstrate as strong a relationship with the game. This lack of relationship lessens the aesthetic stance.

Rosenblatt (1978) uses a quote by Coleridge about how poetry should carry the reader forward and provide an attraction to the journey provided by the piece. This explanation helps to give foundation to the idea of the reader turning "his attention inward to his experience of 'the journey itself'" (p. 28) to create the aesthetic stance and eventually the transaction. The *Halo 1* and *WoW* participants, unlike the *Sims FreePlay* participants, were focused on the journey provided by the game; they were moving forward in the journey to reach an ending or a level of accomplishment. The *Sims FreePlay* participants simply exist within the entertainment of the game. The CEGEQ results show that *Halo 1* and *WoW* participants have a much stronger belief about the importance of game completion than *Sims FreePlay* participants. *WoW* and *Halo 1* players strongly agree with statements about having a clear strategy and having a desire to move forward in the game, but *Sims FreePlay* participants do not strongly agree with such belief and attitude statements.

The aesthetic stance allows the reader distance from reality. This distance from reality is aligned with Coleridge's concept of "suspension of disbelief," which Rosenblatt (1978) believes "is felt as an escape … an experiencing of alternative possibilities" (p. 32). When describing the gaming experience, the participants detailed how they were also distanced from reality, even when very reality-based concepts were being played out in the game. The participants fully accept a distance from reality as players within their chosen games demonstrating a more aesthetic stance.

The Gaming Experience as the Transaction

Through the transaction, meaning is constructed: "A novel or poem or play remains merely ink spots on paper until a reader transforms them into a set of meaningful symbols" (Rosenblatt, 1995, p. 24). Just as readers can have a transaction with text, the gamer can have such a transaction with a video game. The stance created lends to the occurrence of the transaction and eventually the poem. Rosenblatt (2005) explains that the stance is aligned with the reader's purpose, and by selecting a particular stance, the reader will have a different kind of relationship with the text. This relationship and transaction are deeply connected to the emotion evoked during gameplay.

The literary experience begins with marks on the paper connected with knowledge and emotion, to result in meaning for the reader. The gamer walks down a similar path when creating a gaming experience. Such meaning gained for a reader, which results in a literary experience, goes beyond a literal meaning of the text and connects what is experienced when read to a greater meaning outside the text and applies to the reader's life. Rosenblatt describes how we must go beyond the text: "The patterns of signs on the page remain[s] the same; the difference is in the reader's activity in relation to those signs" (p. xxiii). Cox and Many (1989) relate this idea in their levels of personal use (LPU) chart to the more aesthetic end of the chart described as a general belief or application to life opposed to the more efferent end of the chart described as a literal meaning of the text. The LPU has a 4-point scale to further demonstrate if the response is more aesthetic or efferent. The first and second points demonstrate the world of the text while the third and fourth points show application to life. Points one and two connect to responses that show a more literal meaning of the text. Points three and four rate responses that show a personal connection with the text. Responses on the third point will demonstrate understanding the story with an analogy to self or the world. The fourth point responses show an understanding of relating the story with a belief about life (Cox & Many, 1992a).

Rosenblatt does not list gaming specifically but does discuss that "literature makes comprehensible the myriad ways in which human beings meet the infinite possibilities that life offers" (Rosenblatt, 1995, p. 6). Such a connection to the outside world can apply to generalizations about society and/or to more personal connections to the individual's life. Rosenblatt believes this level of application cannot be avoided: "Even if the teacher desired to, he could not evade transmitting certain generalized concepts concerning character and the ways in which it is molded and motivated"

(Rosenblatt, 1995, p. 14). When the reader is in a more predominately aesthetic stance, she/he is able to make a personal application to the literature or relate it to the outside world. The complexity of combining both the social awareness and pure enjoyment is what Rosenblatt (1995) calls a "more fruitful understanding and appreciation of literature" (p. 23). The participants discussed this concept of application to their lives and greater understanding in their interviews about the gaming experience. The meaning of the challenges faced in the game provided an understanding of how to operate in life when dealing with obstacles.

During an aesthetic transaction, the text is particularly important to the reader. A rephrasing of the material is not appropriate for a reader in the aesthetic stance. In contrast, the reader in an efferent stance can gain an equal experience from a rephrasing of the text given to her/him (Rosenblatt, 1978). Each of the participants discussed their views regarding the gaming experience when they were not actually playing the game but just watching. The participants did not believe that hearing about game play would equal a gaming experience. On the other hand, the participants did believe they could have a gaming experience from watching game play. This idea of watching another player as evoking a gaming experience falls in line with Rosenblatt's transaction when in an aesthetic stance because watching the game is not a rephrasing of the game play. The players (especially the *Halo 1* and *WoW* gamers) who were watching, saw themselves as actually engaging in the game play even if they were not actually controlling the play. Rosenblatt explains that the transaction occurring in an aesthetic stance cannot be rephrased or paraphrased for another because a listing of ideas or even feelings "elicited by the text would not be mistaken for a statement of its 'meaning'" (Rosenblatt, 1978, p. 87). By watching the game play, the players were involved directly, and thus could have a transaction.

Meaning is created during the transaction and is an organic process occurring as the reader and the text connect in a specific moment in time. "A novel or poem or play remains merely ink spots on paper until a reader transforms them into a set of meaningful symbols" (Rosenblatt, 1995, p. 24). Since meaning is creating through the transaction process, meaning cannot be separated from the transaction; they are intertwined (Rosenblatt, 2005). Throughout the gaming experience, gamers are also creating meaning, but cheating can impact and possibly interrupt such creation of meaning and thus affect the transaction. Rosenblatt (1995) describes the transaction and meaning creation as a "give and take" (p. 26) between the symbols

on the page and the reader; the *Halo 1* and *WoW* participants viewed cheating as an one-way street where players are not giving (of their genuine skills) and only taking. As a result, those participants saw the gaming experience of those who are cheating as inauthentic. The belief and attitude statements in the CEGEQ about cheating reflected these results, with *WoW* and *Halo 1* participants scoring directly opposite from *Sims FreePlay* participants.

DISCUSSION

The emotional response to text is important to Rosenblatt's transactional theory because the reader brings a unique personal experience to the reading to create a meaning that is particular to that time and place. By combining individual experience with the symbols on the page, the reader can then begin to have a transaction with the text, resulting in an emotional response (Rosenblatt, 1995). The same type of emotional response can result when a gamer has a transaction while gaming. All of the *Halo 1* and *WoW* participants talk specifically about their emotional responses to gaming, while the *Sims FreePlay* participants have a different type of response. Cox and Many's (1992a) efferent-aesthetic continuum chart details how these types of response differ and how those differences relate to a more efferent or more aesthetic response. By detailing the emotional responses to the video games in relation to the Cox and Many chart, the presence (or lack) of the transaction is evident. When feelings are evoked through a transaction with the text, the response is a more aesthetic response.

None of the *WoW* participants felt particularly sympathetic with the characters in the game; instead, they all discussed feeling deeply tied to characters based on how much time they had put into the character. The more time they had spent developing the character, the more connected they felt with that character. In fact, the emotional attachment to the characters was so strong because most of the *WoW* participants discussed how the characters were a true part of them. The *Halo 1* players obviously had a strong connection to Master Chief. On the efferent-aesthetic continuum chart (Cox & Many, 1992b), the response to the game of *Halo 1* players clearly falls in the range of the most aesthetic response because the participants' responses regarding their connection to Master Chief shows clear evidence of living through the experience of the work. The focus on storyline as opposed to connection to the characters described by the *Sims FreePlay* participants demonstrated a primarily efferent response on the efferent-aesthetic continuum chart (Cox & Many, 1992b).

Even though reader-response theory is historically based in print literature, a natural progression of the theory's application can be made into the world of gaming. Since the aesthetic responses to literary texts are the primary ways that readers experience a transaction in Rosenblatt's reading response theory, the specificity of looking for an aesthetic response present in the gaming experience is crucial to making a parallel between the gaming experience and reader-response theory. This study adds to the growing literature involving reader-response and new literacies. Research specifically pinpointing gaming and reader-response is not presently substantial, but with video gaming becoming a common part of life, a real need does exist to expand research in this area.

Rosenblatt's reader-response theory is a good pairing with video gaming because the reading transaction is an active event, where meaning is created as the text and reader come together. Gaming connects well with this theory because it is such an active event, where meaning is creating within a certain context between the game and the gamer. Just as in reader-response theory, the gamer and the game have a particular affect on one another to create an experience. Since the connection is evident, more research should explore how the transaction in video games occurs and how this transaction can relate to motivation for learning. The spark between the reader and the text, that Rosenblatt (1995) discusses must happen for the reader to fully understand and experience the text, is happening for gamers, and this study provides insight into how these cases show the importance of that experience for these participants.

Strong motivation provided by video games could be used in the classroom to help teachers better incorporate strategies already used in the language arts classroom, such as researching and collaborating. Inclusion of gaming in the classroom is not an easy addition, but curriculum developers could begin to build upon what is evident with gamers of certain games because there are positive components that can be integrated into curriculum development. For example, the *Halo 1* participants provided insight into how they were more successful when playing in the format of first person, and *WoW* participants discussed the extensive hours of outside research done to prepare for the game, based on their relationship with the game. This type of insight could help curriculum developers either tap into the techniques used in the games to garner such conditions, or use these or similar games paired with curriculum content to result in increased motivation and a stronger emotional connection to the learning experience. By combining a theory that has been typically paired with traditional print text with video

gaming, the implication is that the boundaries of literacy are widening to include much more than those traditionally considered.

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CHAPTER 7

What Type of Narrative do Children Prefer in Active Video Games? An Exploratory Study of Cognitive and Emotional Responses

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INTRODUCTION

Childhood obesity is an international epidemic (Ogden, Carroll, Kit, & Flegal, 2014), which increases the risk of several cancers (National Cancer Institute, 2004); shortens lifespan; impedes functional ability; diminishes quality of life (Danaei et al., 2009); and tracks into adulthood (Freedman, Khan, Dietz, Srinivasan, & Berenson, 2001). Physical activity (PA) is critical in preventing childhood obesity and lowering the risk of certain cancers (Andersen et al., 2006; Estabrooks, Fisher, & Hayman, 2008). Unfortunately, increasing PA can be challenging and we have to consider tools that would aid us in increasing PA from adolescence to adulthood. To this end, some of the most promising digital tools for increasing PA, are active video games (AVGs).

AVGs provide an innovative method, which offers promise of increasing PA and enhancing health outcomes (Bailey & McInnis, 2011; Biddiss & Irwin, 2010; Foley & Maddison, 2010; Graf, Pratt, Hester, & Short, 2009). As of 2009, a typical US child lived in a home with an average of 3.8 televisions and 2.3 video game consoles (Kaiser Family Foundation, 2010). Some 87% of children aged 8-18 had a video game console at home and 50% had one in their bedroom (Kaiser Family Foundation, 2010). As of

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2013, all major game console manufacturers offered products that could be used for exercise (Greenwald, 2013). Compared with traditional media, AVGs provide an innovative venue for childhood obesity prevention (Lu, Kharrazi, Gharghabi, & Thompson, 2013; Thompson, 2014b).

While AVGs could prevent childhood obesity, a child's motivation to play an AVG decreases quickly (Chin, Jacobs, Vaessen, Titze, & van Mechelen, 2008; Graves, Ridgers, Atkinson, & Stratton, 2010; Madsen, Yen, Wlasiuk, Newman, & Lustig, 2007). Motivation is crucial to being physically active (Epstein & Roemmich, 2001), but evidence is lacking as to the long-term effectiveness of traditional PA interventions (Brown & Summerbell, 2009; Shaya, Flores, Gbarayor, & Wang, 2008). Innovative approaches are needed to enhance and sustain a child's motivation to play AVGs energetically (Epstein, 1998; Ryan & Deci, 2000). Narratives possess unique motivational properties that may encourage long-term AVG play (Lu, Baranowski, Thompson, & Buday, 2012).

Narratives, or stories, are among the oldest, but still most pervasive, forms of communication (Fisher, 1985). A narrative provides information about characters and plot that promote immersion (Lu, Thompson, Baranowski, Buday, & Baranowski, 2012). Although there has been a recent surge in the exploration of narratives in health communication (Baranowski, Buday, Thompson, & Baranowski, 2008; Green, 2006; Moyer-Gusé & Nabi, 2010), few studies have taken children's narrative preferences into consideration, or explored the responses to narratives in video games. Children's perspectives deserve scholarly attention because they offer first-hand insight from the population of interest (Buckingham, 2013). This project presents formative research addressing this key gap in the literature.

THEORETICAL PERSPECTIVES AND CONCEPTS

Narratives

A narrative refers to "any cohesive and coherent story with an identifiable beginning, middle, and end" (Hinyard & Kreuter, 2007, p. 778). Narrative is one of the most distinctive human characteristics (Lyotard, 1984), and the ability to enjoy narrative is universal (Cosmides & Tooby, 2000; Pinker, 1997).

Characters and plots are the main components of a narrative. A character is a crucial structural property (Jacobs, 2002) and provides a narrative's driving force (Surmelian, 1969), serving as an "internal" source of information or beliefs (Green & Brock, 2000). The plot ("narrative discourse") is the way

in which the story is conveyed. Plots can be described as the basis for all fiction (Horning, 2010) and play a pivotal role in story delivery by organizing events into a logically unfolding developments (Brown, 1987) or temporal order (Labov, 1972).

Narratives can have a significant impact on cognition, affect, and health behavior through *transportation* (Green & Brock, 2000), also called *immersion* (Lu, Thompson, et al., 2012), a unique quality that enables the suspension of dis/belief (Green, Garst, & Brock, 2004), instills vivid personal experiences (Epstein, 1998) and creates a deep affection for a story's characters (Oatley, 2002). Health communicators are increasingly turning to narrative as a persuasion tool (Kim, Bigman, Leader, Lerman, & Cappella, 2012).

Narratives and Active Video Games

Both narratives and video games share the immersive quality that attracts an audience member's engagement. A 2008 review showed that many health games have attempted to merge the immersive properties of story and fantasy with behavior-change technology (Baranowski et al., 2008). While narrative immersion seems directly applicable to the AVG gaming experience, systematic empirical research in this area has been scarce (Lu, Baranowski, et al., 2012). Game researchers debate the feasibility of narrative integration into video games: some believe that games and narratives do not work together, while others argue that both entities share many similarities and are essentially the same (Juul, 2001; Schell, 2005). Media researchers tend to focus primarily on the contribution of video games to violence (Anderson, Gentile, & Buckley, 2007), but few empirical theories have been developed in game studies, let alone in AVG research. A recent systematic review on games used for childhood obesity prevention found that less than 10% of the games studied included narratives (Lu et al., 2013).

The addition of a narrative to an AVG could foster intrinsic motivation to play the game by reducing cognitive load and hence lead to: more active engagement in metacognitive regulation (Pillay, 2002); engendering diverse emotional arousal and a sense of presence, as assessed by skin conductance and heart rate; eliciting character identification through various narrative elements (Hefner, Klimmt, & Vorderer, 2007); absorbing players in an immersive fictional world (McLellan, 1993); and promoting perceptions of PA as necessary and fun (Laurillard, 1998). Narrative elements, such as action, character, conflict, and genre could also encourage players in their role as in-game actors to enhance and maintain learning (Bielenberg & Carpenter-Smith, 1997).

Adding narratives to an AVG is an important area not yet thoroughly investigated by game developers and health researchers. This project aims to conduct research to address this gap.

Children's Engagement with Narratives

Most research on children's narrative engagement has come from education and psychology, and has focused on printed materials (Thorndike, 1941). Older children were studied more often than younger children, due to a lack of valid and reliable assessment instruments for younger ages (Zimet, 1966). In a study by Clark and Rumbold (2006), only 5% of pupils reported not reading fiction (Clark & Rumbold, 2006). Children preferred fantasy, magic, scary, sorcery, school, romance, and true story genres (Hopper, 2005), and most reported fiction was easier and more fun to read than other text types (Moyer, 2007). Most children's fiction narrative follows a linear path, with events happening in chronological order (Horning, 2010).

Narrative engagement can be conceptualized as both cognitive and emotional stimulation (Djikic, Oatley, Zoeterman, & Peterson, 2009). Fiction provides varying degrees of challenges by demanding high-level reading skills, intertextual references, and allowing complex engagement with the story (Hopper, 2005). Narratives also offer affective stimulation (Oatley, 1999), e.g., exposure to narrative fiction correlates positively with empathic ability and social support, while exposure to non-fiction is associated with loneliness and lack of social support (Mar, Oatley, & Peterson, 2009). Children's identification with characters is a primary catalyst for their response to narratives (Heilman, 2003).

Narratives, thus, pervade the media landscape and have the potential to instigate significant changes. Compared with other types of media, well-crafted narratives integrated into fun, AVGs may be an important means of reaching out and engaging audiences, especially children. This study explores the possibilities in a childhood obesity prevention context. This study is among the first to address this important topic and therefore, has the potential to provide critical insights into future AVG game design.

METHOD

Project Description

This study is the first stage of a larger project funded by the National Cancer Institute at the National Institutes of Health (NIH), to systematically explore the effect of narratives on children's motivation to play AVGs. It proposes

the creation of professionally-made animated narrative video clips (i.e., brief, animated clips that convey information about the story arc) to accompany an existing AVG. Four video clips of comparable duration were created for an AVG that was endorsed by the American Heart Association (AHA) for stimulating moderate to vigorous PA: Nintendo's *Swordplay: Showdown* in *Wii Sports Resort* (Schectman, 2010). To ensure an appropriate video clip, our study targeted 8-11 year olds. We performed cognitive interviews with 20 children to gauge their interests and preferences (Borgers, de Leeuw, & Hox, 2000; Willis, 2005). The 8-11 age group was targeted because children younger than 8 have cognitive limitations with respect to responding to survey questionnaires (Borgers, de Leeuw, & Hox, 2000) and children older than 11 have entered early adolescence and are subject to many physical, mental, emotional, and social changes (Centers for Disease Control and Prevention, 2010).

Participants

A total of 20 participants aged 8-11 were recruited from three participating elementary schools in a large, diverse, public school district in Midwest United States. The majority of students came from low-income families. The research team anticipated 20 would be adequate to achieve theoretical saturation (i.e., the point at which no new information is attained) (Kreuger & Casey, 2009).

The targeted, in this study, population reported positive experiences playing AVGs, being familiar with *Wii* games, and playing games or AVG more than their friends. Around half had not played *Wii Sports Resort* before, while the other half had played it. All of the children received a souvenir for their participation in the screening process. Table 7.1 presents their demographic information in greater detail.

Narrative Video Clip Preparation

Four narrative plots were developed to presage the selected *Swordplay: Showdown* AVG. *Swordplay: Showdown* requires players to wave a *Wiimote* controller as a sword to knock out enemies coming at them in different environmental settings (e.g., bridge, mountain, ruins, etc.). Since the essential movement was to wield a sword, "sword fighting" became the theme for the four narratives. Fantasy was selected as a common genre for all four stories (Hopper, 2005). Each story featured a different fantastical theme believed to be appealing to children (i.e., adventure, fable, mystery, and comedy) and presented events chronologically (Horning, 2010). All of

Table 7.1 Children's demographic information ($n = 20$)

Characteristic		Count	Percentage (%)
Gender	Female	6	30
	Male	14	70
Race	African-American	9	45
	Caucasian-American	9	45
	Hispanic-American	1	5
	Biracial	1	5
Age		$M = 9.5$ (Range: 8.3-11.2)	
Weight status[a]	Healthy weight (20-74 BMI%)	7	35
	Overweight (86-94 BMI%)	6	30
	Obese (95-98 BMI%)	6	30
Wii Sports Resort experience[a]	Never played it before	9	45
	Played it before	9	45
	Not sure	1	5
Video-game experience[a]	How much have you played Wii games?	$M = 5.3$ (1: Little or no; 7: A lot)	
	How familiar are you with Wii games?	$M = 6$ (1: Not; 7: Very)	
	Compared to your friends, how much have you played Wii games?	$M = 5$ (1: Much less; 7: Much more)	

[a]All except one went through a screening process that measured height, weight, and AVG experience (the one was not at school when the screening took place).

the narratives were created with the goal of encouraging the player to play the game harder and longer. Each video clip lasted between 1.2 and 1.8 min (M=1.5), serving as a "teaser" of the whole story. All featured the same voiceover, recorded from text-to-speech engine. All stories ended with a cliffhanger and dissolved into a "To be continued …" screen, suggesting future narrative development.

In the *Swordplay: Showdown* game, all non-player game characters (NPC) are rendered as stick figures, as is the player's avatar. However, the player avatar is not shown directly. Instead, the player is represented in the AVG as a semi-transparent stick figure whose back faces the screen. This provided the study's animators freedom in creating a generic Wii protagonist character without the need for race or gender identification (Lu, Thompson, et al., 2012) to integrate with gameplay.

One narrative was entitled, *The Legend of Yu*, an *adventure* story about the player character as heir to a magic kingdom who is kidnapped when only 3 weeks old by an evil assistant to the royal family. The assistant switches

his own child for the player, hoping the King and Queen would never find out. In the story, kindly pig farmers who raise the player far from the capital find the player. Growing up, the player becomes an expert swordsperson, and is soon known throughout the land. One day, a note from the palace arrives inviting the player to the castle to become the (fake) royal heir's playmate. The player's journey back to the castle begins a quest to regain the royal birthright. The journey promises to be difficult. The evil assistant is determined to prevent the player's return, unleashing an army of sword-wielding stickmen.

The Stones of Eitan is a *fable* about two legendary magical stones said to be the source of all knowledge when held together. The land is harshly ruled by evil ninjas. In the story, the player character is a wandering swordsperson who stumbles upon the stones in a river. The player puts the stones together and begins to learn how to stop the evil ninjas—but alas, the ninjas attack and steal one of the stones. The player's quest to retrieve the missing stone begins. The ninjas do not make it easy. They want the remaining stones.

The Door is a *mystery* about the player trying to go to sleep. It begins in an ordinary bedroom of a modern-day child. A magical door suddenly appears and sucks the player into a strange world filled with stick people carrying swords. The player tries to befriend a passing stickman, asking him, "Where is the door back to my room?" But the stickman attacks. The player successfully fends him off, as more stickmen attack. The battle is on, stickmen inexplicably attacking as the player searches for the magic door home.

Wuhu Boo-hoo is a *comedy* that opens in an airplane flying over Wuhu Island. The player is one of two passengers in the plane and wears a parachute. The other passenger announces the plane is over the drop zone and opens the door. As the player is about to jump out, the passenger casually mentions that sword-wielding stickmen have killed everyone on the island—and wishes the player good luck. The player sits down and refuses to jump. The passenger then says there was a billion dollar reward for whoever can save the island. The player thinks for a moment, and jumps.

To avoid order effect, the four video clips were played to each child randomly. After children finished viewing all of the video clips and completed the cognitive interviews, they were given four photo cards showing the title and content of each story to rank clips from most favorite to least favorite, by arranging them on a table. Research assistants documented their order of

choice (1 = Most Favorite to 4 = Least Favorite), which was later entered into a computer database.

Cognitive Interview

A second session was scheduled 1 month after the screenings. Each of the 20 children was shown the four narrative video clips and were individually cognitively interviewed in each participating school's classroom, by trained research assistants (Willis, 2005). Each interview was conducted using a standardized script consisting of open-ended questions developed by the researchers (Table 7.2). Probes were used to expand and clarify responses. Children watched the four video clips playing on a laptop and answered questions after watching each clip. Sessions lasted between 27 and 49 min. Trained research assistants audio-recorded each session and took notes as they interviewed each child. Each child received a $10 gift card at the end of the session.

Cognitive Interview Coding

All cognitive interview sessions were audio-recorded and transcribed verbatim by a professional transcription service. The transcripts were reviewed for accuracy and later sent to an independent company for thematic coding using NVivo 10. The company was established in 1996 and is one of the first independent research companies utilizing qualitative software. To ensure the neutrality of the analysis, neither the transcription service nor the qualitative company were aware of the research question or relevant literature.

The independent company conducted the thematic coding as follows: in accordance with the cognitive interview questions for each story (the same six questions were asked for each video clip, see Table 7.2 for details), six node titles were created for each story with abbreviated titles to mirror the script. The interview scripts from 20 children in regard to the four stories were broken into a total of 80 mini-interviews (20 interviews per each

Table 7.2 Cognitive interview questions

1.	Could you tell me about the story you just saw? How would you describe the story to a friend?
2.	What, if anything, do you like about the story?
3.	What, if anything, do you not like about the story?
4.	Is there anything we should add or change?
5.	What do you think happens next?
6.	How do you think the story will end?

story). The 80 mini-interviews were imported and coded using NVivo 10. Each set of story documents was coded to the six node titles. Additional subcategories for each node were created and coding was refined within the questions, resulting in a total of 191 subcategories for the 80 documents.

RESULTS

The cognitive interviews provided rich and insightful comments, identifying key characteristics of stories, such as characters and actions, plot or storyline, setting, stages, player levels, and ending. They also included comments regarding graphics, sound, and emotional responses. All children answered all questions.

Video Clip Preference

Distribution of participants and average rank score were calculated for each narrative (Table 7.3). A lower score indicates higher preference. Although closely clustered, *The Door* received a higher preference score (2.3) than *The Stones of Eitan* (2.4), *Wuhu Boo-hoo* (2.5), or *The Legend of Yu* (2.8). *The Stones of Eitan* received fewer positive qualitative responses than *The Door* (about one-third of the children said that they liked everything about *The Door*, while not as many said the same thing for *The Stones of Eitan*). *Wuhu Boo-hoo* received divided opinion: 40% of the children liked it the most, while 35% liked it the least. Interview transcripts indicated children's response to the question, "What, if anything, do you not like about the story?" was shortest for *The Door* compared with the other three. Therefore, *The Door* was chosen for the next stage of the research project.

Responses toward the Favorite Narrative, The Door

Children seemed to understand the plot, liked the story in general, and were able to recount it in detail. The narrative triggered different affective responses as it unfolded. Children had the impression that the story was vivid

Table 7.3 Children's narrative video clip preferences

Title	1 (Most favorite)	2	3	4 (Least favorite)	Average
The Door	4	9	4	3	2.3
The Stones of Eitan	5	6	5	4	2.4
Wuhu Boo-hoo	8	1	4	7	2.5
The Legend of Yu	3	4	7	6	2.8

and real, and that it could happen in real life. They also mentioned the video clip matched the visual style of the original game:

> *I just saw this new trailer on TV. It's like this game on the Wii …*
> ***(African-American boy, 10 years old, normal weight)***

Children's responses to questions concerning what they liked about the narrative centered on three themes: action, character, and the vividness of the fantasy element. *Action* was a theme many mentioned as their favorite part of the story. Most liked the actions of the narrative protagonist fighting against opponents. Interestingly, although the animators aimed for a gender- and race-neutral look for the protagonist, almost all children referred to the protagonist as a "he". (Perhaps this had something to do with the male voiceover.)

> *I liked how when he yells when he was fighting. I liked those parts.*
> ***(African-American boy, 10 years old, normal weight)***

The game's *protagonist* was another popular theme many children commented on. The "one versus many" setup was appreciated:

> *I like how it's like you have to fight all these people and there's just yourself going against them.*
> ***(African-American boy, 11 years old, obese)***

Children tended to have a positive evaluation of the main character. For example, one liked that the character was able to acquire sword fighting skills quickly:

> *The thing that stuck out most was that he didn't know how to sword fight, but he just found the sword and he started fighting and he was beating all of them and he kept on fighting.*
> ***(African-American boy, 10 years old, obese)***

Children also applauded the protagonist's perseverance:

> *I like the story because he kept on fighting and fighting … That he never gave up.*
> ***(Biracial boy, 8 years old, overweight)***

Children responded positively to the *fantasy* setting of *The Door* and how vividly it was presented:

> *I like the door that is surreal … I hope it would be real … Like in a … movie. That dreams are so powerful they come true.*
> ***(Hispanic-American boy, 9 years old, normal weight)***

When children were asked what they did not like about the narrative video clip, their feedback primarily focused on the affective response to the protagonist and the opponents. To create tension, stickmen launched an

unprovoked attack on the player/protagonist immediately after trying to make friends. The story encouraged players to wonder why and to try to solve the mystery in a later part of the story. Children, however, did not seem to like this. On one hand, they were concerned about the health and wellbeing of the protagonist:

> *I didn't like that part because maybe the kid got hurt or he got killed.*
>
> ***(Caucasian girl, 11 years old, obese)***

Other children disliked that the protagonist was unexpectedly attacked by the stickmen:

> *It didn't really make a lot of sense when they just randomly attacked because I would wanna know why they attack.*
>
> ***(Caucasian boy, 10 years old, overweight)***

They wanted to know the reason behind the stickmen's attacking behaviors:

> *(I wonder) why he has to fight his way, like somebody has to tell him.*
>
> ***(African-American boy, 11 years old, obese)***

As a result, when asked if they would like to suggest any change to the narrative video clip, the main response focused on providing the reasons for the unexpected actions of the stickmen:

> *I think there should be a way. Why he has to fight his way, like somebody has to tell him … There should be an AI (artificial intelligent character) next to him … then the AI tells him what it's about.*
>
> ***(African-American boy, 11 years old, obese)***

Children suggested an alternative to gain allies for the protagonist:

> *He might meet a companion.*
>
> ***(African-American boy, 10 years old, overweight)***

When asked how the story should develop and how it should end, most children said ongoing fighting would be the natural progression of story development.

> *(He will) keep on fighting them, and they'll keep on coming.*
>
> ***(Caucasian boy, 8 years old, normal weight)***

Some children would like to bring the suggested new ally/companion into the next stage of fighting, even with romantic context:

> *(H)e thought she (the companion) had good skills. And they're (opponents) boys and said, 'Hey, you trying to take my girl?' And he said, 'That's not your girl. That's my girl.'*
>
> ***(African-American boy, no age or weight info)***

As for the ending of the story, most children suggested a happy ending. Almost all children felt the protagonist would find the door to get back home:

> *(Y)ou're searching to find a part to the door. Like there are parts of the doorframe, and parts of the doorknob, and then you also need to find a key.*
>
> ***(Caucasian boy, 11 years old, normal weight)***

Several children added a more complicated narrative layer to the story, making it a dream:

> *He'll just come back and it's like a dream type of thing.*
>
> ***(Caucasian boy, 10 years old, overweight)***

A few children also suggested a sad alternative, in which the protagonist was killed:

> *That he ends up getting killed.*
>
> ***(African-American boy, 8 years old, obese)***

Other children mentioned recognition as another element of the story progression:

> *He survived and he got crowned for it (by) a magical person who is in charge of the stages.*
>
> ***(African-American girl, 10 years old, overweight)***

Response toward the Remaining Narratives

The interview transcripts of the other three stories were examined with special attention to why the children did not find the stories appealing, and a pattern emerged. The main issue was about the protagonist's motivation and subsequent inconsistency with game's PA requirement, swordplay. In other words, the protagonist's motivation was not well presented or justified enough to get players interested playing a game about sword fighting.

For *The Legend of Yu*, children had questions regarding why the royal family's assistant switched the protagonist.

> *I mean, it didn't make a lot of sense to me when he switched his baby … from the other baby … so it didn't make a lot of sense to me there.*
>
> ***(Caucasian boy, 10 years old, overweight)***

Part of the reason might be the antagonist of the story, the assistant, was not given a clear justification to be the bad person.

> *I don't like that he was really a bad guy … because he was really a good guy.*
>
> ***(Hispanic American boy, 9 years old, normal weight)***

Similarly, children questioned the motivation of the ninjas who ruled the world and stole the stone from the protagonist in *The Stones of Eitan*.

> *I don't know why (they) just came and attacked them and took the stone away from them.*
>
> ***(Caucasian girl, 11 years old, obese)***

Such criticism was especially prominent in *Wuhu Boo-hoo*, in which the protagonist was lured purely by money to save the island.

> *(What) I really didn't like is when he said there will be a cash prize and just jump out of the airplane …*
>
> ***(African-American girl, 8 years old, obese)***

From the interview transcripts, children seemed to understand the four narratives well and preferred the fantasy-mystery genre. Their responses came both from the cognitive and the affective domains. Action was their perceptual theme for the stories. They demonstrated significantly different empathic reactions to the protagonist, as opposed to the antagonist. For example, they were able to perceive several good characteristics from the protagonist as he fought against the opponents. On the other hand, they showed negative reactions toward the attackers or the opponents, partly because the attackers' motives were not clearly illustrated. The animated clips were able to induce player anticipation of fighting to continue and even become elevated in subsequent levels. Players were also expecting a companion to fight alongside the protagonist.

DISCUSSION

Several insights can be drawn from children's responses regarding narratives for AVGs. First and foremost, movement, or action in the story, is a crucial element to realize an AVG's potential health value. Video game writers should take this into consideration when developing the stories. Indeed, a common theme emphasized by all of the children about all of the stories, was that they involved lots of action. Since narratives must be created in accordance with the gameplay requirements, AVG stories should emphasize moderate to vigorous body movement. These findings suggest that to make the players move as much as possible, the AVG should employ narratives and integrate player movement seamlessly with the story. Players' perceptions must be taken into consideration, which highlights the need for more qualitative research in story-based AVGs (Thompson, 2014a).

Second, to ensure a narrative is organically related to physical movement, the motivation of the protagonist's actions must be clear and credible. A common issue the children had was justifying the player's action in each story. This has some similarity to the difference between intrinsic and extrinsic motivation (Ryan & Deci, 2000). Embedding engaging narratives into behavioral change games could promote development of players' intrinsic motivation to play (Lu, Baranowski, et al., 2012), but it must be done carefully. A protagonist should carry out actions (or PA) as a natural progression of story development (e.g., pick up the "sword" to defend his or her character's life), instead of being lured by extrinsic factors (e.g., motivated by money). If character or plot development causes confusion regarding the protagonist's motivation, it becomes difficult for the players to become fully engaged, breaks their immersive experience, and ultimately lessens their motivation to play.

Third, the narrative should keep children's developmental capacities in mind. To create suspense, each video clip deliberately left some background details out, hoping players would be more engaged by discovering details as the narrative progressed. For example, the stickmen's attack on the protagonist in *The Door* was not explained. Similarly, why and how *The Legend of Yu's* evil assistant switched babies, or why the *Stones of Eitan*'s ninjas suddenly appeared, and how Wuhu Island became invaded, were never described. Adult audiences might be able to make the mental bridges as part of their sense-making process, but the extra effort appeared taxing to these children (Bruner & Haste, 2010). At the risk of lowering suspense, brief clips affirming character motivations could be inserted to avoid the assumption that children will discover the future story, which may prevent some children from fully enjoying the narrative and game. It would be important to assess if such insertions prevent those who are cognitively developed enough to understand the story from fully enjoying the story, and to what extent such "mental paving" is needed.

Fourth, it is crucial to create a protagonist character the children like, and with whom they can identify. When a narrative provides appropriate details and depictions of the protagonist's positive qualities, child players should be able to identify with the character faster, be more willing to look up to them, and be more able to carry out actions on behalf of the character (Hoffner, 1996). When players internalize a character's motivation and make it their own, subsequent physical activities may come naturally (Cohen, 2001). Research is needed to test this proposition experimentally and ascertain what character attributes maximally motivate children's PA. Research is also

needed to identify what makes a realistic blend of characteristics or personalities for a likeable character.

Fifth, companionship could be an important design feature for AVG narrative design. Recent studies indicate game players in a cooperative mode are more intrinsically motivated to play (Staiano, Abraham, & Calvert, 2012). Perhaps a good narrative could help translate cooperative play into a game. When multiple characters are introduced and share similar goals, players may be more likely to work together, accomplish common goals, and have a better experience. The game *Journey* (Thatgamecompany, 2012) provides an illustration of companionship during gameplay. The method, by which companionship should be introduced into AVGs so that children do not feel alone, but are engaged in the narrative together, remains to be assessed.

Finally, narrative development should be built into AVG progression as part of a continuum. The story should be interesting enough to get the players started, as well as to continue to play the game, but not be too eager to conclude the narrative by skipping actual physical movement. The challenge is giving players enough information to start, and then keep them engaged and wanting more gameplay at the end of each level, thereby increasing the level of PA as the story progresses. An AVG narrative should naturally lead players to additional cycles of gameplay.

CONCLUSION

Narratives have the potential for behavioral intervention in AVGs, but the key is integrating narrative development. This study is a first step towards the development of a series of systematic inquiries into the behavioral potential of narratives via AVGs for combating childhood obesity and reducing risks of certain types of cancer. Child participants seem eager to participate in such projects and are able to provide meaningful responses. Narratives can enhance AVGs, as long as they align with gameplay, naturally induce intrinsic motivation, accommodate children's developmental capacities, and present personable characters. Future research should provide insight for the design of innovative and effective media products for various health interventions.

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CHAPTER 8

Educational Neuroscience and the Affective Affordances of Video Games in Language Learning

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INTRODUCTION

The purpose of this chapter is to explore some of the affective affordances that video games offer within the context of language learning, particularly within the field of English as a Foreign Language (EFL), through a case study of adult life-long learners' experiences with several popular commercial off-the-shelf (COTS) video games. Included in Yin's (2013) suggestions for designing an exemplary case study, is the advice to choose a case that is unusual, revelatory, and has the potential to add to the theory in its field. With this in mind, the majority of the participants were over 60 years old, a demographic that is underrepresented in video-game research (Allaire et al., 2013; Levy et al., 2012). The games that were selected for the study were widely popular, critical and commercial successes, but have not been the subject of much academic study within the context of language education (Godwin-Jones, 2014). Furthermore, the topic of emotions and video games in language learning may not be receiving the focus that it deserves. Without a doubt, Sykes and Reinhardt's (2013) book about digital games in second and foreign language teaching and learning is a "lucid, engaging, and highly useful volume" (Thorne & Watters, 2013), but a search of the Kindle version of the book only revealed four instances of the word "emotion" or its derivational morphemes (e.g., "emotional" or "emotionally") in the text and only one instance of the word "affect" or its derivational morphemes. Indeed, Peterson (2012) states that more research should be done on the influence of affective factors on language learner performance.

The exploration of the role of emotion in education is of paramount importance because of the highly interrelated nature of affect and cognition.

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In recent years, mounting evidence from modern brain imaging technology used in the burgeoning field of mind, brain, and education (MBE)—a field that combines education, biology, and cognitive science (Fischer et al., 2007)—has shown that emotion plays a central role in cognitive processes.

Educators simply cannot afford to ignore emotion. "The aspects of cognition that are recruited most heavily in education, including learning, attention, memory, decision making, motivation, and social functioning, are both profoundly affected by emotion and in fact subsumed within the processes of emotion" (Immordino-Yang & Damasio, 2007, p. 7). It is impossible to divorce emotion from cognition. Immordino-Yang and Fischer (2010) reported that within the brain,

> *emotion-related networks function as modulators and facilitators of memory and domain-specific learning… Through regulating and inciting attention, motivation, and evaluation of simulated or actual outcomes, emotion serves to modulate the recruitment of neural networks for domain-specific skills, for example, for math or reading. In this way, cognition and emotion in the brain are two sides of the same coin, and most of the thought processes that educators care about, including memory, learning, and creativity among others, critically involved both cognitive and emotional aspects.*
>
> ***(Immordino-Yang & Fischer, 2010, p. 313)***

While modern brain imaging technology has increasingly provided evidence of the importance of emotion in education, it is by no means a new idea to educators in general (Hawley & Hawley, 1972; Miller, 1976) and specifically within the field of foreign language education. In describing a practical approach to applying humanistic techniques in the foreign-language classroom, Moskowitz (1978) distills the importance of emotion in learning into a single pithy phrase: "affective education is effective education" (p. 14).

One of the best-known models of second language acquisition, the Monitor Model, comes from Krashen (1982) (Lightbown & Spada, 2013). Krashen was very intuitive and prescient about his assumptions and inferences about the way that the brains of second language learners operate. He developed the Affective-filter hypothesis, which states that negative attitudes or anxiety can create a barrier within a student's brain that would block out otherwise comprehensible input. This hypothesis actually inspired educator and neuroscientist, Judy Willis to seek out the physical basis for these learning theories:

> *It was Krashen's theory of an affective (emotion-responsive) filter that started my search for how the brain's physical structures or neurochemicals are influenced by emotions. Research now supports recommendations to avoid high-stress*

> *instructional practices such as use of fear of punishment and to incorporate appropriate environmental, social, emotional, and cognitive considerations into instruction. We recognize that the brain has filters that influence what information enters our neural networks, as we see the effects of stress and other emotions on these filters.*
>
> ***(Willis, 2010, Section 5, para 6)***

Taking this, and all of the previously mentioned points into consideration, the following research question was formulated for the present case study. *Within the context of EFL, how do various popular COTS video games influence the affective states of adult life-long learner participants (both players and observers) who have little to no interest in or experience with video games?* The authors hypothesized that the participants would have strong negative emotional reactions to the video games that depicted violence and/or criminal activity. Conversely, they predicted that the participants would have strong positive emotional reactions to the more peaceful, artistic video games.

First, this chapter reviews some of the neuroscience evidence of emotion's role in learning. Second, it examines video games' multifarious effects on people and their connection to learning, as well as some of the theories about game-based learning. Third, there are details of the case study with adult life-long learners of EFL in Tokyo, Japan, examining the affective elements of a wide range of video games from different genres using both quantitative and qualitative data. Finally, there is a discussion of the findings from the case study.

NEUROSCIENCE, EMOTION, AND LEARNING

Language Learning and the Brain

Almost all human infants begin learning their mother tongue (L1) by listening to the language that is spoken around them and then later mimicking the speech in a practice that is commonly referred to as "babbling." From this start, they make the transition to using words, phrases, and complete sentences. This is a natural and innate phenomenon; Eimas, Siqueland, Jusczyk, and Vigorito (1971) demonstrated that infants were able to recognize and respond to speech patterns. This discovery was supported by brain imaging evidence that proves that specialized neural networks exist in the brains of 4-month-old infants, which allow them to recognize and respond to the auditory elements of language (Dehaene-Lambertz, 2000). For a fascinating look at this process in action, see MIT researcher, Deb Roy's (2010) TED Talk where he details an experiment in which he and his wife filmed almost the

entire first 2 years of his son's life (amounting to 90,000 h of video) and then analyzed the emergence of the child's first words, cross-referenced with temporal and spatial positioning within their home and also with every instance that the child heard those words spoken by his caregivers. In one particularly moving segment, Roy compresses every instance that his son tried to say the word "water" up until he actually succeeded in uttering the correct word. A general overview (Roy, 2009) and a more detailed examination (Roy, Frank & Roy, 2009) of the research are also available.

Most people have similar language processing systems, which are located in the left hemisphere of their brains, the two most important components of which are called Broca's area and Wernicke's area. The processing of vocabulary, syntax, and rules of grammar apparently takes place in Broca's area in the left frontal lobe, and the processing of the sense and meaning of language is believed to be conducted in Wernicke's area located in the left temporal lobe (Sousa, 2010).

The Physical Side of Learning and Memory

Every day, the average human brain receives a massive amount of data from the surrounding environment:

> *Our senses constantly collect tens of thousands of bits of information from the environment every second, even while we sleep. That number may seem very high, but think about it. The nerve endings on your skin are detecting the clothes you are wearing. Your ears pick up sounds around you, the rods and cones in your eyes are reacting to this print as they move across the page, you may still be tasting recent food or drink, and your nose may be detecting an odor. Put these data together and you see how they can add up.*
>
> ***(Sousa, 2011, p. 45)***

Taken in total, the volume of this incoming data would be overwhelming to experience all at once; the challenge that the brain faces is to determine which information is valuable and should be retained and which information is extraneous and can be ignored and discarded. The first step in this process of sorting and evaluating the incoming information is located in a part of the brain located in the brainstem called the reticular activating system (RAS). With the exception of olfactory information (which goes directly to the part of the limbic system known as the amygdala), all sensory data must first pass through this filter, which is sometimes also referred to as the sensory register.

This filtering is a largely automatic and unconscious process. It takes place in the brainstem, which is one of the oldest parts of the brain, also

known as the reptile brain (because of its structural similarity to actual reptilian brains), and its main purpose is to protect the survival of its owner.

> *Thus, it will process immediately any data interpreted as posing a threat to the survival of the individual, such as a burning odor, a snarling dog, or someone threatening bodily injury. Upon receiving the stimulus, the reticular activating system sends a rush of adrenaline throughout the brain. This reflexive response shuts down all unnecessary activity and directs the brain's attention to the source of the stimulus. Emotional data also take high priority.*
>
> ***(Sousa, 2011, p. 47)***

In addition to perceived threats and emotionally charged information, novelty is highly valued by the RAS. If the information passes through the sensory register, it is sent to the limbic system—the bridge between the brainstem and many other parts of the brain—which has four parts that play a key role in learning and memory: the thalamus, the hypothalamus, the hippocampus, and the amygdala. Of particular note to educators is the hippocampus, which plays a significant role in the formation of long-term memories and the creation of meaning, and the amygdala, which encodes emotional data, if it is present, when transferring information from the working memory to the long-term memory.

> *The interactions between the amygdala and the hippocampus ensure that we remember for a long time those events that are important and emotional. Teachers, of course, hope that their students will permanently remember what was taught. Therefore, it is intriguing to realize that the two structures in the brain mainly responsible for long-term remembering are located in the emotional area of the brain.*
>
> ***(Sousa, 2011, p. 19)***

Affect and the Brain

Emotion can have long- and short-term effects on cognition. In the long-term, they help to give people direction in order to make appropriate decisions; patients who have brain damage to the parts of the brain which process emotion are sometimes left utterly unable to make sound judgments (Damasio, 2004 [1994]). Emotion has been described as being similar to a ship's rudder, providing a stabilizing and guiding effect for students' thinking, learning, and decision-making, often in very subtle ways and even unconsciously (Damasio, 2005; Haidt, 2001; Immordino-Yang & Damasio, 2007; Immordino-Yang & Faeth, 2010). Pekrun, Goetz, Titz, and Perry (2002) advocated teachers using set strategies to develop this rudder of academic emotions.

Equally important are the effects that emotions have on the short- and mid-term, specifically in the creation, storage, and retrieval of memories. There is considerable evidence that individuals remember emotional occurrences better than those occurrences that lack emotion (Buchanan, 2007; Hamann, 2001; Ochsner, 2000). In an extensive review of the neuroscientific evidence in the literature on the effect of emotion in humans, Buchanan (2007) concluded, "it is clear that emotion can exert effects at the time of encoding, during retrieval search processes as well as during the experience of recollection" (p. 776).

Emotionally arousing events result in the adrenal glands releasing epinephrine (adrenalin) and the glucocorticoid stress hormone, cortisol (Roozendaal, McEwen, & Chattarji, 2009). Increasing the concentrations of these hormones in human subjects by drugs or other methods during or following learning has been shown to enhance memory (Cahill & Alkire, 2003; Kuhlmann & Wolf, 2006; Moor et al., 2005; Zoladz et al., 2011). This and the subsequent activation of the amygdala may be a partial cause of the effect known as emotional tagging, where an emotionally arousing experience is marked as more important and therefore more likely to be entered into long-term memory (Richter-Levin & Akirav, 2003).

Lewis, Critchley, Smith, and Dolan (2005) investigated the phenomenon of mood-congruent memory—where recollection is enhanced when the affective state of an individual is the same at the time a memory is formed as it is when the individual tries to remember it. They found greater activation in certain areas of the pre-frontal cortex when individuals were attempting to remember information in a mood-congruent state, which suggested that emotion guides the search process for memories. "Just as external cues that are similar to the to-be-remembered item are the best cues for the retrieval of non-emotional information …, emotional states similar to the original experience serve as potent cues to the retrieval of those experiences" (Buchanan, 2007, p. 774).

In Bergado, Lucas, and Richter-Levin (2011) review of the literature, they found ample evidence to support the concept of emotional tagging. However, they advised taking into account the complex interplay of multiple factors, such as the age of the person experiencing an emotional event and the intensity, duration, and controllability of that emotional event, all of which can have an impact on the memory formation of that event. Bennion, Ford, Murray, and Kensinger (2013) agree that the beneficial effect that emotion has on memory is true, but they caution that some of that effect may be attributable to other factors, such as novelty and semantic connections.

HOW VIDEO GAMES AFFECT PEOPLE

There is no doubt that video games can affect how people think and act. There has been a considerable amount of research done on the negative effects that they can cause, much of which has been related to video games increasing the aggressive behaviors of players. For example, Anderson and Dill (2000) found that video games can increase aggressive thoughts. Video games have also been shown to desensitize people to violence (Bartholow, Bushman, & Sestir, 2006) and to decrease players' empathy (Funk, Buchman, Jenks, & Bechtoldt, 2003). Furthermore, higher usage of video games has been linked to lower grades and lower self-reported contentedness (Roberts, Foehr, & Rideout, 2005), as has higher consumption of digital media in general, including playing video games (Rideout, Foehr, & Roberts, 2010), although in both cases, there was no causal link found.

There is, however, a growing body of research demonstrating the positive effects of video games. In a systemic literature review, Primack et al. (2012) determined that there was evidence that video games have "potential for improving health in a wide variety of areas, for a variety of sociodemographic groups" (p. 9), particularly in the areas of psychological therapy and physical therapy. For example, a video-game-based intervention was found to significantly improve the behavioral outcomes (e.g., adhering to treatment) in adolescents (Kato, Cole, Bradlyn, & Pollock, 2008). Playing casual video games (ones that are easy to learn, quick to play, and often available on mobile devices) has been found to improve mood and decrease stress (Russoniello, O'Brien, & Parks, 2009). Video games also can help make people become better citizens; "teens who have civic gaming experiences, such as helping or guiding other players … report much higher levels of civic and political engagement than teens who do not have these kinds of experiences" (Kahne, Middaugh, & Evans, 2009, p. 30).

Within the context of education, there are many examples of positive and effective uses of video games. For example, they were found to have a highly statistically significant positive impact on students' performance in math and language arts classes in a large-scale longitudinal study involving over 10,000 Italian students (Wastiau, Kearney, & Van den Berghe, 2009). Furthermore, Shaffer (2006) offers an extensive list of a variety of epistemic games that help people learn. There are also multiple examples of how video games can be used to meet curriculum standards, including those set by the National Council of Teachers of English and the International Reading Association (Hirumi, 2010).

As was stated earlier, emotions have a huge effect on cognition. The affective power of games has been demonstrated before. For example, Merkx, Truong, and Neerincx (2007) found that one particular game, a competitive multiplayer first person shooter, was able to elicit a wide range of emotions, spanning the entire spectrums of valence and arousal.

There is also evidence that shows that video games can aid in language learning (Peterson, 2013; Reinders, 2012). In a meta-analysis of the literature suggesting that video games can help to improve second language acquisition (SLA), Peterson (2010) said that there is "compelling evidence that participation in gaming and simulation may facilitate aspects of SLA and the development of communicative competence" (p. 89). Citing a half-dozen studies of the use of an extremely popular massively multiplayer (MMO) game by second language learners, Godwin-Jones (2014) says that the games in the MMO genre "have substantial potential … for language socialization and for acquisition of skills related to just-in-time linguistic tools and services" (p. 12).

Of course, these positive educational outcomes are not the result of simply introducing games into a particular learning environment haphazardly. A significant amount of thought needs to go into the pedagogical structuring of any activities involving games and consideration needs to be paid to the theories about game based learning. Fortunately, there are a number of recently published books (Peterson, 2013; Reinders, 2012; Sykes & Reinhardt, 2013) that offer an excellent overview of the various competing theories as well as practical pedagogical applications of video games for language learners. Because there is this existent body of theoretical work available, this chapter will not go into exhaustive depth on the subject. Instead, it will focus on the theoretical viewpoints that are most cogent to the present case study.

This look into the nexus of relevant theories begins with the elegant description that Gee (2008) has offered for what video games actually are: "learning machines" (p. 2). He claims, "good video games are thinking tools. Their deepest pleasures are cognitive. The 'drug' the video game industry discovered was learning—humans love it when it's done right" (p. 17). Some elements of video games that make them into learning machines include scaffolding, individualized achievable challenges, incremental goal progress, real-time feedback (Willis, 2011), encouraging failure states (McGonigal, 2011; Sykes & Reinhardt, 2013), and the ability to affect both players and observers (deHaan, Reed, & Kuwada, 2010).

These learning machines can be used to augment pre-existing language learning theories and approaches, such as Ellis's (2003) task-based approach.

"These new forms of task-based language teaching involve including learners in more complex narratives or plots in which they assume the part or role of a character" (Reinders, 2012, para. 5). Practice in the target language can emerge from social interaction that occurs within the gameplay or from communication concerning the gaming experience, but which happens outside of the actual gameplay (Piiranen-Marsh & Tainio, 2009; Thorne, 2008).

> *Informed by game-mediated learning research, pedagogical application is trending towards seeing digital games as social literacy practices and sociocultural literacy objects that afford narrative experiences. In this view, playing digital games involves the interaction between the narratives designed in a game (Juul, 2005; Salen & Zimmerman, 2005) and those that the players are designing themselves, from which L2 learning can potentially emerge.*
>
> ***(Reinders, 2012, para. 2)***

Peterson (2013) suggests that two particular theories of SLA are particularly well suited for the understanding of successful game-based language learning. On one hand, are the cognitive theories (e.g., Kasper, 1997; Long, 1990), which stress the importance of the interior mental processes of the language learners and on the other, are theories which focus on the social and contextual aspects of language learning (e.g., Atkinson, 2002; Tarone, 2007). The authors of this chapter agree that these are both useful theoretical lenses through which to view video games and language learning, but would also like to stress that they do not feel as though the two theoretical approaches are necessarily mutually exclusive or logically inconsistent. Rather, the two seemingly dichotomous theoretical viewpoints are actually an example of superposition, one of the defining characteristics of complex dynamic systems (van Geert & Steenbeek, 2008). Human language learning is undoubtedly a complex dynamic system, and therefore, multifaceted theoretical approaches should be expected and embraced. Clearly, video games' effects on both the learners' interior mental processes and the surrounding social/contextual environment must be considered.

CASE STUDY RESEARCH

This section details a case study that was conducted by the authors in the context of video games, affect, and language learning. The purpose of the case study was to gain a qualitative and quantitative snapshot of the emotional effect of a wide variety of commercially and critically successful COTS video games on a small group of adult Japanese EFL students.

The case study was conducted with the following research question in mind: *Within the context of EFL, how do various popular COTS video games influence the affective states of adult life-long learner participants (both players and observers) who have little to no interest in or experience with video games?* The authors hypothesized that the participants would have strong negative emotional reactions to the video games that depicted violence and/or criminal activity; ones which were rated "mature" for being "generally suitable for ages 17 and up [containing] … intense violence, blood and gore, sexual content and/or strong language" (Entertainment Software Rating Board, n.d., Rating Categories). Conversely, they predicted that the participants would have strong positive emotional reactions to the more peaceful, artistic video games.

Case Study

Issues of Validity and Reliability

One problem that has historically plagued research about video games in education is the issue of methodological weakness (Griffiths, 1996; O'Neil, Wainess, & Baker, 2005; Peterson, 2013; Randel, Morris, Wetzel, & Whitehill, 1992). To address this issue in reference to the present case study, the authors would like to begin by discussing the four essential elements of a valid and reliable case study according to Yin (2013): construct validity, internal validity, external validity, and reliability.

One technique that is used to ensure construct validity is data triangulation, which can be achieved by collecting multiple types of data. In the present case study, several different data types were collected. In order to gauge the participants' experience with and attitudes toward video games, a survey was administered 2 weeks prior to the start of the gameplay sessions. A second, follow-up survey was administered 3 weeks after the final gameplay session. The time lag was intended to assess what elements of the gameplay were most memorable after a relatively long period of time had passed (see Appendix for a list of the questions asked in both surveys). After each gameplay session, the participants took part in a filmed focus group discussion that featured two scripted questions from the participant-observer ("What was your emotional retraction to this game?" and "Do you think this game could be used in studying English?") as well as some unscripted follow-up questions, mainly for clarifying the participants' answers. Finally, during the gameplay sessions, data was also collected in the form of notes written by the participant-observer.

To ensure internal validity, one approach that can be applied is theory triangulation (Gibbert, Ruigrok, & Wicki, 2008; Yin, 1994). In the present

case study, the researchers have examined the findings through many of the theoretical lenses that have previously been mentioned, including Krashen's (1982) Monitor Model; cognitive theories of SLA (e.g., Kasper, 1997; Long, 1990); social and contextual theories of SLA (e.g., Atkinson, 2002; Tarone, 2007); task-based language learning (Ellis, 2003); the theory that game-based learning can occur both during gameplay and outside of it (Piiranen-Marsh & Tainio, 2009; Thorne, 2008); the narrative theory of game-based learning (Juul, 2005; Salen & Zimmerman, 2005); and complex dynamic systems theory (van Geert & Steenbeek, 2008). These and other theoretical lenses also informed the selection of the video games used and the survey questions.

External validity means that a study (regardless of its methodology) can be generalizable beyond its immediate boundaries. Whereas experimental studies based on quantitative data collection methods can be candidates for statistical generalization, case studies are candidates for analytic generalization.

> *An analytic generalization consists of a carefully posed theoretical statement, theory, or theoretical proposition. The generalization can take the form of a lesson learned, working hypothesis, or other principle that is believed to be applicable to other situations (not just other 'like cases'). Thus, the preferred analytic generalization is posed at a conceptual level higher than that of the specific case (presumably, this higher level was needed to justify the importance of studying the chosen case in the first place).*
>
> ***(Yin, 2013, Ch. 2, Tutorial 2.1)***

The analytic generalization will be provided in the discussion section.

Finally comes the issue of reliability. Following Yin's (2013) advice on how to improve the reliability of the present case study, the researchers developed a case study protocol and an archival case study database. (If future researchers are interested in replicating this study, they can contact the authors to request access to them.)

Participants

The four participants provided informed consent before the start of this case study. They were all Japanese adult life-long learners currently studying English as a foreign language in a private language school in central Tokyo, Japan, which is co-owned by the researchers. They are all classmates in a small, advanced level English conversation course. Their average TOEIC scores range from 780 to 850. Their preferred style of lesson involves using textbooks (e.g., Knudsen & Fukuhara, 2013; Powell, 1997) and real-world materials that form the basis of thoughtful analytical discussions that improve their language skills and critical thinking skills.

The participants included three females, aged 62–64 and one male, aged 33. To preserve the anonymity of the participants, they will be referred to as a combination of the first letter of their gender and their age. At the time when the case study was conducted, M33 had a Master's degree and was currently employed as an engineer designing circuits. F63 had a Bachelor's degree and was primarily a housewife and mother, spending 2 years working a part-time job outside the home for 3 days per week. Participant F64 had attained a high school diploma and had worked for a trading company for over 30 years, including the last 20 years in the overseas sales department. She is currently retired. Finally, F65 had a Bachelor's degree and had worked for IBM for 16 years. She is also currently retired.

The participants were all given a survey before the beginning of the first gameplay session to gauge their experience with, interest in, and knowledge about video games (see Appendix). Over the course of three 2 h sessions, the participants were introduced to five COTS video games for the PlayStation3, all displayed on a Sharp Aquos 65-inch flat screen television. The participants were given the option to take turns using the controller or to simply observe the action. After playing each game, the participants took part in a filmed focus group discussion. They also completed a follow-up survey approximately 3 weeks later (see Appendix).

Part of the rationale for including the younger participant with older participants who had minimal experience playing video games was precisely for his experience. Video game controllers can sometimes be difficult to use. Shinkle (2008) addresses the challenges that some game controllers pose:

> *For casual and neophyte gamers, however, the button-based controller can act as a hindrance to good gameplay. A series of complex and often counter-intuitive button or keystroke combinations stands in for a range of widely varied real-world skills. Rather than reducing the need for skillful engagement and the potential for error, such control systems demand their own highly specific skill set.*
>
> ***Shinkle, 2008, p. 909***

It was hoped that the younger participant would be able to aid his older companions if they experienced difficulty using the controller.

M33 had played role-playing video games and shooting games when he was younger, but almost never plays video games now. Only one female (F65) reported having experience playing video games: "I played them with my four-year-old son 28 years ago. The game's name was Super Mario. I was defeated by him in a week, so I gave up." The other two females said that they were not interested in playing video games.

When asked which forms of entertainment they thought were the most emotionally powerful, they replied that books, including long novels, historical nonfiction, and detective stories, painting, and opera were the most emotionally powerful forms of entertainment. Among the reasons that they cited books as being emotionally powerful were that they stimulate the imagination; readers can feel as if they were acting and sharing emotion with the main characters; that books take the reader to unknown worlds; and the reader can freely imagine each world that the authors describe in their novels.

With regard to painting, the emotional power was said to come from not only seeing paintings but also from learning how to paint. Participant F64 said, "when I completed a piece of work I felt satisfied with the effort I made for long hours. Maybe the process makes painting emotionally powerful."

Interestingly, despite their own personal disinterest in video games, all four of the participants believed that video games have the potential to be emotionally powerful, particularly for video game lovers. They cited the potential sources of video games' emotive power as the sounds, images, and musical score. One participant said that, "the images on the screen are so clear and stimulating that they give you strong impressions directly in both a good way and a bad way."

Methods

The pre-gameplay survey, the follow-up survey (see Appendix), and the filmed focus group discussion all focused primarily on the affective elements of the video games, rather than pedagogical applications of the games. In addition, at certain points throughout the gameplay, the participants would pause the game briefly and self-report their emotional state using a tool called the self-assessment manikin (SAM).

Mehrabian (1980, 1996) describes emotions as existing within a dimensional framework, namely the pleasure, arousal, and dominance dimensions. This is known as the pleasure-arousal-dominance emotional state model. The pleasure dimension refers to the valence of a particular emotion, running from negative to positive. The arousal dimension measures how intense emotions feel. The dominance dimension gauges the amount of control that an individual has over a particular emotion, ranging from dependent to independent.

The SAM is a picture-based emotional state measurement tool (Figure 8.1) that is an adaptation of Mehrabian's model (Hodes, Cook, & Lang, 1985; Lang, 1980). It has a series of simple line-drawn images depicting different points on the three previously mentioned affective dimensions,

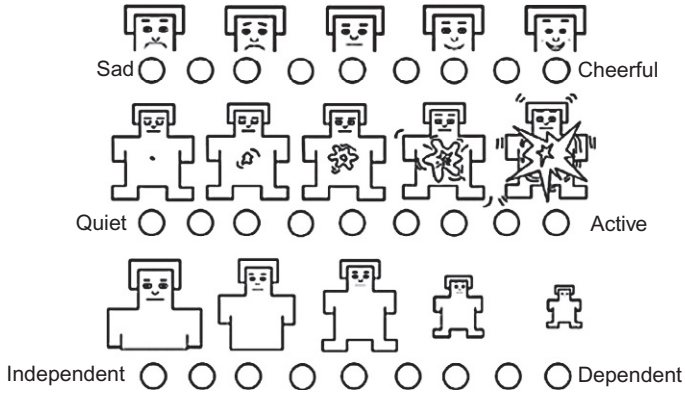


Figure 8.1 The self-assessment manikin (SAM) emotional state measurement tool. *Reproduced from Schifferstein et al., 2011.*

similar to a series of pictorial Likert scale questions. SAM's pleasure dimension ranges from a smiling, happy figure to a frowning, unhappy figure. The arousal dimension ranges from an excited, wide-eyed figure to a relaxed, sleepy figure. The dominance dimension has a large figure that represents maximum control of a situation, while smaller figures indicate gradually reduced control of a situation. It is cheap to use, easy to administer, and because of its predominantly non-verbal design, it is particularly well suited for use by non-native English speakers. Furthermore, the results have been shown to correlate highly with the lengthier, time-consuming semantic differential scale (Bradley & Lang, 1994).

In the first session, the participants played *The Last of Us* (2013) and *Flower* (2013). In the second session, they played Grand Theft Auto V (2013) and *Katamari Forever* (2009). In the final session, they only played *The Walking Dead* (2012). *The Last of Us, Grand Theft Auto V*, and *The Walking Dead* are all rated "mature" (intended for players 17 years old and over) and *Flower* and *Katamari Forever* are rated "everyone" (suitable for all ages) (Entertainment Software Rating Board, n.d., Rating Categories).

Results

This section describes each game and gives a brief summary of the gameplay experience that the participants had. Within those summaries, the times that the games were paused in order to collect the SAM data are marked as T1, T2, etc. (for time 1, time 2, etc.). This is followed by the SAM results for that particular game and then the participants' comments from the follow-up surveys. The participants' answers are reported, *without adding corrections for spelling or grammar.* Issues and themes that arose in the post-gameplay focus

group discussions are addressed in the later Discussion section. As previously mentioned, the participants are referred to here as a combination of the first letter of their gender and their age. The discussion about these results follows at the end of the chapter.

The Last of Us

The Last of Us is categorized as an adventure game with a powerful narrative that also features elements of horror and puzzle-solving. It is played in the third person perspective (the camera is behind and slightly above the character that the player controls). The production values of the graphics, voice acting, and music are all quite high. The musical score was composed by Gustavo Santaolalla, a two-time Academy Award winner for best original score, and one of the main characters is voiced by BAFTA award winning actress, Ashley Johnson. This game is marked with periods of pensive quietude juxtaposed with highly jarring scenes of violence and loss.

The participants played through the prologue stage of the game. The prologue introduces a single father, Joel, and his daughter, Sarah, who share a close, loving bond (T1). Sarah awakes in the middle of the night to a frantic phone call from her uncle trying to reach her father, but the phone line suddenly goes dead. At this point, the player takes control of Sarah and begins to explore the house to locate her father. His bedroom is empty but the television is on and showing a newscast that hints at a spreading panic in the neighboring city. Unknown to Sarah (but known to the player), this is the beginning of a zombie-like outbreak caused by a fungus. The newscast is cut short with an explosion that is big enough to rattle the windows of Sarah's house (T2). Even more frightened now, she continues to look for her father downstairs. He suddenly re-enters the house in a very agitated state, asking her quickly if she is okay, while pulling a handgun from his desk drawer and loading it.

The reason why Joel is arming himself quickly becomes clear when one of their neighbors comes crashing through a sliding glass door into their house, aggressive and incoherent, clearly infected by the zombifying fungus. Joel protects his daughter by shooting his infected neighbor, and then his brother, Sarah's uncle, arrives in a car to pick them both up. The three drive into the nearby town to seek help. Along the way, they see a neighboring farmhouse that is on fire and pass by other families begging to be picked up (T3). When they arrive in the downtown of the neighboring city, the situation deteriorates rapidly because of the spreading epidemic of madness and cannibalism (T4) (Figure 8.2).

Participants described their emotional reactions to *The Last of Us*, as follows:

F63

"I have watched this type of movie a few times. Therefore the game itself didn't surprise me. What amazed me was the advanced computer graphics that let me look at the whole room and enter the rooms as I like by using the controller."

F64

"As the story unfolded, I started to feel uneasy and worrying about the problems that I expected and I got scared of zombies."

S65

"We did not foresee any problems so I was uneasy about what was happening next. But it was exciting."

M33

"I felt that the story was dark inside. I think the story is simple and there is only one way to go. I think that I would not like to play this game twice."

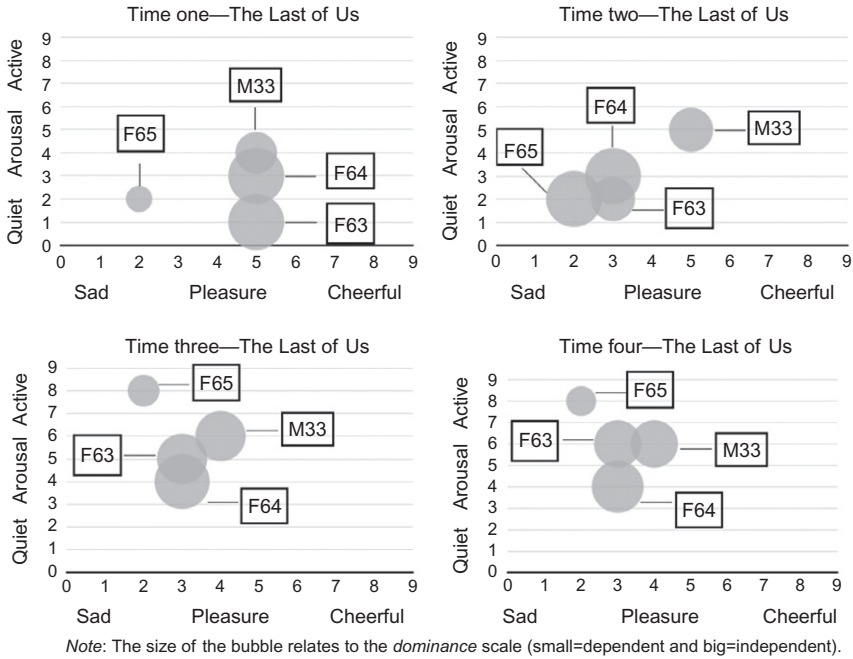


Figure 8.2 Participants' emotional reactions to *The Last of Us.*

Flower

Flower was the second game played in the first session, after *The Last of Us*. Perhaps one of the best descriptions of this game comes from the Smithsonian

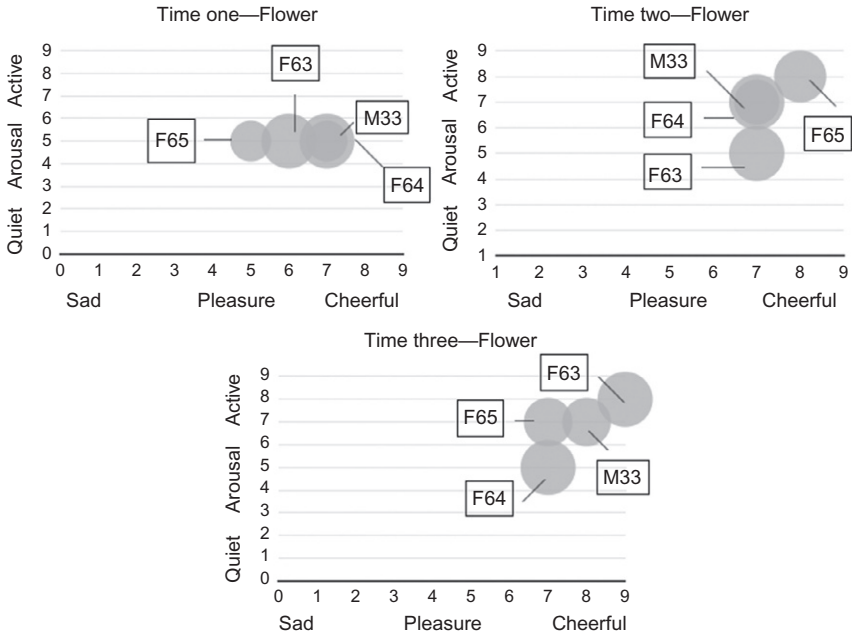
Museum in a press release announcing that it had added *Flower* to its permanent collection in 2013:

> Flower *represents an important moment in the development of interactivity and art. This innovative game puts the player in an unusual role—the wind—and uses minimal controls to create an emotional, immersive experience of the landscape that changes in response to the player's actions. Conceived as an "interactive poem" in response to tensions between urban and rural space, Chen and Santiago imagine an unexplored land for the player to discover.* Flower *presents an entirely new kind of physical and virtual choreography unfolding in real time, one that invites participants to weave aural, visual, and tactile sensations into an emotional arc rather than a narrative one (The Smithsonian American Art Museum, 2013, para. 7).*

In this game, the player guides a gust of wind around a pastoral landscape. When it comes in contact with certain flowers, it collects petals that get swept up into the breeze, eventually creating a long, fluttering trail of multicolored flower petals. When all of the flower petals in a certain area are collected, the landscape evolves by becoming more beautiful. Sometimes entire gardens of flowers explode into bloom, other times Stonehenge-like rock formations appear and shift alignment. All of these events, from successfully collecting flower petals, to triggering the landscape-changing events, are all synchronized with the light, tinkling musical soundtrack. The participants filled in their SAM charts at three different points in the gameplay: at the beginning of level one (T1); midway through level one (T2); and at the end of level two (T3) (Figure 8.3).

Participants described their emotional reactions to *Flower*, as follows:

> *F63*
>
> *"The game itself was monotonous except for one scene. The flower petals that were wanted in a circle bloomed all at once with a comfortable sound like bells, and they changed into a colorful flower garden after being picked up. It was fresh for me. On the other hand, I expected something beyond any expectations would happen in this peaceful game. Eventually nothing happened. It made me feel relieved and less satisfied. I have mixed feelings about it and I felt ambivalent."*
>
> *F64*
>
> *"I felt peaceful and relaxed looking at the pictures, just like watching TV. I wasn't interested in handling the controller to join the game."*
>
> *F65*
>
> *"Just healing. After "The Last of Us", "Flower" had the effect of relaxing our stress and strains. I felt comfortable."*
>
> *M33*
>
> *"I felt excited when I controlled it, and felt refreshed because the story of "The last of us" was a little dark and sad. But this game is simple and easy, no zombies, nobody dies in it. As I said before, I think I would get bored with this game."*



Note: The size of the bubble relates to the *dominance* scale (small=dependent and big=independent).

Figure 8.3 Participants' emotional reactions to *Flower*.

Grand Theft Auto V

Grand Theft Auto V is the fifth installment of a long-running and extremely popular series of video games that is also highly controversial. Most of the controversy stems from the fact that many in-game activities are illegal and antisocial, such as robbery, murder, drug-dealing, and kidnapping, to name a few. As is *The Last of Us*, this game is played in the third person perspective and it allows players to switch between three characters: a retired robber in the federal witness protection plan, a young and ambitious thief just starting out, and an older, mentally unstable military veteran with a penchant for violence.

The graphics in this game are very realistic and the environment changes automatically; the time cycles from night to day, and unpredictable weather occurs. The location in which this game takes place is a massive, sprawling island that is an amalgamation of several locations in California, including Los Angeles, San Francisco, beaches, mountains, and deserts. This combination of location and environmental changes allows for some very beautiful scenes to be created unexpectedly.

The game does have a narrative structure that allows the player to take part in several daring and increasingly complex heists. However, arguably, the most popular element of this game is the fact that it is also a so-called

"open-world game." This means that a player is not confined to the linear narrative structure that is presented in a more cinematic game, such as *The Last of Us*; if they choose not to pursue the story, they are free to explore the extensive game world and interact with it in any way that they choose. Some of the unscripted, non-narrative activities that are available to players include, but by no means are limited to, hiking, skydiving, yoga, scuba diving, racing jet skis, attending flight school, playing golf, watching short films in the cinema, shopping for clothes, visiting the hair salon, investing in the stock market, and purchasing real estate.

For this, the first game of the second session, the participants were informed of the game's violent and antisocial content, but were told that they would not be following any of the story missions. Instead, they would explore the open-world activities of their choosing. They were shown a map of the large island and offered a list of potential activities. They were also told that they should try to avoid engaging in illegal activity to the best of their ability, but not to worry if they did so.

The first activity that they decided to pursue was skydiving. They spent a long time enjoying flying a fighter jet around the island, but unfortunately, before they were able to successfully eject and parachute safely to the ground, the player controlling the jet crashed (T1). From there, they stole a car and drove through a ramshackle town in the desert. The game offers a selection of several radio stations to listen to while driving. When a player steals a car, the radio station is set to the previous drivers' preference. In this case, because the original owner of the storm car was from a rural desert town, the radio was tuned to a country/western station. When the participants were shown how to change the music, they declined to do so, because they thought that the music suited the type of car and the environment they were driving through.

After that, they decided that they wanted to try racing jet skis. They drove to the east coast of the island and paused to take in the view from the highlands overlooking the ocean and the mountain range behind them (T2). When they arrived at the beach, the player in control was able to ride a jet ski around in the surf. After a while of riding, she noticed that there was a sailboat anchored off in the distance and wondered aloud if she could possibly steal it. She was hesitant to do so because she said she had never stolen anything in her life, but her fellow participants encouraged her to try. She pulled the jet ski alongside the sailboat and boarded it successfully. As she set off in her newly commandeered boat, she looked around at the beautiful purple sunset reflecting off of the ocean waves as the sun dipped below the mountain range to the west (T3) (Figure 8.4).

Participants described their emotional reactions to *Grand Theft Auto V*, as follows:

F63

"I became a vandal, so I stole the yacht. This game allowed me to vandalize anything as I like. People and animals weren't in the game. I could play the game without caring about it becoming a story of bloodshed. This game is evoked my girlhood, when I had liked exploring unknown places and doing little adventures near my house like boys."

F64

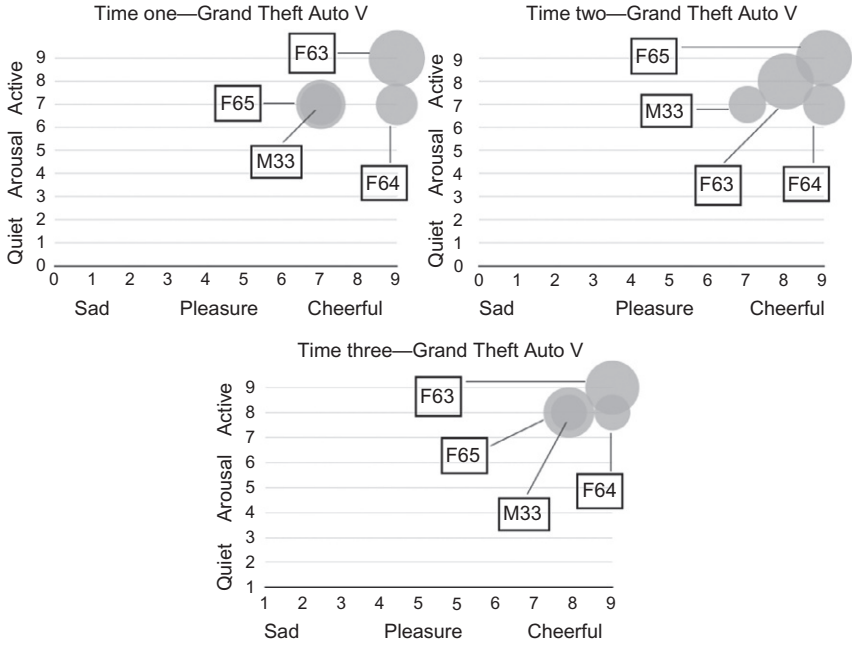
"I was overwhelmed by so many choices. And it was fun to try anything I wouldn't experience in everyday life."

F65

"I became a little violent and wild. I think even in a wild scene, we can recover from the stresses of the day."

M33

"As I said when I played it, it was fresh for me to play this game without bad things and criminals. I think the topic of this game is not suitable for kids. But I like the flexibility of this game."



Note: The size of the bubble relates to the *dominance* scale (small=dependent and big=independent).

Figure 8.4 Participants' emotional reactions to *Grand Theft Auto V*.

Katamari Forever

Katamari Forever was the second game in the second session and a tonal departure from *Grand Theft Auto V*. The music is quirky and the visual design is cartoonish and a little childish. There is very little narrative to speak of in this game. The gameplay is straightforward and simple, with little variation as players progress through the levels.

Again, this game is played in the third person perspective. The player controls a small character, roughly 2 cm tall. This character rolls a small ball in front of him as he walks around a particular space; the first level is the living room in a small Japanese-style apartment. If the ball comes in contact with something smaller than itself, that object becomes adhered to the ball and it grows bigger in size; if it bumps into an object larger than itself, some of the previously adhered objects may be knocked off, consequently making the ball smaller. In practice, this means that when the player first begins pushing the ball around on the floor of the apartment, they can only pick up objects, such as thumbtacks and coins (T1). As the ball of collected items grows larger and larger, the player can begin to pick up things, such as house cats, cups, television remote controls, and so on. The second level that was played by the participants started in a toy store (T2). Once the ball reaches a certain diameter, the player is able to leave the toy store and continue outside to collect larger and larger items, such as bicycles, cars, and even buildings (T3). The participants were able to skip to the ninth level, wherein, by the time limit, they were able to make their ball of collected items reach 17 meters in diameter (T4) (Figure 8.5).

Participants described their emotional reactions to *Katamari Forever*, as follows:

F63

"Even if I had dealt with the controller well, I could've had a feeling of a giant who lived in a toy country. The game itself was simple. I didn't feel something to be able to expand the game. I would like to know what would happen at the ending."

F64

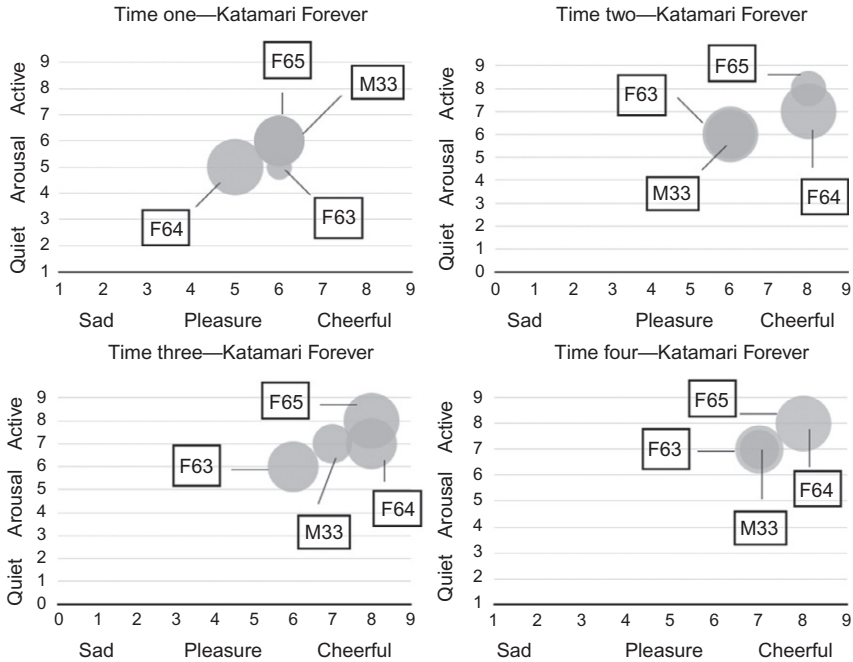
"This simple game made me feel relaxed, free from stress. But soon I became tired of handling the controller."

F65

"It's fun and good for refreshment. Collecting objects makes us happy because we don't have much space at home."

M33

"I know this game and I played other ones in the series. I could enjoy playing this game, but I think I needed more time to enjoy it more. I think this game probably has a climax, the most interesting point, when I can manage to do what I had not done before."



Note: The size of the bubble relates to the *dominance* scale (small=dependent and big=independent).

Figure 8.5 Participants' emotional reactions to *Katamari Forever.*

The Walking Dead

The Walking Dead was the only game played in the third session. It is based on Robert Kirkman's popular comic book series of the same name and it has been critically acclaimed, winning over 90 "Game of the Year Awards" (Shaw-Williams, 2014). At first glance, it may seem to be similar to *The Last of Us* because of the central role that zombies play, but the experience is quite different. *The Walking Dead* is a narratively focused, episodic game. While there are definitely some scenes where the players need to react quickly to avoid being eaten by zombies, that action is not the central part of the gaming experience. Instead, the game focuses primarily on character development and the interpersonal relationships between the various characters with whom the protagonists interact.

The player is faced with many difficult choices, and they are often given the option of selecting one of several different replies to a conversational prompt from another character. There is a limited amount of time in which the player can choose the best reaction. Once decided, that choice affects how the story progresses. The player choice can affect

who lives and dies, who receives limited resources, and which characters become close friends and which become enemies. Some of the choices have far-reaching effects that continued even to the sequel that was released in 2013. Because of the difficulty of some of the language and its speed, the game was played with subtitles on and the participants were able to pause the game to discuss (in English) the merits and demerits of various replies.

The story opens with a convicted murderer, Lee, in the back of a police car being escorted to his first day in prison (T1). He never makes it to the prison because of the outbreak of a zombie pandemic. After narrowly avoiding death three times, Lee meets a young girl, Clementine, whose parents were out of town at the beginning of the outbreak. Lee has reason to believe that her parents were no longer alive because of a series of voicemail messages that they had left on their home's answering machine the previous evening (T2). When Clementine asks Lee about her parents, the player is faced with the choice of being brutally honest with her or telling a placating lie.

Lee takes Clementine under his wing and promises to protect the orphan. The pair eventually make their way to a farm where they meet other survivors and talk to them about their experiences (T3). Unfortunately, the farm is later overrun with zombies and only certain members of the group survive the attack, depending on the player's choices (T4) (Figure 8.6).

Participants describe their emotional reactions to *The Walking Dead*:

F63

"This game required instant skills to read the subtitles and choose one answer from them. I didn't have enough English skills to do it well. It interested me that I could make the story by depending on my choice. I felt like I peeked into a powerful virtual world through this video game."

F64

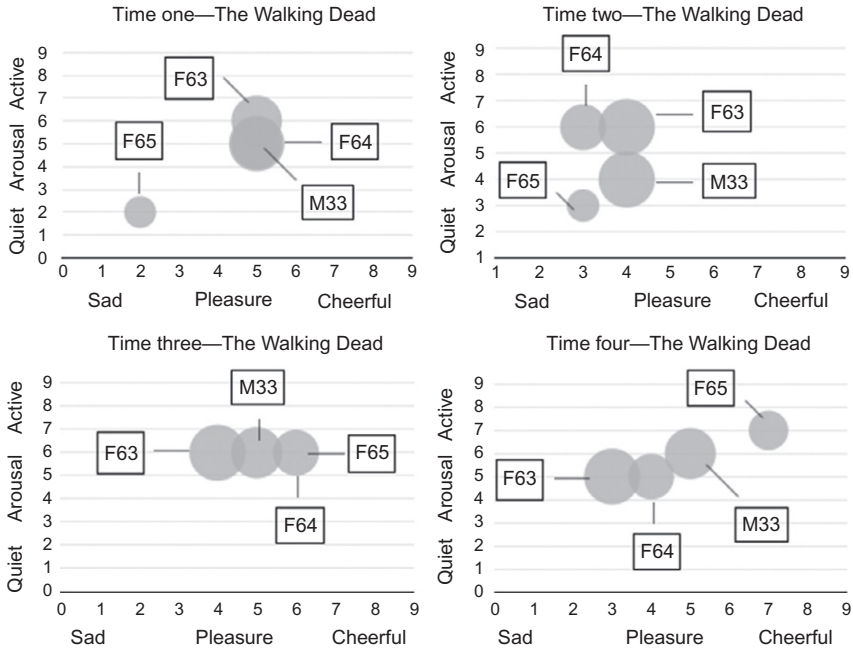
"This game was the most difficult one, requiring skills and quick decisions. It was hard for me to guess the intentions of each character and choose one answer from the various options."

F65

"With option buttons (to choose different answers) it was more exciting than "The Last of Us." I enjoyed the feeling of escape and attack."

M33

"[Because of the subtitles,] I felt as if I was reading read a book at first. But the question of characters and how to reply to them were difficult and complex; all choices were reasonable. And the time to choose was limited, that made me feel a sense of reality."



Note: The size of the bubble relates to the *dominance* scale (small=dependent and big=independent).

Figure 8.6 Participants' emotional reactions to *The Walking Dead*.

DISCUSSION

The research question that framed this present case study asked: *Within the context of EFL, how do various popular COTS video games influence the affective states of adult life-long learner participants (both players and observers) who have little to no interest in or experience with video games?* The authors hypothesized that the participants would have strong negative emotional reactions to the video games that depicted violence and/or criminal activity. Conversely, they predicted that the participants would have strong positive emotional reactions to the more peaceful, artistic video games. Surprisingly, on both counts, the results of the case study did not support this hypothesis.

One of the benefits of conducting a case study is that qualitative data can provide rich descriptions of complex, dynamic phenomena (van Geert & Steenbeek, 2008) that may get lost in the parsing that is necessary for the collection of quantitative data (Patton, 1975; Sofaer, 1999). One clear example of this is F63's reaction to her theft of the sailboat while playing *Grand Theft Auto V*; she had a potent mix of excitement, giddiness, and guilt about "becoming a vandal," all things that may be able to be identified and

quantified through physiological measures. However, it is fascinating to see the connections that she is able to draw from the experience. This experience evoked memories of her childhood when she was an adventurous tomboy who was probably engaged in a little minor naughtiness from time to time. This would seem to indicate that her emotional state was linking to previously held memories (Buchanan, 2007; Lewis et al., 2005).

Looking at the SAM data from when this event occurred (T4), it is clear that this was one of the most positive, active, and independent sets of emotional scores that was recorded across all four participants in the entire study. From our observation of that point in time, it was clear that this emotional reaction was not solely "emanating from" the game. There was definitely a social-emotional component that was occurring. The interplay between F63 (who had the controller) and the remaining three participants was a lively, laugh-filled exchange. She was intrigued by the possibility of committing the virtual crime, but reluctant to do so; the other participants gleefully egged her on.

She talked about this event a number of times after the study was completed, not only in the official follow-up questionnaire. Although it may be difficult to single out one particular source for this enhanced memory (the beautiful sunset, the naughty behavior, the playful interaction among peers, etc.), together they certainly created an environment that made a lasting impression on her. This was an unexpected outcome. The researchers had not predicted that a controversial and violent game, such as *Grand Theft Auto V* would have such positive resonance with a group of Japanese grandmothers (and M33, too of course).

An interesting theme that surfaced in the filmed focus group discussions was the positive effect of encouraging and energizing failure states (McGonigal, 2011; Sykes & Reinhardt, 2013). All of the participants mentioned the energizing failure states' phenomenon repeatedly. They pointed to the experiences of crashing an airplane and colliding their car with a freight train in *Grand Theft Auto V* as extremely positive and arousing events. At one point during the gameplay session with *The Last of Us*, the avatar was overtaken by the aggressive zombies and killed, which then required the scene to be replayed. Rather than having a negative or discouraging effect, the participants agreed that the graphic and gruesome failure actually was positive and very arousing. They stated that it was quite a different experience from watching a typical movie where the protagonist's safety is almost always assured. Knowing that an unpleasant failure awaited unsuccessful players increased their emotional connection to the avatar and his experiences.

Another point that surfaced in the analysis of this data is that, while there are overarching similarities in the emotional trends at different points in time in the gameplay (demonstrated by the clustering of data points within the bubble charts), there is still considerable individual variability in many of the examined points in time. As Harvard university professor, Todd Rose (Rose & Ellison, 2013) declares, "modern neuroscience has since confirmed this wisdom, establishing that there's simply no such thing as an 'average' brain. Each, instead, provides a unique way of perceiving and reacting to the world" (p. 65). An experience that one person might find calming and relaxing (such as F64's reaction to playing *Flower*), could be monotonous and boring to a different person (as for F63). Teachers should bear this in mind when attempting to incorporate emotional content into their classes. They should keep a keen eye on their students' reactions and also track them through feedback from the students.

In order to improve external validity of this case study, it is necessary to develop an analytic generalization of the results. This can be in the form of a conceptually higher-level lesson learned or working hypothesis (Yin, 2013). In light of the data collected and the above discussion, the following analytic generalization has been synthesized. *Commercially and critically successful COTS video games, particularly ones rated "mature," can be highly emotionally evocative for adult life-long learner participants (both players and observers) who have little to no interest in or experience with video games; therefore, they demonstrate the potential for effective use in language learning.*

CONCLUSION

Godwin-Jones (2014) and Squire (2007) both caution people not to make sweeping generalizations about video games. The differences in genre, complexity, rating, interface, connectivity, social interaction, and narrative, make such generalizations nearly impossible. When selecting games for inclusion in education, these are some of the factors that must be considered (Sykes & Reinhardt, 2013, Appendix 2).

The present case study did not focus on the pedagogical applications of video games. Instead, it was more interested in exploring how a wide variety of different commercially and critically successful COTS video games would emotionally stimulate a group of adult life-long learners who had previously had very little to no experience playing video games.

Of course, the larger goal for teachers is to think about how these games can be moved into aiding the pursuit of second-language learning. Although

there are certainly games that can be used as stand-alone educational tools, it may be preferable to look at these COTS video games as working within an ecosystem of competing and complementary theoretical paradigms. They are tools, much in the same way that books or films may be used in many different ways to supplement a particular curriculum (Squire, 2007). Sometimes they can be used for individual, self-directed learning, while at other times they act as support within the larger structure of curricular learning activities. For example, in one setting, a video game could aid the development of metacognitive skills under a cognitivism paradigmatic approach; in a different setting, a video game could be used as the centerpiece around which students could work together to develop their knowledge of a particular topic within a social-constructivist paradigm.

Researchers and pragmatic educators should eclectically and liberally borrow from several different educational approaches and learning theories, including behaviorism, cognitivism, and social-constructivism. They should be promiscuous in their acceptance of different theories and should only be limited by what they find to be effective in their day-to-day interactions with their students. The practice of teaching and learning a language is a complex dynamic system and therefore, the condition of superposition (the existence of multiple, seemingly conflicting theories, explanation, or approaches) should be expected and welcomed (van Geert & Steenbeek, 2008). The measurement of the value of a learning theory is in its application in real-world classrooms. Within the context of this chapter, namely neuroscience, affect, and language learning, it appears that commercially and critically successful COTS games can be used as a source of emotion and the teacher's responsibility should be to construct pedagogically sound learning activities around them (Arnseth, 2006; Reinders, 2009; Squire, 2002; Sykes & Reinhardt, 2013).

APPENDIX

Pre-gameplay Survey Questions

Name: Age (optional):

1. Have you ever played video games?
2. If yes, how often do you play them? What games and systems have you played? If no, why not?
3. Which forms of entertainment (i.e., books, poetry, opera, ballet, etc.) do you think are the most emotionally powerful? Please give some personal examples.

4. What makes those forms of entertainment so emotionally powerful?
5. Do you think that video games can be emotionally powerful? Why or why not?
6. Do you think that video games can be effectively used in language learning? Why or why not?

Post-gameplay Follow-up Survey Questions

(1) Please describe your **emotional reactions** to the following games:
- **A.** "*The Last of Us*" (father and daughter at the beginning of a zombie outbreak)
- **B.** "*Flower*" (controlling the wind and picking up flower petals)
- **C.** "*Grand Theft Auto 5*" (open-world game with flying, driving, and jet skis)
- **D.** "*Katamari Forever*" (rolling a ball around to collect objects)
- **E.** "*The Walking Dead*" (zombie game where you choose different answers to conversations).

(2) Did your opinion of video games change after trying these games? If so, how did it change?

(3) How do you think the emotional impact of video games compares to the emotional impact of other entertainment (ie. music, books, movies, plays, opera, etc.)?

(4) Based on your experience of these games, do you think that video games could be used in language education?

(5) Do you think that the emotional content of the games that we played helped you to remember the English that we used when we played and discussed those games?

(6) Are there any limitations or negative aspects of using video games in language learning?

(7) Do you have any other questions or comments regarding this research, or about video games in language learning or about emotions and video games?

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SECTION III

Emotional Affordances, Videogames, and Learning

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CHAPTER 9

Affect During Instructional Video Game Learning: Story's Potential Role

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GAMES, EMOTIONS, AND LEARNING: THE STORY'S ROLE IN ALL THREE

In order to examine the links between games, emotion, and learning, it is important to establish the links between the three. The links between games, emotions, and learning have been described by both researchers in this volume, researchers in other fields (Light, 2003), and industry professionals (Lazzaro, 2004). In addition to links between games, emotions, and learning, there have also been other researchers, who in making the case for using games for learning, have discussed the positive effect that children feel in playing games (Gee, 2003; Prensky, 2007; Shaffer, 2006). Arguments made by these authors further reinforce the idea that the three are interrelated. While one may immediately associate video games with positive effect, increased heart-rate, and plain joy, video games have also been linked to negative emotions. For example, researchers have concluded that awarding violent behaviors in a game context (versus punishing or doing nothing) increased the amount of hostile emotion that players experience (Carnagey & Anderson, 2005). With the previous authors discussing an increase in negative emotions, and the mainstream notion that games produce or increase positive emotions, one may conclude that video games often amplify player emotions. Nonetheless, other researchers have found that people who play violent games have a greater capacity to *suppress* their emotions. These researchers further argue that when players suppress their emotions, such as fear, it helps those players make decisions (Weber, Ritterfeld, & Mathiak, 2006). The debate or discussion on when video games increase or suppress emotions is outside the scope of this chapter; rather, the research presented so far is meant to highlight the strong link between playing games and emotions. Carnagey & Anderson's research also provides support for a link

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between a game's design and the emotions that the game produces. In their study, rewarding players in the game who exhibited violent behaviors, had profound effects on player's emotions (2005). Carnagey & Anderson's findings support the idea that the types of structures and design decisions that are introduced in games can impact the emotions that players can experience. These emotions, in turn, may influence what students learn.

With literature reviews discussing both positive and negative emotional effects related to playing video games (Barlett, Anderson, & Swing, 2009), one may wonder how story fits in. In my analysis, I have only found a few research studies which discuss the role of "story" in games, as having an impact on learning (Habgood & Ainsworth, 2011; Habgood, Ainsworth, & Benford, 2005) and motivation (Malone, 1981; Parker & Lepper, 1992). With research on the link between story and games still in its infancy, it is prudent to look at a mature field of study that has found ties between emotions, learning, and stories via another mass-medium— television. This field is called *Entertainment-Education* or *E-E*. Entertainment-education is broadly defined as "the intentional placement of educational content in entertainment messages" (Singhal & Rogers, 2002, p. 117). The field and its shows have been successful enough that television producers from around the world now leverage a heavily developed model for producing mass-media dramas with social justice messages in their respective countries (Nariman, 1993). In examining the shows produced, researchers have called the field to look at the communication of affect, feelings, and emotions that occurs between the medium and its audience (Singhal & Rogers, 2002). It is the hope of the authors and researchers in this field to more closely understand this link in order for, e.g., soap operas to have a stronger effect on individuals. Entertainment-Education's continuous study of story and the success that has been documented by the use of soap operas to help change public ideals provides support for the role that the story may have not only in the medium of television, but also in games.

Based on the evidence found in the field of E-E, it seemed important to understand the role that story has in making games that entertain and educate. In looking further at the research around story, the use of stories has been shown by researchers to help students remember information more effectively (Black & Bower, 1980; Mandler & Johnson, 1977), which one can argue, would help individuals learn the information. If story is allowing individuals to recall the information, then it is more likely they will be able to understand and apply it in the correct situations. These links between stories and intelligence follow from that which artificial intelligence and cognitive

psychology pioneer Roger Schank and his colleagues have written, about stories being essentially scripts, which can help individuals organize new information into previously stored knowledge (Schank & Abelson, 1975). Schank and his colleagues have gone as far as to write that intelligence (even for computers) is really about being able to retrieve and tell an entertaining and apposite story (Schank & Morson, 1995). In addition to the educational benefits, story has also been linked to emotion as alluded by Roger Schank and colleagues as well, who stated that people are "naturally predisposed to hear, remember, and to tell stories." (Schank & Morson, 1995, p. 243) Other researchers have documented that the arousal, which stems from stories and their plot-twists (Bryant & Miron, 2003), may be instrumental in transforming stories into an enjoyable experience, which directly ties to their emotions. Nonetheless, much of the literature surrounding the effects of story discusses how stories are a tool that can be used to persuade individuals (Fazio & Zanna, 1981; Green & Brock, 2000). In fact, stories are seen as such a strong persuasive tool that researchers have compared stories to statistical information to examine which medium is a more powerful form of evidence to the public, with literature reviews on the topic being unclear as to which format was more persuasive (Allen & Preiss, 1997; Reinard, 1988; Taylor & Thompson, 1982). The mixed findings provide support for the notion that stories are at least as formidable as statistics in persuading individuals.

While the topic of persuasion may seem to be orthogonal to emotions and learning, I believe that it may be a central component to both. Persuasion theories have proposed that emotions can play a big part in persuading individuals (Mackie & Worth, 1989; Petty & Cacioppo, 1986). For example, Petty & Cacioppo's Elaboration Likelihood Model states that the easier of the two routes of persuasion is to persuade someone by appealing to their emotions (1986). Persuasion is also linked to learning, since one can argue that one must learn information or an idea before one can be persuaded by that idea (Hovland, Janis, & Kelley, 1953), or at the very least recognize the existence of a complex relationship between learning and persuasion (Greenwald, Albert, Cullen, Love, & Have, 1968).

While games have been shown to provide a variety of emotions, including fear, sadness, and laughter, in this chapter, I concentrate on reporting the positive emotions expressed by the students, which I describe as "fun." Researchers have argued that fun can be an outcome of a wide range of emotions (Desmet, 2005). The point of the chapter is not to describe in detail the emotions but rather to describe how the design decisions made in one educational game around story seem to have impacted on the emotions and

learning experienced by the students. In this chapter, I have used the word "fun" to describe the state of high arousal actions and utterances related to positive affect both displayed and self-reported by students. Fun, as an experience for players, is an important factor linked to learning because it could lead both to a more positive affect and more engagement and motivation (Plass et al., 2010; Read, MacFarlane, & Casey, 2002; Slater & Rouner, 2002), so it will be used throughout this chapter to describe player's experiences with the game.

TUG-OF-WAR, A CARD GAME DESIGNED TO TEACH CHILDREN ABOUT FRACTIONS

While the previous section provided some justification for the possible connection that story may have with both emotions and learning in games, this section is devoted to discussing research, which sought to test that notion by examining the amount of fun and learning that students receive from playing an educational game. This educational game—a computerized card game—helped teach 4th graders about partitive-whole fractions (Hodgen, Küchemann, Brown, & Coe, 2010). Fractions are a difficult concept for students to master in elementary school (Petit, Laird, & Marsden, 2010) and also one of the first topics that causes children to move away from a science, technology, engineering, and math (STEM) pathway (Nunes, 2006). Based on the literature, I hypothesized that the inclusion of a story would make a game more enjoyable for students to play, which in turn would make the game easier for those students to learn.

To investigate the role that story has in learning and emotions, three versions of a card game were developed that only differed on the amounts of story that were provided to students via the gameplay. The three versions of the game were updated from a previous version of a card game that had demonstrated gains on paper and pencil fractions tests (Jimenez, Arena, & Acholonu, 2013). The game versions varied in the amount of story that was embedded in each game (Figure 9.1). The story behind the game is that players are trying to recruit as many people to their side of a tug of war as possible. Once players recruit an initial number of people, they are then given some options to try to increase the number of people on their side, or to reduce the number of people their opponent has. This can be done in the game by playing action cards on their opponent's people or on their own. Mainly, students are deciding between playing a card that will help reduce their opponent's people or restore some of their own players. When

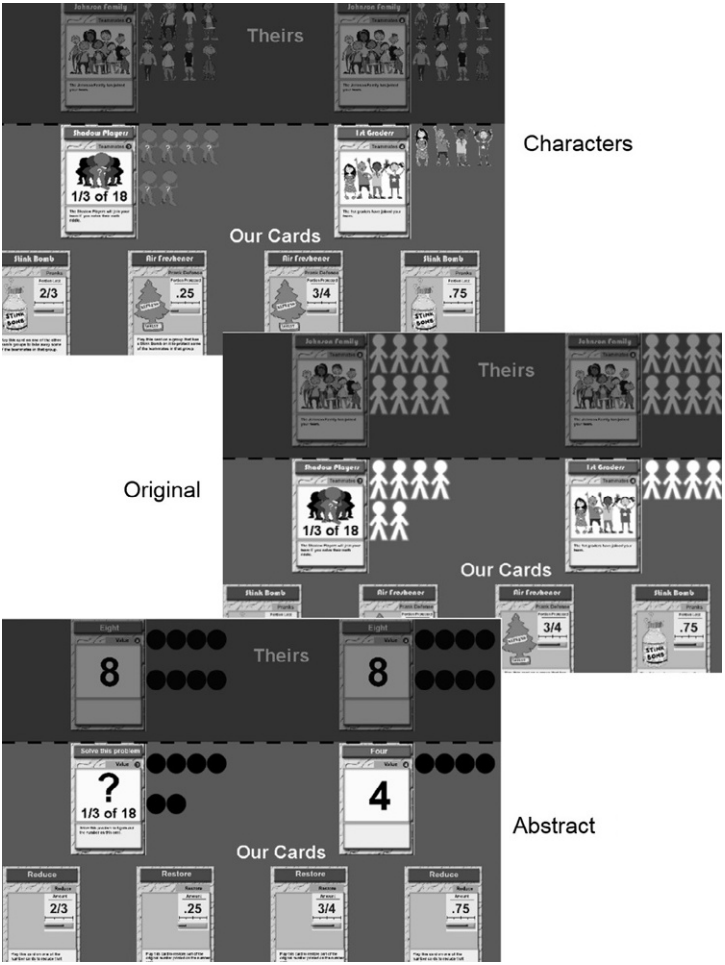

Figure 9.1 The three conditions on the card playing screen: the Characters condition (top), the Original condition (middle) and the Abstract game condition (bottom).

embellishing the game with a story, reducing their opponent's people is done by adding story elements which allow the students to believe that they are reducing their opponent's people by making some of them stinky, and restoring people translates to giving student's own people an air freshener to make them not stinky anymore.

For the experiment, rather than having two versions of the game, one with story and one without, three more nuanced versions were utilized. Most notably, one version, which I call the "Characters" version, had a story embedded into its game, which was made salient by the use of characters.

Another version (the "Abstract" version) was stripped of all notions of story. That is, rather than having action cards that caused their opponent's people to be stinky, students had "reduce" cards, which would reduce the number of dots (instead of people) their opponent had. Figure 9.1 shows the three versions of the game with the same exact cards, with the Original version looking most similar to previous versions of the game, and the Abstract version stripping away all notions of story. In contrast, the Characters version strengthened the game's story, by making the characters more salient to the game. The decision to embellish the story by making the characters more salient was based on previous interviews with children about the game and what they remember about its story. This decision, along with minor improvements made to an earlier version of the game, was based on interviews with children as well as the research literature. After the three variations were built, a study was conducted where students played one of the three versions. In total, 73 4th-grade students from three classrooms were shuffled into these three different conditions. In each condition, children played the game as a pair and played in 1 h segments each week, for 5 weeks. To measure learning, children were given a test before starting their play, and a week after they finished playing. The results of the learning outcomes have been reported; all the conditions saw an overall significant gain from pre- to post-test on their fractions measures, however, no condition displayed a significant overall difference from the other conditions (Jimenez, 2014).

Having briefly discussed the potential role of learning with respect to story in games, the goal of this chapter is to detail the interplay between emotions (via the outcome of fun) and learning with respect to using story in games. To describe this interplay with respect to the study, I will now analyze each condition's ratings of self-reported fun and examine how story impacted both the emotions in the game as well as the learning. To investigate each condition's rating of their enjoyment with the game, a survey was given to students in all conditions that asked them to rate the amount of fun they had playing their version of the game. The survey was adapted from a previous version that was built in helping to measure the amount of fun students had with initial versions of the game, which adapted measures from components described in previous intrinsic motivation work (Harter, 1981, 1982). The survey was subsequently modified to be bilingual in recognizing that certain students in the study preferred Spanish. The changes in language were modeled from the California Healthy Kids Survey (California Department of Education (Safe, Healthy Kids Program Office), WestEd (Health, and Human Development Department) (2012)). After all

of the students played the games for 5 weeks, they were asked to fill out the survey in the same booklet as their post-test, which was 1 week after the last gameplay session.

Two of five items on the survey were used to determine the amount of fun that students had in playing the game. These two items were the statements: "This game was fun" and "This game was boring." These items most directly tied with a student's sense of fun. The other three items "I would want to play this game again," "This game is too hard," and "Sometimes I got frustrated while playing the game," were not used because software glitches and usability issues during the session confounded their utility as measures of fun. A score was built on the two items once the second item was reverse-coded and a one-way ANOVA was performed. Results of the ANOVA suggest a significant difference between scores $F(2, 68) = 4.72$, $p < 0.02$. Comparing the Abstract condition with the Original condition shows no significant difference $t(44) = -1.38$, $p = 0.17$, nonetheless, there is a significant difference between the Characters and Abstract conditions $t(48) = 3.07$, $p < 0.01$, $d = 0.89$, with the Characters condition ($M = 6.46$, $SD = 1.48$) having a higher average rating than both the Original ($M = 5.50$, $SD = 1.99$) and Abstract conditions ($M = 4.65$, $SD = 2.62$). The lower score in the Abstract condition, where children played a game with no story, suggests that students ranked their experience as less fun than students in the Characters condition that had a game with a stronger story.

LINKS BETWEEN FUN AND LEARNING IN THE PRESENCE OF NARRATIVE

The significant difference in the children's ratings of fun seemed to confirm my own observations as well as other researchers, who found that the children in the story conditions seemed to be exhibiting more vocal acts of excitement during the gameplay when compared with the abstract condition. The significant difference here, tied with the non-significant differences in learning, provoked further analysis. Particularly, based on this observation of the children being louder in some conditions, I became interested in examining whether or not fun was related to learning for the students. To do this, I compared how much fun students reported having with their gain in test scores from pre-test to post-test. This comparison was completed by graphing each individual gain from pre-test to post-test with the student's fun rating. Figure 9.2 displays the gains of individual students on the overall fractions test, by condition. The height of each digit

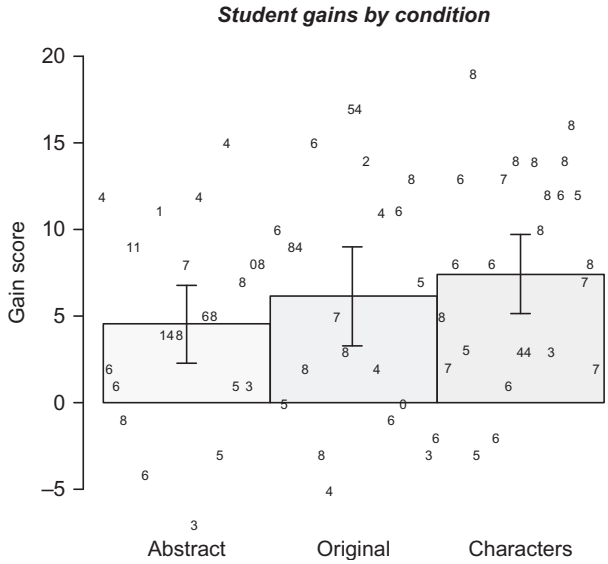

Figure 9.2 Student gain scores by condition. The height of each digit represents the gain score for a particular student, and the digit used represents the student's "fun" score rating.

on the graph represents the gain that a particular student had from pre-test to post-test. The particular digit represented on the graph (0-8) is that individual student's fun score, with 8 being the highest amount of fun that a child could indicate, and 0 indicating that a child did not have fun playing the game at all. Upon initial examination of both graphs, the Characters condition exhibited a pattern of having higher fun scores associated with higher learning gains. Nonetheless, this pattern does not seem apparent in the Abstract or Original conditions.

To analyze this observation further, the correlations between these fun ratings and the gains the students had made, were run. Table 9.1 gives the correlations between these two ratings. Positive correlations would provide evidence that there is a positive association between fun and learning. In a positive correlation, students who reported having more fun would be linked to stronger gains from pre-test to post-test. The correlation table does not display a positive correlation for either the Abstract or the Original

Table 9.1 Correlations of fun ratings with gain scores by condition

	Abstract	Original	Characters
Correlation (*r*) of overall gain with fun	−0.14	−0.08	0.45

conditions, but rather a negative one. Furthermore, the Abstract condition has a stronger correlation than the Original condition, but in the *negative* direction. Nonetheless, the Abstract condition exhibited no significant correlations in the fraction gain scores $z(22) = -0.89$, $p = 0.37$, which suggests there is no association between the gain score and fun rating. Because the Original condition was closer to zero (0) than the Abstract condition, no significance tests were performed.

While the Abstract and Original conditions did not exhibit a correlation, there does seem to be a positive correlation between students' self-reported ratings of fun and the gains that they made from pre-test to post-test in the Characters condition. In fact, the Characters condition exhibits a significant positive correlation between the fun rating and gain score $z(25) = 2.92$, $p < 0.01$, which was not present in the other two conditions.

To describe the relationship between the fun total and overall gain scores, a graph was created that placed individual's fun rating and learning gain on an axis (Figure 9.3). The letters in the graph represent the conditions that each student was in: A for Abstract, O for Original, and C for Characters. In addition to reporting each individual's relationship between their fun

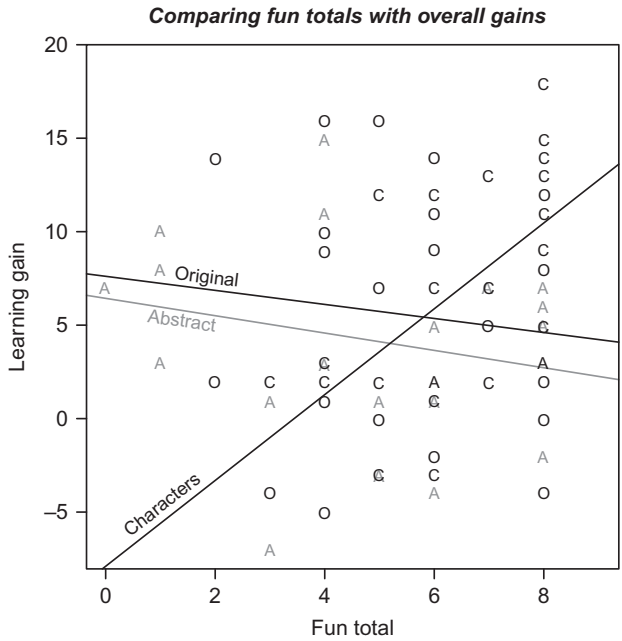

Figure 9.3 Plotting learning gains by the amount of fun that a subject had.

rating and gain scores, Figure 9.3 also provides a visual representation of the aforementioned correlations by condition; the lines drawn in the graph are the regression lines used to predict each condition's association. The fact that there exists a positive correlation in the Characters condition, but no correlation in the other two conditions warrants further review. The next section details a video analysis that was conducted around the two extreme conditions in the study, the Characters condition and the Abstract condition, to examine the gameplay that each condition exhibited and how that could provide insight into the significant correlation between fun and learning present in the condition with the embellished story.

Examining Video

To get a better sense of how the children were interacting with the game, video cameras were used to record four students playing the game against each other in the Abstract group and another four in the Character group, during their last play session. In analyzing the videos, an open coding system was used, watching each video twice. Codes, such as joint problem-solving, teasing, story linking, emotion, pressuring, and helping others, were generated. After having watched the video, immediately striking were the amounts of references made to story elements in the Characters condition that were not being made in the Abstract condition. For example, in the Characters condition, there appeared to be a frequent amount of teasing in the playing groups as to the moves they were going to make. For example, in one instance, two 4th graders, Freddy and Ramon were paired together and played against two other 4th graders, Lalo and Carmen. All four players were in a conversation. Lalo and Carmen had just placed a point-5 air freshener to save some of their players. The following transcript starts with Freddy announcing the card that his opponents Lalo and Carmen had placed to protect their own players:

Freddy—Air Freshener point 5. Whatever we don't really care, we're gonna stink them back
Carmen—Not even
Freddy—Yes we can
Lalo—We still got another air freshener
(Freddy and Lalo play a 1/2 stink bomb on their end)
Ramon—Now pick the yellow one
Carmen—Why do you use that, you're not gonna do that watch, you guys are gonna play the ice cream truck
Lalo—The red one is still fresh.

If we look more closely at the conversation, we see that after announcing or reading the card, Freddy expresses his indifference to the card, and then adds that they are going to "stink them back." At this point, there is a pause for a few seconds before Carmen looks at Freddy and Ramon and then says "Not even," disagreeing with Freddy's statement. Freddy then reiterates the possibility, and Lalo then tells Freddy and Ramon that they still have another air freshener. My interpretation of the first four lines of conversation is that there is some disagreement about what Freddy and Ramon are able to play and whether they could "stink them back." After Freddy and Ramon play the 1/2 stink bomb, Ramon then suggests to Freddy that he should pick the yellow one to be stinky, which I conclude was in reference to picking one of two characters. The character card that this pair is referring to is called *The Twins*. On the "twins" card, there is a drawing of two identical twins: one wearing a red shirt and another wearing a yellow shirt. While the twins were not given any names, it would make sense that the students would use color as a way to reference the characters, which both Ramon and Lalo referenced. Aside from deciding whom to stink and who is fresh, the dialog suggests that Carmen was reasoning about what card she felt her opponents were going to play, providing an example of the students thinking ahead in the game. Nevertheless, what is important from a story standpoint is the reliance that the students have in using the language of the story (air fresheners, stinking, getting people back, determining who is stinky). All four players in this group made mention or referenced elements or language specific to the story conditions that were not a part of the Abstract condition in this short excerpt.

This dialog is one of over 30 instances where these kinds of story referencing speech acts were made. The Characters condition heavily relied on the language during their gameplay, and theoretically, the Abstract condition could have followed the same structure. These students could have talked about how they would reduce and restore their version of people in the tug of war, which were dots. The video for the Abstract condition provides a sample of group interactions and talk references. Nonetheless, most of the video recorded in the Abstract condition suggests a far different reality. Conversations in the Abstract condition were commonly arguments between the individual pairs of students about answers and who had control, something that was rare, if at all present, in the Characters condition. The recordings provided few instances of the four Abstract players using the language in their version of the game. Below are isolated excerpts from the video that could be argued as referencing story elements in the Abstract

condition where two 4th graders, Tito and Hector played against two other 4th graders Angel and Gabriel:

Gabriel (1-9:20)—We're tied right now look—three, six, nine, two, four, six, eight, nine—it's nine on nine (reference to dots)

Gabriel (1-14:25)—Yay! (Giggles) … No—wait! Reduce is over theirs! No! (Reduce card)

Tito/Hector (2-3:28)—Están felices! [They are happy!] (Dots)

Gabriel (2-3:48)—Oh wait—they have more … They won again … Why do they give them more dots than us all the time?

Gabriel (2-8:29)—Put two tokens … look (Two tokens)

Gabriel (2-10:20)—We won! We only got 4 points, oh no 6 points.

Over the 25 min of audio of this group, the six statements made in this segment, along with one more statement, are the only statements arguably related to the referent language structure of the game. Other than one other statement, there were no other mentions of structures related to the game. While this group only had seven references, the group videotaped in the Characters condition had over 30 references to these same elements. For example, in one instance, Freddy teases Lalo and Carmen about a recent move in their gameplay, saying, "You freshened them all and now they're stinky" and then there was giggling. This statement both demonstrates how the students were using the language as well as some of the mild teasing or taunting that was happening in reference to game actions. In another case, after a round was over and Lalo and Carmen won the round, Lalo tells Freddy, "You said you were gonna crush us," to which Freddy quickly replied, "Well yeah, you got the basketball team." In this interaction, Freddy is using the game's language (basketball team) to explain why they could not crush their opponents as he had proclaimed earlier. This also suggests some knowledge of the basketball team card as a powerful card, which was demonstrated at another point in the video, when Freddy states, "ooh the basketball team." These types of additional verbal utterances for powerful cards were not observed at all in the video from the Abstract pod. In fact, there was rarely any sign of emotion other than in-fighting and the example given earlier.

Videos from the two pods provide evidence of the children in the Characters condition being more engaged, more on task, and on the whole, having a better grasp of the rules. While there are a variety of reasons for these differences, I speculate that the teasing between groups would keep the references to the story fresh in the students' minds. The use of the game's story to tease, and the engagement of the individuals in the story to help

them reference what was happening in the game, may possibly explain why a positive correlation between fun and learning existed in the Characters condition. The engagement that students could have with the story and the use of the language to tease their opponents, could have led to a desire to learn more about the game and kept them more involved than they would have been in the Abstract condition. The dialog of the players in the Characters condition (see above) might also help explain why the Characters condition was stronger than the Original condition. In that dialog, there were two separate segments of conversation that exhibited explicit references to which characters were made stinky and which were made fresh, which notes a distinct feature of the Characters condition. Other examples of this type of dialog were also present in the Characters condition, where time was spent by the students discussing and debating who they would stink. One could argue such discussions would not be as salient in other conditions, since all the characters look exactly the same in both the Original and Abstract conditions.

DISCUSSION

The study was to measure the amount of fun students had across conditions. Students who were in the Characters condition had significantly higher ratings of fun than students in the Abstract condition. This suggests that a story seems to make an educational game more fun, which may lead to more engagement and motivation (Plass et al., 2010; Read et al., 2002; Slater & Rouner, 2002) in this fractions context. The evidence around the differences in the reported ratings of fun, along with the video analysis, provides support for the notion that story may have an impact on the emotions that are exhibited in the game.

The other finding of interest was the high correlation present between the amount of fun that the students reported, and the amount that a student's score increased from pre-test to post-test in the one condition. While such a correlation displayed no correlation in the Abstract and Original conditions, the Characters condition exhibited a strong correlation between fun and learning. Therefore, the results reveal a strong positive association between the amount of fun a Characters condition student had and the amount that they learned. One possible speculation for this comes from previous research done on transportation (Green & Brock, 2000). That research highlighted that the amount a student was absorbed in a narrative would affect the amount they were persuaded by such a narrative. Green & Brock's research

may be one way to explain the high correlation—students who enjoyed and were more absorbed by the story were more persuaded and thus more motivated to learn the material.

The results from the video data also support the idea that students who enjoyed the game in the Characters condition would be more likely to learn. Transcripts and video exhibit the amount of chatter about the story that certain students made (e.g., Freddy, who was discussed earlier). Freddy displayed some utterances and phrases that related elements of the story to the gameplay as the group was playing. The amount of talk that Freddy displayed linking the story to the game was high. Not surprisingly, Freddy also had a high gain score from pre- to post- and rated the game with the highest possible fun score. Because of the amount of dialog that Freddy used in the game about the story, Freddy seemed absorbed in the story, which could then lead him to have more fun with the game, and be persuaded to think about and focus on the game's pedagogical content. If a child is having fun, then he or she may be more likely to learn the material. When children play educational games, they can choose whether or not to pay attention to the educational message. If they become absorbed in the story, which leads them to have more fun, research on story contends that they would be more open to learning the material or having a more open view on the game itself (Koenig & Zorn, 2002; Sunwolf & Frey, 2001). The findings here tie not only to that research, but to Green & Brock's work, which details the amount that one is willing to be absorbed dictates how much they will be persuaded (2000). The difference between Green & Brock's study and these findings is that rather than being persuaded by the story's message; it appeared that being absorbed in the story persuaded the students to learn the material, which aligns with the previous research presented on how stories help people not only remember (Black & Bower, 1980; Mandler & Johnson, 1977) but also incorporate information into their personal memory structures (Schank & Morson, 1995).

CONCLUSION

The study's finding conclude that story has an impact on emotions and learning, as evidenced by the three different versions of the game, and the correlations between fun and gains shown by students in the one condition. The way that the game Tug-of-War was created has impacted the emotions, the students experienced. Furthermore, the positive correlation between fun and learning in one game version has implications for future game designers

in thinking carefully about the decisions they make and the possible emotions that they are promoting. While this study demonstrates an interesting link between fun and learning that seems to be facilitated by story, more research needs to be done to help make sense of the difference, so that we can better understand how emotions that students experience while playing different versions of the game may impact their learning.

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CHAPTER 10

Social-Emotional Learning Opportunities in Online Games for Preschoolers

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INTRODUCTION

Television programming for children has a history of not only entertaining but also trying to educate children. With new forms of children's digital media emerging, there is an effort to provide more educational content and most recently, an emphasis placed on social-emotional development. Social-emotional learning is becoming a priority in the planning and goal-setting process of large networks. Sesame Workshop, for example, has incorporated emotions and emotional coping into its curricular goals (Wilson, 2008); Disney Junior has stated that social-emotional development is as much of a priority as cognitive skills enhancement (Press Release, 2010); and Nick Jr. devotes a lot of transmedia resources to preschoolers' social-emotional skills. This spike of interest is not surprising, as according to research, social-emotional development contributes to various areas of well-being: from life satisfaction, mental and physical health, to academic achievement and employment success (e.g., Austin, Saklofske, & Egan, 2005; Brackett, Rivers, & Salovey, 2011; Payton et al., 2000).

As more and more children interact with digital media, it is important to identify the components that might support greater social-emotional development. Currently, it is unclear whether children's media content equally focuses on various social-emotional needs, or whether some skills are more targeted than others. Further, little is known about the intensity or superficiality of social-emotional skills offered through digital media. Looking at preschool online games offered on three major networks, this study assessed the breadth of social-emotional skills addressed and the level of complexity of the presentation and learning provided by these online games. Data are drawn from a larger study of the educational affordances and developmental

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appropriateness of online games designed for preschool-aged children. Before presenting the study details, we begin with an overview of various social-emotional skills and their importance. Then we cover the study design and learning affordances assessment tool, and finally discuss the frequency, developmental complexity, and methods of presenting specific social-emotional skills in preschool online games across three major networks. Enhancement of social-emotional skills is a goal of many providers of online games for preschoolers, however, the actual opportunities for development of these skills is yet to be tested.

WHAT IS SOCIAL-EMOTIONAL DEVELOPMENT?

Social-emotional development is a multidimensional construct that includes a number of inter- and intra-personal processes related to the acquisition of fundamental social-emotional competencies, such as: the ability to understand, recognize, and label one's own and others' emotions; appropriately express, control, and regulate one's own feelings and behaviors; effectively establish, maintain, and manage social relationships; and make responsible choices and decisions (Cohen, Onunaku, Clothier, & Poppe, 2005; Hoffman, 2009). Researchers describe five core dimensions of social-emotional development in children: (1) self-awareness that manifests itself in the ability to identify and describe one's feelings, desires, and intentions; (2) self-management or ability to reflect, introspect and regulate one's emotions; (3) social-awareness and capacities to recognize, empathize, and respond appropriately to the feelings of others; (4) relationship skills to interact effectively and establish and maintain relationships with others; and (5) responsible decision-making, based on careful analysis of information (Collaborative for Academic Social, and Emotional Learning, 2005).

CORRELATES AND OUTCOMES

Social-emotional development is important in its own right and in relation to cognitive development. Researchers find that children's academic success is often predicted by positive child–teacher interactions, positive representations of self, emotion knowledge, emotion regulatory abilities, social skills, and peer inclusion (Denham, McKinley, Couchoud, & Holt, 1990; Zins, Bloodworth, Weissberg, & Walberg, 2007). As children are able to recognize and regulate their own emotions, identify the feelings of others, select responses to others that are appropriate, and engage in ways that

facilitate social relationships, they are better able to—develop friendships; gain popularity (Denham, 2007); work cooperatively; sustain attention to a task; exhibit empathetic behaviors (Blair & Razza, 2007); follow directions; communicate their own wishes and desires (Bodrova & Leong, 2008); achieve higher scores on standardized assessment tests (Malecki & Elliott, 2002); and be less at-risk for problems of aggression and anxiety disorders (Greenberg, Domitrovich, & Bumbarger, 2001).

Emotionally competent children, that is, children who are able to feel and express emotions appropriately, are consistently rated as more prosocial by their teachers, and are more liked by their peers (Denham, 2007). Students, who start kindergarten with better social-emotional skills successfully and quickly adjust to the new environment, develop positive attitudes about school, and receive better grades than their peers with less advanced social-emotional skills (Blair, Denham, Kochanoff, & Whipple, 2004). Research has found that first-graders' social skills predict literacy achievement (Miles & Stipek, 2006) and children's social-emotional skills at the age of 8 years predict marital quality at the age of 36 years (Kinnunen, & Pulkkinen, 2003).

Children's deficits in the social-emotional domains, on the other hand, present a risk for psychopathology and academic failure, both short-and long-term. For example, preschoolers who are low in emotional knowledge have a harder time making friends at school (Arsenio, Cooperman, & Lover, 2000), and aggressive kindergarteners are at-risk for academic difficulties (Miles & Stipek, 2006).

SOCIAL-EMOTIONAL DEVELOPMENT IN THE EARLY YEARS

Social-emotional development begins very early in life, as infants demonstrate basic emotions and react differently to the emotions of caregivers (Denham, Wyatt, Bassett, Echeverria, & Knox, 2009). From a very young age, children take an interest in people, crave personal attention, participate in coordinated interactions, and acquire some emotion-regulation by learning to self-sooth with the help of trusted adults. Young toddlers tap into social relations by participating in group play and playing alongside their peers. They also expand on emotional knowledge by discriminating "good" and "bad" emotions, and widening the repertoire of expressive emotions, such as guilt, shame, and empathy. Children's social-emotional development rockets during preschool years, when they develop and master Theory of Mind, begin to express "blended" emotions, understand expressions and

situations of basic emotions, and exhibit more independent emotion regulation (Denham et al., 2009). Social-emotional skills continue to develop as children mature, with greater perspective-taking skills and understanding of emotional complexity, children begin to form more intimate and stable relationships, acquire various cognitive strategies to regulate emotions, assert themselves in socially-acceptable ways, and learn to navigate and balance relations with parents and peers (Denham et al., 2009).

PREDICTORS OF DEVELOPMENT

Social-emotional skills develop in a context through interactions with others, exposure to various social situations, the need to build relationships with peers and adults, and the ability to observe and emulate others. Close adults, such as parents, caregivers, and teachers play a crucial role in young children's healthy social-emotional development. Researchers have found associations among children's social-emotional skills and parental discussions of mental states, having child-aged siblings, socioeconomic status, preschool quality, parenting styles, media exposure, and history of deprivation (Kochanska, Kim, Boldt, & Nordling, 2013; Mar, Tackett, & Moore, 2010; Nathanson, Sharp, Aladé, Rasmussen & Christy, 2013).

One interesting and rapidly expanding context is digital media. Modern children are born into and are growing up in a world saturated with digital media, which can shape their social, emotional, cognitive, and even physical development (Blumberg & Fisch, 2013; Ito, 2009). Many adults view technology as a way to support and promote children's development (Ito, 2009) and believe that internet helps their children learn (Tezer, 2013). Others express concern that digital media is supplanting face-to-face interactions. For example, the author of a *Wall Street Journal* article, "Why Gen-Y Johnny Can't Read Nonverbal Cues" (Baurlein, 2009) expressed fear that children are losing opportunities to read verbal and non-verbal cues and thus are less socially and emotionally competent.

Parents from different socioeconomic status (SES) and cultural backgrounds allow their children to engage with digital media and many believe that technology promotes young children's creativity and basic academic skills (Tezer, 2013; Wartella, Rideout, Lauricella, & Connell, 2013). In considering opportunities to learn from digital media, the internet is a prominent and well-accepted form of learning media, as it contains a multitude of educational destinations aimed to teach while entertaining children (Shuler, 2007). These educational web portals and online game sites are routinely visited by

children—according to Compete and Inc. (2012), 20 million children visit online game sites each month. However, although marketed as educational, it is largely unknown which and how many educational opportunities are present within these contexts. This question, however, is of great importance, since accumulating evidence from research on educational digital games for young children highlights the importance of quality design; well-designed games have been shown to enhance children's learning and development, whereas poorly-designed games are believed to have few educational benefits, may contribute to a sedentary lifestyle, and some extremely poorly-designed games can be harmful for mental health and development by encouraging aggressive behaviors, creating anxiety and fear, and instilling stereotypes (Lieberman, Fisk, & Biely, 2009; Prot, McDonald, Anderson, & Gentile, 2012).

There are a number of television programs designed to teach prosocial behaviors and social skills to preschoolers, such as *Sesame Street* (PBS), *Dora the Explorer* (Nickelodeon), *Dragon Tales* (PBS), and *Daniel's Tiger Neighborhood* (PBS) (Wilson, 2008). Research on the effects of media on social-emotional development is limited and conflicting. Some studies show that older children are learning and transferring emotional lessons from TV programs, and there is some evidence that preschoolers have some increases in emotional knowledge from watching *Sesame Street* (Calvert & Kotler, 2003; Weiss & Wilson, 1996; Wilson, 2008). However, a study by Nathanson et al. (2013), demonstrated a negative association between the amount of television exposure and children's developing abilities to attribute mental states to self and others (i.e., theory of mind skills). Furthermore, the type of media might matter. Mar et al. (2010) found that children with more exposure to films performed better on Theory of Mind tasks than those children exposed to children's television programming. However, one possible explanation for the difference between film and TV may be parent–child communication, as film might provide more opportunities for discussions of mental state than television, since children's television watching is often a solitary activity (Mar et al., 2010; Nathanson & Fries, 2014).

Although children's television has been studied, little research has focused on online forms of digital media, especially games.

PROGRAMS, MEDIA, AND GAMES

The body of literature on associations among children's social-emotional competence and its far-reaching implications have prompted most educational organizations from schools to children's media networks to include

social-emotional development in their list of learning goals and develop curricula and programs with a focus on enhancing social-emotional skills. Some State Departments of Education have established specific standards for social-emotional learning, implemented teacher trainings, and developed assessment materials. A number of organizations, corporations, and websites offer training programs, curricula, and workshops on the topic (Hoffman, 2009). It is estimated that in 2003, nearly 200 different classroom-based social-emotional learning programs were adapted in US schools (Collaborative for Academic, Social, and Emotional Learning [CASEL], 2003, as cited in Hoffman, 2009).

Although many programs claim to focus on social-emotional development, little is known about the scope and depth of the targeted skills. In considering digital media and the development of these social-emotional skills, television programming is one of the few forms of media to be assessed. However, children actively engage with online games, tablet, and phone applications, and yet little is known about the educational affordances of these resources for the development of children's social-emotional skills. Several non-profit organizations, such as Common Sense Media, attempt to review, categorize, and critique online games and sites for children. Even with this effort, it remains unclear which skills are targeted in the games: games cataloged as teaching social-emotional skills vary considerably in themes and descriptions. For example, games in the Social-emotional Development section of the Top Pick list on Graphite.org by Common Sense Media list diversity, honesty, responsibility, social-emotional cues and vocabulary, health and hygiene, Asian history, art, and more, as targeted skills.

Therefore, the prevalence of learning opportunities for social-emotional development as well as understanding the depth and complexity of the presentation of these skills remains largely unclear. Lack of information on these topics makes it difficult to assess the quality of games for preschoolers and their educational benefits, effectiveness, and appropriateness. To close this gap, the current study examined the social-emotional educational opportunities of 66 online games for preschoolers from three major media networks. The study was guided by the following questions:

1. Which delivery methods of educational tasks targeting social-emotional development are most common across the games?
2. How prevalent and diverse are educational opportunities for social-emotional learning in educational games?
3. What is the breadth and complexity of educational tasks targeting social-emotional learning?

METHOD

Materials and Procedure

Using rankings of internet traffic via compete.com website, we selected the three most common sites for preschool games: PBS Kids, Nick Jr., and Disney Jr. As of summer 2012, collectively, these three sites offered 543 games listed for young children (2–6 years old). Using site information about the games, we divided all games into one of eight major themes: (1) Literacy and Language; (2) Math, Measurement and Patterning; (3) Memory and Puzzles; (4) Music; (5) Science; (6) Health, Nutrition or Exercise; (7) Art; (8) Social Games. We then randomly sampled two or three games from each of these eight categories for each of these three sites, yielding a total of 66 games (22 games per site) to be coded. It is important to note that games were categorized based on how they were listed on the network and that the themes of the games and targeted skills did not necessarily coincide (e.g., games identified on the website as targeting Memory and/or Puzzles may involve a complex story line that contains social elements, literacy tasks, and musical tasks). Games across all the themes were analyzed for social-emotional tasks.

Systematic Coding of Online Preschool Games

Since efforts to assess the educational opportunities and developmental appropriateness of games for children are not commonplace, we adapted a normed tool for assessing these skills in preschool-aged children, the desired results developmental profile—preschool scale (DRDP-PS). The DRDP-PS is a standardized instrument developed by the California Department of Education specifically to measure developmental progress in children aged 3 years to the age of kindergarten entry (DRDP; California Department of Education, 2012). This standardized assessment is mandated for any preschools receiving California State funding and has been adopted by federally-funded preschool programs, such as Head Start. The DRDP-PS assesses development across seven domains: self and social development; language and literacy development; English language development; cognitive development; mathematical development; physical development; and health. All DRDP scales are developed to align to the California Infant/Toddler Learning and Development Foundations and the California Preschool Learning Foundations. Each domain contains several measures and every measure is presented in the form of developmental continuum from "exploring" to "developing" to "building" to "integrating." There are a total of 43 measures across all the domains. For the purpose of this chapter, we focus exclusively on

the Self and Social Development Scale. The scale was designed to correspond to the Social-emotional Development domain in the California Preschool Learning Foundations (California Department of Education, 2013).

The expected overall outcome of the Self and Social Development scale assessment (desired result) is evidence that the child is personally and socially competent. The scale consists of 12 measures assessing various aspects of social-emotional development. For the purpose of the study, we adapted the measures to represent opportunities for a player to exercise 12 different skills. The skills are: (1) Identity of self; (2) Recognition of own skills and accomplishments; (3) Expressions of empathy; (4) impulse control; (5) taking turns; (6) awareness of diversity; (7) relationships with adults; (8) cooperative play with peers; (9) socio-dramatic play; (10) friendships with peers; (11) conflict negotiation; (12) shared use of space and materials.

Adapting the DRDP to assess preschool games necessitated consideration of how these domains are represented in digital space. For many games, there are opportunities for children to demonstrate and work on developing specific skills. Additionally, many online games include non-player characters (NPCs) who can model specific skills for the user. Further, preschool games often offer ways to bypass game features. Thus, opportunities for demonstrating or developing specific skills may be present in games but optional. Therefore, in adapting the DRDP to this context, special attention was paid to the education delivery method: whether educational opportunities required active play, offered optional play, and/or provided modeled behavior.

Thus, rather than observe and score the demonstrated skills of a child playing the online games, we used the DRDP to code the educational affordances of the game itself. As in the original instrument, every measure was presented in the form of a developmental continuum or progression towards the mastery of the measure: exploring, developing, building, and integrating. Thus, the adapted version of DRDP assessed the levels of task complexity as exploring (usually the most basic task), developing, building, and integrating (usually the most challenging). For instance, for Measure (3): Expression of empathy, the most basic level of *exploring* would involve allowing the player to move next to or away from a character in distress, while *integrating* could involve having the user or NPC actively engage or be friendly with a character who appears to be lonely.

Reliability

Three researchers, two undergraduate students and one graduate student, coded all games. Both undergraduate students majored in psychology and

had prior research experience involving children's games. The graduate student had a background in child development and studied instruction and technology. A School of Education faculty member oversaw the study and the graduate student served as the master coder. Coders participated in a 3-week training course and achieved at least 85% agreement with the master coders before coding games independently. Reliability checks were conducted throughout the study in order to maintain an acceptable level of agreement. A total of 10% of all games were recoded to assess interrater reliability ($\alpha = 0.89$).

RESULTS

Question 1: Which Educational Delivery Methods are Used?

To explore the differences in delivery method across games, a summary score of learning affordances for each of the three delivery methods (essential, optional, modeled) was computed for each skill and the frequency of each delivery method across all games was calculated. A single game could possibly employ different delivery methods. Results demonstrated that opportunities for social-emotional development in digital games in our sample came predominantly from modeling, rather than direct play: most of the games (62, 94%) used modeling to teach the skills, whereas only 15 (23%) games required user experience (i.e., essential—required to complete the tasks in order to proceed in the game), and 17 (26%) games included optional user experience (i.e., player had an option to practice the skill, but could bypass it without penalty). Games modeled social behaviors in different ways. For example, Minnie's Skating Symphony game by Disney Jr. demonstrated Cooperative Play with Peers at the developing level by showing Minnie and Daisy rehearsing their dance routine together, i.e., the characters modeled an activity involving a common purpose and cooperation (Figure 10.1).

Some games modeled higher levels of social-emotional skills. For example, Daizy's Kickety-Kick Ball game by Nick Jr. showed NPCs engaging in Cooperative Play with Peers of the integrating (the most complex) level. In the game, NPC Wubbzy organized his playmates, NPC Daizy and the player, to play kickety-kick ball. Wubbzy first asked the player about the plans for the day and then said: "I know. Let's go out and see whether Daizy would like to play kickety-kick ball with us today." Wubbzy was then displayed talking to Daizy, suggesting to her that they play kickety-kick ball.

We then investigated whether games employed different delivery methods to teach the same skill (i.e., when there were opportunities for

Figure 10.1 Minnie and Daisy are shown to rehearse their dance routine together, i.e., they are modeling an activity that involves a common purpose. This corresponds to the developing level of Cooperative Play with Peers' skill.

players to observe and practice the skill). To address this question, we first dichotomized the summary scores of learning affordances for each of the three delivery methods (essential, optional, modeled) and then combined them. Combined scores greater than 1 indicated that the skill was taught using several delivery methods. In our sample, only one game, Dora's Fairy Fiesta by Nick Jr., included both modeling and optional direct play to teach the same skill. Specifically, Expressions of Empathy skill was modeled when Dora labeled the emotions of other NPCs: "The Three Pigs were very excited about the fiesta" (Figure 10.2). Players were also given an option, but not required to practice the skill by having an opportunity to help find dwarfs hidden by the mean witch.

Question 2: Prevalence and Diversity of Social-emotional Learning Opportunities

To explore the prevalence of social-emotional learning opportunities in these online games, we created a summary of all opportunities for each measure, regardless of the type of delivery (essential, optional, modeled) or complexity level (exploring, developing, building, integrating). We then dichotomized the summary score, so that if the opportunity in the game was present one or more times, it was coded as 1, and if it was not present, it was

Figure 10.2 Dora labels emotions of others, thus modeling an exploring level of Expressions of Empathy skill.

coded as 0. Finally, we calculated the frequency of the measure across all games (Figure 10.3). It was possible for a single game to target several skills.

On average, games targeted 2.5 social skills with a range from 0 to 7 skills per game, $SD = 1.4$. The most frequent learning affordance was "recognition of own skills and accomplishments": 45 games out of 66 (68%) attempted to teach children to appreciate their own abilities to perform skillfully. Frequency analysis of the raw summary scores of the delivery methods indicated that all 45 games used modeling, or in other words, demonstrated recognition of achievement by providing praise and positive feedback. Often, positive feedback of different complexity occurred in the same game. At the most simple level (exploring), positive feedback was nonspecific, such as "Good job" along with a laughing or smiling NPC. A total of 30 games employed nonspecific feedback. Slightly more complex, developing-level praise was provided in terms of general skill/success, such as, "You did it!" Developing-level praise appeared in 22 (33%) games. A smaller number of games, 14 (21%), included building-level feedback, i.e., described positively player's specific skills involved in the game. For example, in Scrub a Pup game from the Martha Speaks series by PBS Kids, the narrator praised the player for cleaning dogs "You did a good job dog washing!" Finally, only seven (11%) games modeled the most complex, integrating-level feedback

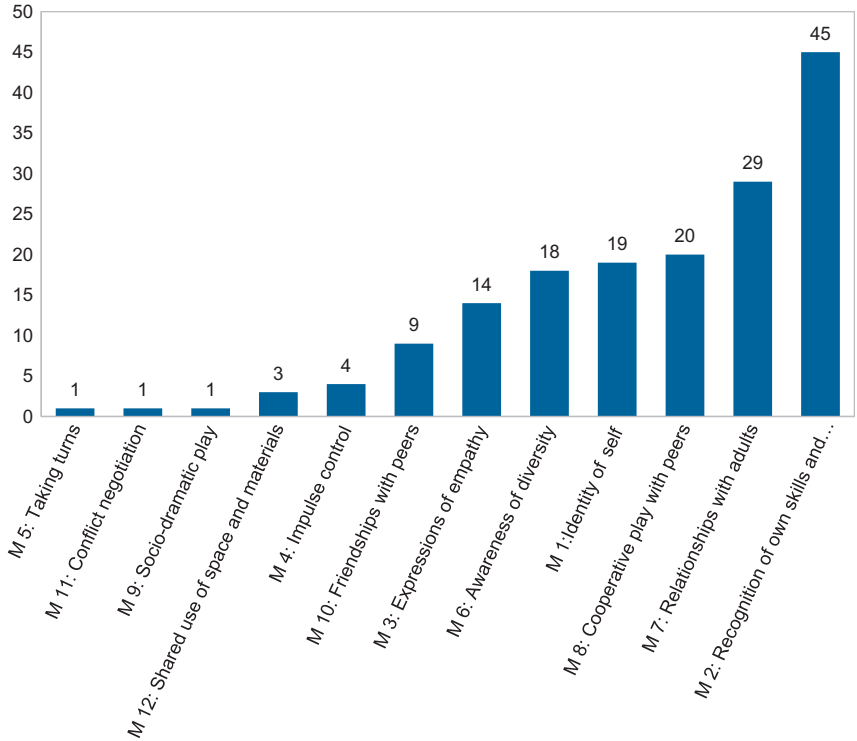

Figure 10.3 Number of games that included learning opportunities for any of the 12 social-emotional skills.

or characterized the child positively in terms of generalized ability or skills. For example, in an Elmo's World: Books game by PBS Kids, Elmo told the player "You are a great artist!"

The second most frequent learning opportunity corresponded to the "interaction with adults" measure. In total, 29 (44%) games contained possibilities to learn about socializing with adults in various ways, such as being provided with instructions or help by an adult voice or character, showing NPCs having a conversation with a familiar adult, or working alongside an adult character; 13 (20%) games employed optional tasks of exploring the level of complexity, i.e., had a help button/instruction option that, if used, delivered instructions through an adult character or voice; and 12 (18%) games used modeled tasks of building level complexity, i.e., had feedback and instructions provided by an adult game character or voice. For example, in the Curios George Apple Picking game by PBS Kids, The Man with the Yellow Hat gave players instructions and provided feedback (Figure 10.4);

Figure 10.4 Instructions are provided by The Man with the Yellow Hat, an adult character. This corresponds to building level of complexity of Relationships with Adults skill.

"Shared use of space and materials" and "impulse control" skills were only present in games three and four, respectively. Players practiced sharing space and materials through direct play in Rosita's Fiesta game from PBS Kids, by dividing party supplies and food among amigos after Rosita's prompting. Preschoolers could learn the basics of impulse control in the Ready, Set, HOOK game by Disney Jr. The exploring level of impulse control involves needing direct guidance in order to move from one activity to another. In that game, the alarm went off signaling that the time was up, and the activity stopped and another activity started, preventing children from playing further.

Finally, across all 66 games, learning opportunities for conflict negotiation, turn taking, and socio-dramatic play were present only once, each at the exploring level of complexity. Conflict negotiation and socio-dramatic play were demonstrated by NPCs in two different Nick Jr. games (Piper Bubble Guessing Game and Dora's Ride-Along City Adventure, respectively), and Turn Taking was taught as essential direct play activity in Lambie's Ballet game by Disney Jr. game. To teach the basics of turn taking, Lambie in the Lambie's Ballet game demonstrated specific moves with no option for players to skip, while the narrator gave instructions and told players that their turn to play would come when the button lit

up. Only after Lambie finished the demonstration of the activity, and the button lit up, did the narrator say "Your turn!" and allowed the player to begin the game.

Question 3: Breadth and Complexity across Games

To address the third goal of the study and explore the prevalence of various levels of complexity of the tasks corresponding to the developmental continuum of the skills, we calculated a summary score of opportunities for each of the four complexity levels of developmental continuum (exploring, developing, building, integrating) for every skill across the three delivery methods (essential, optional, modeled), and then calculated the frequencies of the complexity levels across all games. It was possible for a single game to include tasks of differing levels of complexity. Overall, most games (52, 79%), contained tasks of the very basic, exploring level of complexity, whereas many games (39, 59%) also had learning opportunities of the developing level and building complexity levels (34, 52%). A smaller subset of games (14, 21%) involved learning opportunities for the skills of the highest level of complexity, corresponding to the integrating developmental stage.

We then investigated whether any of the games in our sample targeted all four different complexity levels within one skill. We dichotomized the summary score for each complexity level, so that if the complexity level in the game was present one or more times, regardless of the delivery method, it was coded as 1, and if it was not present, it was coded as 0. We then combined these scores for each skill within the game. The score of four meant that the skill could be learned or practiced at each complexity level of the developmental continuum within one game. Only three games targeted skills at all four complexity levels: two games demonstrated Recognition of Own Skills and Accomplishments (Ride Along City Adventure and Dora Star Mountain Mini-golf, both by Nick Jr.) and one game modeled four levels of Expressions of Empathy (Dora's Fairy Fiesta by Nick Jr.).

DISCUSSION

Social-emotional skills are reported to be an important focus in children's digital media and our study of online games designed for preschoolers found that at least some social-emotional skills are present in most games. Interestingly, the bulk of the opportunities for learning social-emotional skills were from watching a non-player character model the behavior. Less than a third of the games we coded allowed for optional use of a social-emotional skills,

and less than a quarter of the games made practicing these skills essential for successful game-play. Additionally, we found that although online games for preschoolers provide learning opportunities for some social-emotional skills, many important skills within the domain, such as taking turns and conflict negotiation, remain untargeted. Finally, results revealed that the majority of games relied on tasks at the lowest level of complexity (i.e., exploring) and rarely were highly complex tasks (i.e., integrating) offered.

Methods of Teaching Social-emotional Skills

Researchers of social-emotional curricula stress the importance of systematic social-emotional skill instruction through various methods: teaching, modeling, and practice (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger, 2011). They believe that although modeling social behavior is a beneficial teaching strategy, application and practice is crucial for comprehensive learning (Greenberg et al., 2003). Studies on principles of effective learning in technology-supported student-centered learning environments also highlight the necessity for students to access multiple perspectives, representations, and resources (Land, Hannafin, & Oliver, 2012). Despite this body of literature, games in our sample relied predominately on modeling as the delivery method; only a quarter of the games required children to practice actions in order to progress on the game (essential) and another quarter gave only an option to practice social-emotional tasks. In other words, players often observed social-emotional skill demonstrated but rarely had an opportunity to complete a task by themselves. Thus, there was no way to transfer observed learning into practice while playing and for the learning to be most effective, games should include various methods of teaching children social-emotional skills.

Comprehensive Social-emotional Development through Games: Successful Solutions and Missed Opportunities

As mentioned above, social-emotional development is a construct that encompasses several different interrelated competencies. Researchers name social competence or relationship skills and emotional regulation (part of self-management competency) as two areas of social-emotional development that greatly contribute to preschoolers' school readiness (Blair & Razza, 2007; Denham, 2006; Graziano, Reavis, Keane, & Calkins, 2007; Kim, Nordling, Yoon, Boldt, & Kochanska, 2013; Snow & Van Hemel, 2008, as cited in DRDP–PS Summary Results scale, 2012). Thus, it would be highly desirable for games that market themselves as educational to target

skills pertaining to these two areas. Yet, in this study most of the online games for preschoolers contained opportunities for children to practice or observe only relationship skills, such as following instructions from an adult, playing with peers, or requesting help from the person in charge, whereas opportunities for learning self-management skills were overlooked. In other words, children did not have opportunities to practice and learn impulse control, taking turns, conflict negotiation, and sharing. Research-based strategies exist to teach emotion-regulation in the classroom (Blair & Razza, 2007; Diamond, 2012), and could be potentially further adapted to be used in computer games.

Advancing Social-emotional Skills through Tasks of Various Complexity

Social-emotional skills emerge early in life and evolve with age, through contexts and interactions with others. Children begin with learning basic skills and then advance and develop more complex skills through social contexts and situations. Almost all of the games in our sample provided children with opportunities to learn social-emotional skills of basic levels of complexity (exploring level); half of the games included tasks of more advanced, developing and building levels of complexity, but only a fifth of the games allowed players to graduate to the most challenging tasks of integrating level of complexity. These results indicate that these online games for preschoolers provide few opportunities to improve in many social-emotional tasks or master them. Furthermore, being stuck at the same level of complexity and not being challenged may lead players to lose interest in learning social-emotional skills through the game. Previous work with games has noted the golden path (Bateman, 2006; Thomas & Young, 2010), in which players must have a nice balance of success and challenge. Lacking increasing complexity might diminish motivation to play. Finally, social-emotional tasks at the integrating level are rare in the games. Yet, to be considered kindergarten-ready, children are expected to perform tasks corresponding to the integrating level of the DRDP–PS developmental continuum. Therefore, despite many claims of educational games for preschoolers that their purpose is to get children ready for kindergarten, very few games provide such opportunities within the social-emotional domain.

CONCLUSION

As indicated by previous research, high-quality game design is paramount to children's learning (Lieberman et al., 2009). Researchers believe that in

order to design high-quality, effective digital learning environments, designers should be informed of the findings from the field of developmental science (Revelle, 2013). Our study makes a step in this direction by analyzing the learning affordances of online games for preschoolers through developmental and educational lenses.

The results highlight the strengths and uncover the gaps in the design of online games for preschoolers specific to social-emotional development. Games are prolific in the lives of children and thus have a great potential to improve children's performance in many areas, including social-emotional development. Thus, designers need to capitalize on children's abilities by targeting a larger spectrum of skills responsible for positive social-emotional development, designing tasks and challenges of various complexity levels, and providing opportunities for children to learn by performing, and not only observing, behaviors.

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CHAPTER 11

Dashboard Effects Challenge Flow-Learning Assumption in Digital Instructional Games

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AFFECT DURING INSTRUCTIONAL VIDEO GAME LEARNING

There is some expectation that instructional video games will motivate student engagement in academics because games are "fun" (National Research Council, 2011). Professional game designers and theorists design to create fun (Fullerton, Swain, & Hoffman, 2004; Schell, 2008); however, the term may be inadequate because subjective experience during successfully designed gameplay is nuanced (Caillois, 1962; LeBlanc, 2004; Salen & Zimmerman, 2004). According to video game design theorists, successful commercial games place their players in a zone of focused attention (Fullerton et al., 2004; Salen & Zimmerman, 2004; Schell, 2008) and "merged action and awareness" (Csikszentmihalyi, 1990, p. 53), known as *flow*. During flow experience, an individual perceives activity as engagement in balanced and relatively high levels of skill and challenge. Indeed, Mihaly Csikszentmihalyi included players of games (e.g., chess masters, Csikszentmihalyi, 1988) within the populations he studied while discovering and describing the psychological construct of flow. Flow experience is intrinsically rewarding and might be described as self-reinforcing (i.e., autotelic, Csikszentmihalyi, 1990; Csikszentmihalyi, 1997). Successful commercial games are engaging, even addictive. Perhaps instructional games might engender similar responses connected to academic endeavor (Kiili, 2005; Kirriemuir & McFarlane, 2004). For example, Valerie Shute and her colleagues (Shute, Ventura, Bauer, & Zapata-Rivera, 2009, p. 297) advocated a "flow" and "grow" model for immersive games and Shute and Ke (2012) proposed a blend of flow theory with Lev Vygotsky's "zone of proximal development." Vygotsky (2012) defined the zone of proximal development as the task difficulty level at which a learner can succeed if instructional supports such as mentoring or hints are provided. Shute and Ke (2012) envisioned that instructional video games might dynamically control difficulty

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level to create optimal learning environments that place learners in the zone and in flow. Instructional video game research and development is a nascent field. It seems prudent to empirically investigate any hypothesis that flow and learning are concurrent, correlated, or causally related. Preliminary to launch of design initiatives targeting learning environments that produce flow states, it seems expedient to determine which states of subjective experience players do perceive during gameplay learning. Presented here is an empirical case study tracing players' subjective experience during gameplay learning within the *Selene: A Lunar Construction GaME* instructional game learning environment. *Selene* is a CyGaMEs learning environment (CyGaMEs: *Cyberlearning through Game-based, Metaphor Enhanced learning objects*). To investigate subjective experience, CyGaMEs adapts the flow research paradigm for data collection and analysis:

- Protocols within the experience sampling method (Csikszentmihalyi & Csikszentmihalyi, 1988) are adapted for collection in player logs within every 5-min segment of gameplay and within non-gameplay segments.
- Instrument items measuring flow within the experience sampling method form (Csikszentmihalyi & Csikszentmihalyi, 1988; Csikszentmihalyi & Schneider, 2000) are adapted as the "Flowometer" (Reese, 2010) to collect self-reported skill and challenge on a scale from 0 (lowest) to 100 (highest).
- Analysis techniques use the "experience fluctuation method" (Delle Fave & Bassi, 2000; Delle Fave, Massimini, & Bassi, 2011; Massimini & Carli, 1988; Moneta, 2012) to determine nine states or channels of subjective experience: flow, arousal, anxiety, worry, apathy, intrinsic motivation, boredom, routine expertise, and control (adapted from Reese, 2010, based upon Bransford, 2005; Csikszentmihalyi & Csikszentmihalyi, 1988; Hatano & Inagaki, 1986; Schwartz, Bransford, & Sears, 2005).

Using graphics and tables, this chapter analyzes a 15-year-old player's learning and affective trajectories through progress from a *Selene* beginner, in 573th place, through seven iterations of game and 66 iterations of module replays, to CyGaMEs *Selene* leaderboard first place out of 3749 players. Over 22 days, the player, Ricardo, logged 22 h of *Selene* gameplay. To provide context, his affective and learning trajectories and attitudes have been compared with those of other players.

Csikszentmihalyi (2008) observed that, by definition, people should not be in flow during the process of learning because their level of challenge would be higher than skill. The case of Ricardo illustrates that subjective perceptions of experience during the work of learning and application of new knowledge may categorize within non-flow channels.

Eustress and Performance

Video games provide player opportunity to explore and take chances in low-risk situations; e.g., an avatar may die, but the player walks away. Thus, one might assume gameplay causes less stress than comparable real-life situations. People are always under some degree of stress. Stress is the mechanism through which people adapt to activities and demands. Stress is "the nonspecific response of the body to any demand, whether it is caused by, or results in, pleasant or unpleasant conditions" (Selye, 2013, para 48). Demands may be physical, cognitive, or affective. Stress effects differ. Differential effects occur between stress agents, between individuals, and because of agent by individual interactions. Differences within individuals are caused by conditioning factors, which may be endogenous (e.g., genetic predisposition, age, sex) or exogenous (e.g., hormones, drugs, diet). According to Selye,

> *Under the influence of such conditioning factors, a normally well-tolerated degree of stress can even become pathogenic, selectively affecting those parts of the body that are particularly sensitized both by those conditioning factors and by the specific effects of the eliciting agent, just as physical tensions of equal strength in different chains will break the particular link that is the weakest as a result of internal or external factors.*
>
> ***(Selye, 2013, para 36)***

Selye (1974, 1975, 2013) established two types of stress. Bad stress, or distress, is debilitating. Good stress, which he termed "eustress," is not. Eustress accompanies success and accomplishment.

> *During both eustress and distress the body undergoes virtually the same nonspecific responses to the various positive or negative stimuli acting upon it. However, the fact that eustress causes much less damage than distress graphically demonstrates that it is "how you take it" that determines, ultimately, whether you can adapt successfully to change.*
>
> ***(Selye, 2013, para 49)***

Implication for game-based learning: by definition, stress reported by a player while performance improves (e.g., the player perseveres to conquer game goals) or reaches high levels of achievement would be categorized as eustress.

Seminal research conducted by Yerkes and Dodson (1908) and later replicated by each individually (Diamond, Campbell, Park, Halonen, & Zoladz, 2007), showed that performance is affected by the interaction between emotionality (e.g., stress or arousal) and the task (e.g., complexity, difficulty). When the task is relatively simple (e.g., a restricted range of cues or stimuli have high discriminability), the relationship between emotionality and performance is linear and positive. Strong emotionality can enhance

performance. When a task is moderately-difficult or difficult, the relationship is curvilinear. Performance increases with emotionality until performance peaks at an optimal level. Higher levels of emotionality impair performance.

Implication for game-based learning: by application of Yerkes-Dodson, levels of high emotionality reported while performance improves (e.g., player perseveres to conquer game goals) or reaches high levels of achievement, must occur at optimal levels of emotionality or co-occur with a relatively easy task. If player logs indicate high performance and moderate or high task difficulty, then emotionality is assumed to be optimal.

The *Selene* Game

Selene is an online Flash/Flex game available for free, 24/7, to players with parental permission. Adult volunteers trained by project staff recruit players, obtain parental permission, and distribute access codes. Recruiters are typically formal, informal, or non-formal[1] (e.g., 4-H, Walker & Dunham, 2002) educators. *Selene* players discover and apply fundamental Earth and space science principles (CyGaMEs, 2013a) targeted by national standards (National Research Council, 2011). During the *Selene* Accretion module, players build their Moon by selecting asteroids and planetesimals from debris orbiting in a ring about the protoEarth. Players must cause collisions that simulate the process of accretion. To form a moon of the correct composition and structure, players must cause collisions that successfully balance velocity, heat, density, and proportion of radioactivity. During the Surface Features module, players replicate our Moon's 4.5 billion-year history by peppering the surface with impact craters and flooding it with lava flows. Successful Surface Features gameplay requires players to cause an optimal amount of lava and impact cratering each gameplay second. Decrease in impact cratering amount and projectile size is modeled by the power law. Lunar lava flow began about 3.8 billion years ago, after radioactive materials gathered during accretion had melted the Moon's mantle. Lava flow increased relatively quickly to a peak over the next 0.34 billion years. Then

[1] "Non-formal education is organized, systematic teaching and learning carried on outside the formal school system. Generally, non-formal education is sponsored by community groups that provide particular types of teaching and learning experiences for specific youth populations. It is not an alternative to formal education offered in the schools; it is another kind of education essential for helping young people grow to optimal maturity" (Walker & Dunham, 2002, para 8).

flow decreased and ended about 0.52 billion years ago when radioactive materials were no longer actively melting the mantle. Lava flow occurred when differences in density caused magma to flow to the surface through vents caused by cracks in the Moon's crust. Fractures had been caused when impact basins formed during the Moon's first 0.7 billion years. During Surface Features, players also launch the large projectiles that cause lunar basins. During the period of lunar lava flow, players must place lava vents in locations that would have fractured, within the inner ring and along the inner edges of outer rings of impact basins.

Plate tectonics and weather erosion have "destroyed or altered" Earth's record of its early history (National Research Council, 2011, p. 7–5), but the history of the early solar system and planetary evolution are preserved on the surface of the Moon (Wood, 2003). Playing *Selene* allows learners to discover and apply targeted concepts about the formation and evolution of the Earth. Fundamental processes include impact cratering and volcanism. Prepared with prior knowledge constructed during *Selene*, an Earth-bound player with a $200 telescope, a pair of binoculars, or even the unaided eye can observe the evidence of these processes on today's Moon. The Earth's satellite allows the Earthbound to observe what they can view nowhere else: 4.5 billion years of planetary geology. The Framework Committee (2011) recommended learners study planetary bodies, such as the Moon to learn these processes and how they occurred on Earth. *Selene* science is relevant to the United States' next generation science standards and to her students. By design (Reese, 2009; Reese, Tabachnick, & Kosko, 2015), *Selene* guides and measures knowledge construction for these standards.

The *Selene* game system incorporates 76 concepts from an ontology of 101 lunar geology concepts (Reese, 2014). The full ontology was developed using a cognitive task analysis procedure (Chipman, Schraagen, & Shalin, 2000; Clark, Feldon, Merriënboer, Yates, & Early, 2008; Reese, 2014). Cognitive task analysis is the foundation of cognitive tutor design (Anderson, Reder, & Simon, 1997; Anderson & Schunn, 2000) and recommended for simulations and instructional game design, especially when these cyberlearning technologies will incorporate assessment (Mislevy, 2007, 2011; Mislevy, Behrens, Dicerbo, Frezzo, & West, 2012; Mislevy, Oranje, & Bauer, 2014). Mislevy and his colleagues proposed that evidence-centered design and similar integrated game assessment design approaches might support a construct representation argument for assessment validity (Embretson, 1983; Mislevy, 2007; Mislevy et al., 2014). Reese et al. (2015) applied

evidence-centered game design as a framework for warranting their validity argument for the CyGaMEs approach, as applied in *Selene*.

Measuring Learning and Subjective Experience: Timed Report and Flowometer

Applying the CyGaMEs approach, our team began design and development of *Selene* (for explanation of the approach, see Reese, 2009, 2014) with cognitive task analysis, and then applied cognitive science structure mapping (specification of domain relational structure and mapping from one domain to another, Gentner, 1983) and pragmatic constraint theories (analogizer's immediate goal structure guide and constrain mapping, Holyoak, 2012; Holyoak & Thagard, 1997; Spellman & Holyoak, 1996) to guide and constrain instructional game design and development. Thereby, a CyGaMEs learning environment such as *Selene* becomes an embodied analog of targeted knowledge: The game is the procedural analog of what is invisible inside experts' heads. CyGaMEs incorporates a Metaphorics process (Reese & Cresto, 2014) for instructional game design and embedded assessment. The process components specify targeted knowledge, embody that ontology as a game world, measure player knowledge construction and application, and integrate game and assessment within instructional practice:

- The *Selene* game was designed as the procedural analog of 76 targeted science concepts. That is, the game system runs according to rules analogous to those natural phenomena. These rules determine the gameplay mechanics through which a player manipulates the game system and changes its state. Each player interaction with gameplay mechanics is a player gesture.
- *Selene* game goals were designed as analogs for learning objectives applying those concepts within the system of phenomena determining planetary growth and evolution.
- *Selene* gameplay data post quantitative information about player behavior. At 10-s intervals and for each player, the Timed Report compiles a quantitative snapshot from player behavior of player progress toward each active game goal. The Timed Report is the primary CyGaMEs Metaphorics assessment measure. Player behavior, as calculated for the Timed Report, is also processed as a real-time player dashboard. At any time, players may access the dashboard as a volitional gesture (players choose to click the dashboard button). The assessment process also collects event-based measures. The dashboard fires as an event at the close of each game module.

- *Selene* collects a time-based measure of player self-perceptions of gameplay experience. Following from flow theory, the CyGaMEs Flowometer (Figure 11.1; Reese, 2010) prompts a player to indicate current level of skill and challenge on a slider scale that runs from 0 (low) to 100 (high). Together, the two dimensions indicate magnitude and state or channel of subjective experience (Figure 11.2). Centering the axes at the point (50,50) and applying experience fluctuation calculations (e.g., Delle Fave & Bassi, 2000; Massimini & Carli, 1988; Moneta, 2012), channels run counterclockwise:
    - Flow: high skill—high challenge; $22.5 \leq \text{angle} < 67.5$.
    - Arousal: moderate skill—high challenge; $67.5 \leq \text{angle} < 112.5$.
    - Anxiety: low skill—high challenge; $112.5 \leq \text{angle} < 157.5$.
    - Worry: moderate skill—moderate challenge; $157.5 \leq \text{angle} < 202.5$.
    - Apathy: low skill—low challenge; $202.5 \leq \text{angle} < 247.5$.
    - Boredom: moderate skill—low challenge; $247.5 \leq \text{angle} < 292.5$.
    - Routine expertise: high skill—low challenge; $292.5 \leq \text{angle} < 337.5$.
    - Control: high skill—moderate challenge; $337.5 \leq \text{angle} < 22.5$.

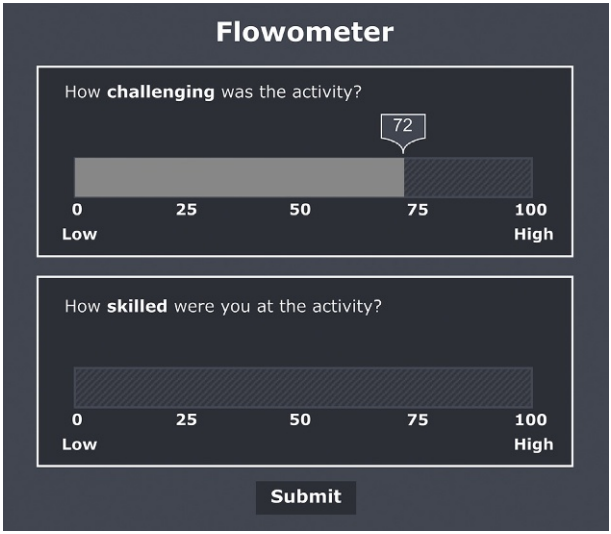

Figure 11.1 The Flowometer. The challenge item displays the interface after the player has activated it, filling in the rating and displaying the cardinal number in a chevron above the rating rectangle. The skill item displays the interface as presented to player before selection of a rating. *Copyright 2014 Debbie Denise Reese. Used with permission.*

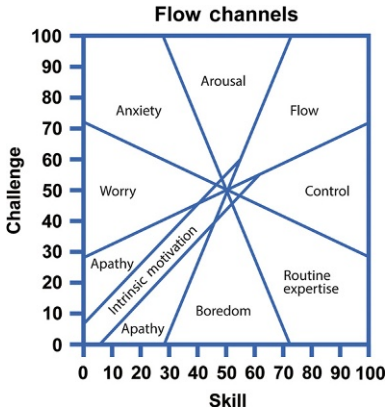

Figure 11.2 The nine-channel model of subjective experience. *Copyright 2014 Debbie Denise Reese. Used with permission.*

The ninth channel (derived from Csikszentmihalyi & Csikszentmihalyi, 1988) is calculated last:

- Intrinsic motivation: Absolute value |skill–challenge| $\leq$5 and channel $\neq$ flow (alternatively, intrinsic motivation may be confined to dyad dimensions located in the apathy channel).

Scaffolds and Dashboards: Fostering Learning and Expertise

Each player who successfully engages with an unfamiliar video game must build a viable mental model of how to play: control mechanics, conquer rules, and achieve goals (Wright, 2004). A player gesture is an inquiry investigating a hypothesis about how the mechanics and rules support goal achievement. The game provides feedback that supports or repudiates that hypothesis through the consequences, such as the resultant game state and scaffolds. Scaffolds may include short or game-stopping written or spoken text, points, and running score. If learning occurs, these are the causal components of game-based instruction. The case presented here provides evidence that a well-designed dashboard enhances achievement. In the words of Dennis Ramirez, the "dashboard allows a player to define expertise" (Litts & Ramirez, 2014). The gameplay allows a player to build a mental model of the game world and strive toward game goal achievement. The dashboard allows a player to build a mental model of expertise and strive toward achievement of that expertise. Through applied analogical reasoning theory, CyGaMEs gameplay allows a player to construct targeted domain knowledge; the dashboard allows a player to construct a model of expertise in applying that domain knowledge.

THE CASE STUDY

Organization of the Case Study

Data collected from three participants provide evidence that subjective experience reported by successful players during discovery and application of new knowledge may be categorized in non-flow channels. Player Mary is used to provide context, to introduce the Accretion gameplay, and to illustrate flow and Timed Report measures. Mary sets the stage for the primary participant, Ricardo. Ricardo strove continuously to improve his performance. He achieved lunar geologist status (all goals met) and continued to push himself until he was the top player on the leaderboard. His learning and affective trajectories are presented here. Juana is his classmate, who also achieved lunar geologist status. Juana's learning trajectory is different because she achieved proficiency more quickly and did not vie for the leaderboard. She provides a third look at affective trajectories. Finally, items and subscales of an attitude survey situate Ricardo's attitude compared to Juana and to his class.

PLAYER MARY: TRIANGULATION ILLUSTRATING THE TIMED REPORT, LEARNING MOMENT, FLOW CHANNELS, AND ACCRETION MODULE

The Accretion Module

The *Selene* Accretion module contains three levels, or segments (also called "scales"). Level segment 1 has one learning goal; level segment 2 has two simultaneous goals; and level segment 3 has four simultaneous goals. Figure 11.3 illustrates the level 3 interface, and Figure 11.4 illustrates goal-achievement meters for each level segment.

- *Level: Segment 1 (Scale 1).* The game guides and reinforces the player to discover and apply the concept of accretion: that low-velocity collisions stick together, and high-velocity collisions fragment. Players select and slingshot particles. Physical phenomena underlying accretion concern the forces of gravity and those produced by collisions between particles and the growing protoMoon. If the force of gravity is greater than those due to the collision, the particles will accrete (stick together). If and where the forces of collision are greater, particles and smaller debris may leave the protoMoon system. Debris may include particles formerly accreted within the protoMoon. To accrete mass, the player must learn to attenuate the velocity. A player controls velocity during the slingshot gesture, varying direction and speed by the direction and length of the slingshot (i.e., the vector from asteroid (a) to terminus of pull-back (b), see Figure 11.5).

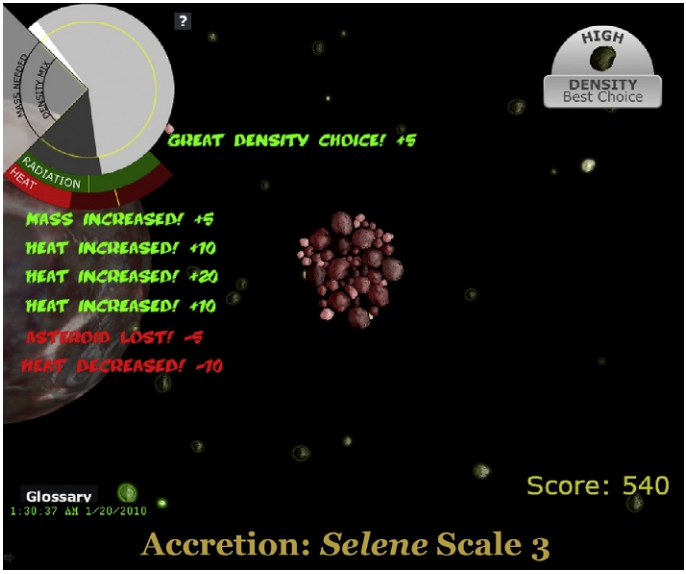

Figure 11.3 The Selene Accretion interface for level segment 3 (also called scale 3). The Accretion interface builds through the scales. Level segment 1 (scale 1) contains the mass components of the goal-achievement meter on the upper left, the protoEarth, the start of the protoMoon, the ring of asteroids, points and short feedback scaffolds, and running score. Level segment 2 (scale 2) adds the density components to goal-achievement meter, adds the best choice meter on the right, and depicts the particles in color and value according to their density (high: dark, medium: beige, or low: light). The level segment 2 (scale 2) adds the density components to goal/achievement meter, adds the best choice meter on the right, and depicts the particles in three shades of gray according to their density (high, medium, or low). The level segment 3 (scale 3) adds the heat and radiation components to goal/achievement meter, depicts radioactive particles in green, and adds shades of red to indicate heat caused by the kinetic energy resultant from each collision of an asteroid with the protoMoon. Colors cannot be represented in grayscale reproduction. *Copyright 2010 by Debbie Denise Reese. Used with permission.*

- *Level segment 2 (Scale 2)*. The game represents particle density (low, medium, high) through color and value. Particle density and velocity interact during collisions. Through the density "Best Choice" meter (upper right, Figure 11.3 and Figure 11.4), text scaffolds (e.g., "Great density choice!"), game-stopping help, points, and running game score, *Selene* scaffolds the player to discover and apply underlying physics of collisions and to accrete a moon with the same composition as Earth's Moon.
- *Level segment 3 (Scale 3)*. Players must now also (a) accrete the correct proportion of radioactive particles and (b) increase the velocities of collisions

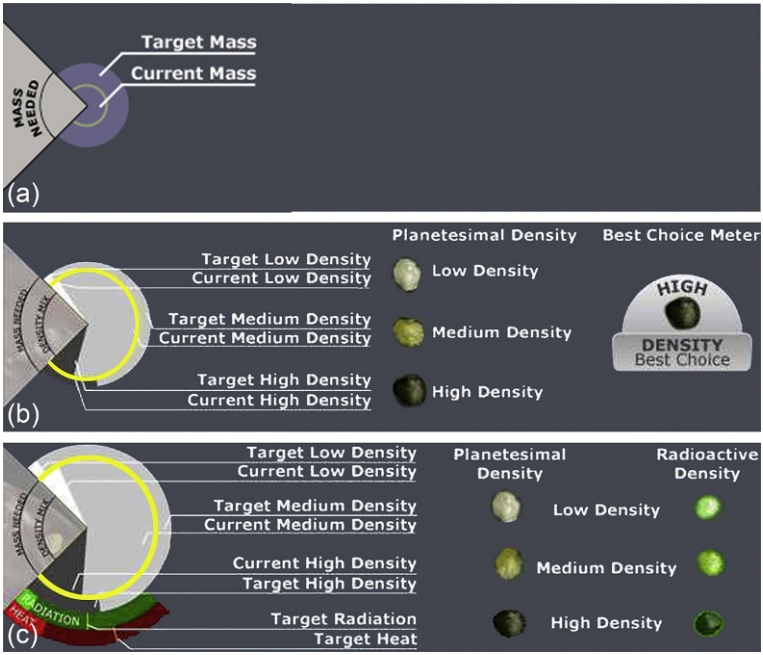

Figure 11.4 Accretion (a) level segment 1, (b) segment 2, and (c) segment 3 goal-achievement meters (meter in upper left of Figure 11.3). Colors cannot be represented in grayscale reproduction. *Copyright 2010 Debbie Denise Reese. Used with permission.*

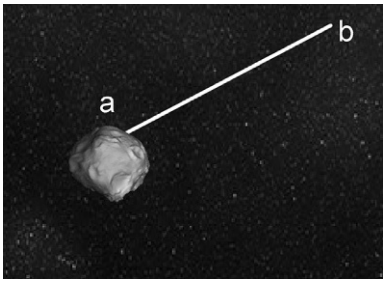

Figure 11.5 The slingshot gesture. A player clicks on a particle at "a" to activate it, and then drags back to a point "b" and releases to impact velocity (direction and speed). *Copyright 2011 Debbie Denise Reese. Used with permission.*

to produce enough heat to melt the protoMoon. To successfully cause enough heat, players must construct a flexible mental model of lunar accretion. They must discover the relationship between gravitational forces and collisional forces and apply this knowledge such that asteroids both accrete and cause heat. As the size of the protoMoon grows (more

mass), it has more gravity to overcome the destructive forces of collisions. Thus, players must increase the velocities imparted by slingshot gestures, but differentially for each density.

Mary's Learning Trajectories and Affect

Player Mary was a female undergraduate attending a mid-sized university in the Midwest during 2009. She participated in the *Selene* study to meet a research participation requirement. Unlike the majority of *Selene* players, she and other participants in her study played the original *Selene Classic* version of the game in a laboratory setting and received $20 for participation ($N_{players} = 148$). Research assistants videotaped each player and the gameplay. The camera filmed from behind and to the side of the player, positioned to capture all player and game activity without an identifiable view of the participant's face.

Baseline: Non/Pre-gameplay Measure of Affect

All players watch a non-gameplay cinematic representation of the accretion process as it might have occurred during the origin of the solar system. During *Selene II* the animation continues, representing the giant impact theory. According to the giant impact theory, a large asteroid about one-quarter the size of Earth collided with the proEarth and caused debris. Debris enveloped the proEarth and then coalesced into a ring, much like the rings around Saturn. The Flowometer (Reese, 2010) pauses the cinematic segment (60.000) and prompts each player to record a level of skill and challenge (Figure 11.1). This non-gameplay Flowometer report provides a pre-gameplay baseline. Figure 11.6 displays each of Mary's skill and challenge dyads graphed on a skill-challenge quadrant with the nine-channel flow sectors superimposed. Mary's baseline categorized as worry (Figure 11.6, segment 60.000 flow rating).

Learning Moment: Triangulating Video, Gesture, and Timed Report Data

Video footage capturing Mary's gameplay and Mary's player log during round 1 Accretion indicated a learning moment at millisecond 616,727 (see Figures 11.7 and 11.8). Mary had completely destroyed her protoMoon using extremely high-velocity gestures. After the learning moment, she attenuated the speed of her slingshot gestures. This allowed her to successfully accrete,

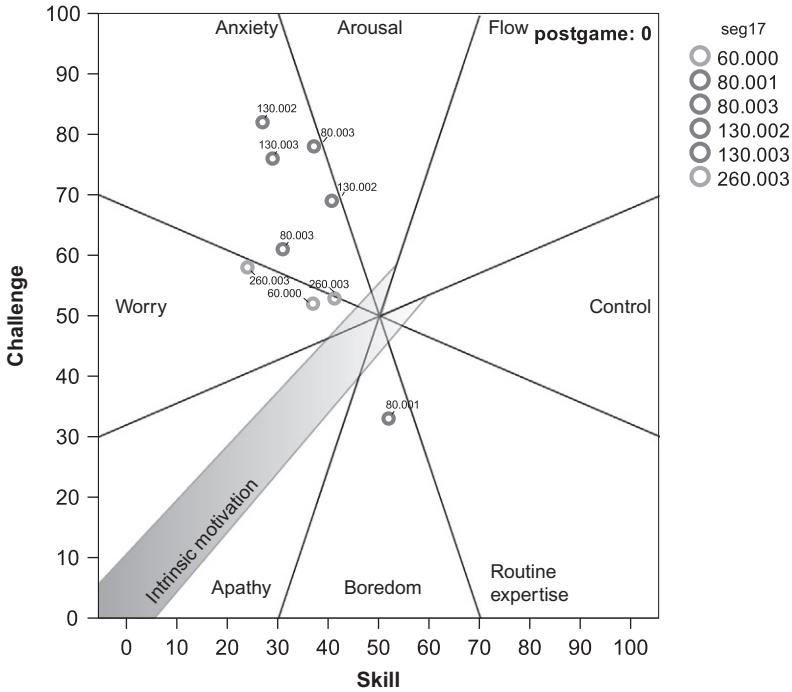

Figure 11.6 Case study player Mary's affective trajectory before and after learning moment. Accretion gameplay (80.001) before learning classifies in the boredom channel Gameplay after learning classifies in worry and anxiety channels. Seg17, game segment; 60, Solar System Accretion cinematic; 80, Accretion game round 1; 130, Surface Features round 1. Thousandths place indicates time period or scale (1, 2, 3). Tenths and hundredths places indicate segment replay.

increasing the mass of her protoMoon. Her new knowledge exhibited the cognitive flexibility (Spiro, Vispoel, Schmitz, Samarapungavan, & Boerger, 1987) necessary for her to solve the problem of simultaneously accomplishing both accretion and increased heat. Figure 11.7 displays the speeds her slingshot gestures imparted to each selected asteroid before, during, and after the learning moment. The velocities before the learning moment are clearly much higher than after learning. The change in behavior was persistent over two rounds of gameplay. Behavior indicates cognitive flexibility because velocities clearly increase during Scale 3 for both rounds of gameplay.

The Timed Report measure of player performance allows inference of learning from behavioral performance. At every 10-s unit of gameplay, the *Selene Classic* version of the Timed Report measured if a player had

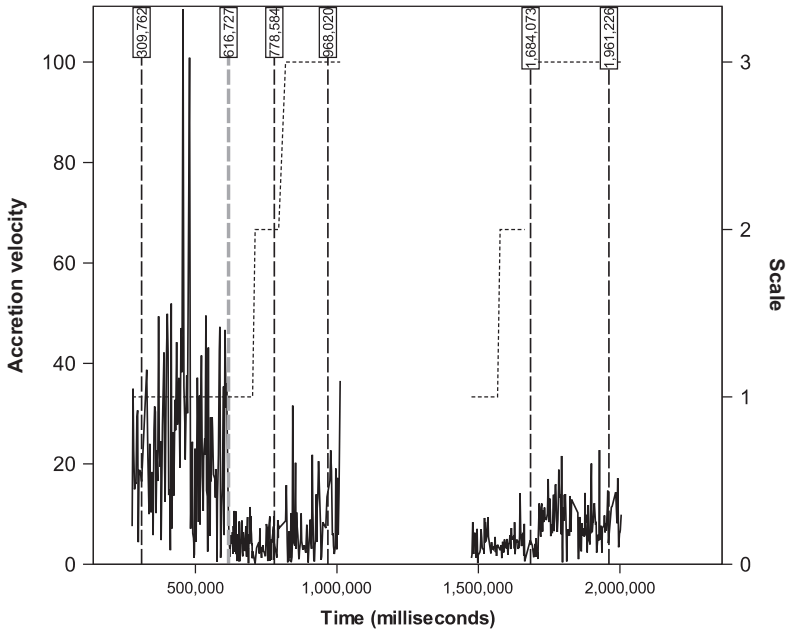

Figure 11.7 Player Mary's slingshot velocity (speed) over time during two rounds of Accretion module gameplay. Small dotted lines indicate level segment scale. Vertical, black, dotted lines indicate the time (milliseconds) at which the player responded to a Flowometer prompt (skill and challenge ratings). The vertical, gray, dotted line labeled 616,727 indicates the Accretion learning moment. Learning is indicated by a persistent, yet flexible, attenuation in the velocity impacted to selected asteroids.

progressed toward the goal (+1), away from the goal (−1), or accomplished no change in progress (0). Mary's cumulative Timed Report is linear and flat before the learning moment (Figure 11.8). After learning, the cumulative Timed Report rose steadily with a slope close to 1. This indicates continuous progress and achievement.

Affect and Achievement

The Flowometer (Figure 11.1) collected the segment 80.001 Flowometer report before Mary's learning moment. Report 80.001 categorized as boredom (Figures 11.6–11.8, millisecond 309,762). After learning, Mary was successful through two rounds of gameplay. Note that her Flowometer reports do not categorize within the flow channel. Rather, all post-learning moment Flowometer reports categorize within anxiety or worry channels. Consistent with self-report, the video of Mary displayed erect, alert posture, and consistent focus.

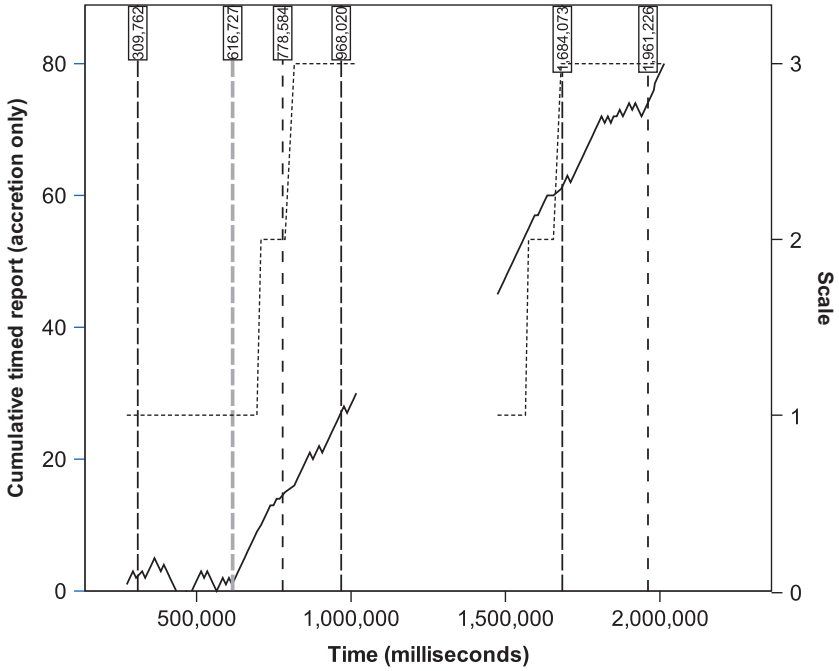

Figure 11.8 Player Mary's performance (cumulative Timed Report: learning inferred from gameplay behavior) over time during two rounds of Accretion module gameplay. Small dotted lines indicate level segment scale. Vertical, black, dotted lines indicate the time (milliseconds) at which the player responded to a Flowometer prompt (skill and challenge ratings). The vertical, gray, dotted line labeled 616,727 indicates the Accretion learning moment. Learning is indicated by a persistent and relatively consistent increase in the line connecting the cumulative timed report sum. The slope of the line approaches 1.

Ricardo's Learning Trajectories and Affect

Selene II

National Science Foundation funding (DRL-0814512) supported iterative design and development refinement of the game between 2010 and 2014, as *Selene II*. This version of the game increased the quality of all graphics and incorporated a greater number of gesture-linked sound effects. Figures 11.2 and 11.3 are screen captures from *Selene II* (the interested reader will find screen captures of *Selene Classic* accretion in Reese et al., 2012, Figures 9.5–9.7)

Accretion module gameplay remained the same across *Classic* and *Selene II*. Player promotion requires the player simultaneously achieves all active and required goals. Thus, promotion is performance-based. Accretion goals are static; they do not change within a game segment.

Surface Features module promotion is time-based. Surface Features runs according to a simulation of 4.5 billion years along a timeline (Figure 11.9). When time reaches a date milestone indicating the end of a targeted geological time period, a player promotes to the next segment (timed period). The *Classic* Surface Features module employed static goals. Unlike the *Classic* game, *Selene II* Surface Features employs dynamic goals. Goals update every gameplay second for target amount of lava flow and impact cratering (Figure 11.10, enlargement of Surface Features meter). The game provides player feedback within the Surface Features meter by superimposing plots of player progress for impact cratering and volcanism (amount of lava flow) over the game goals (Figure 11.11).

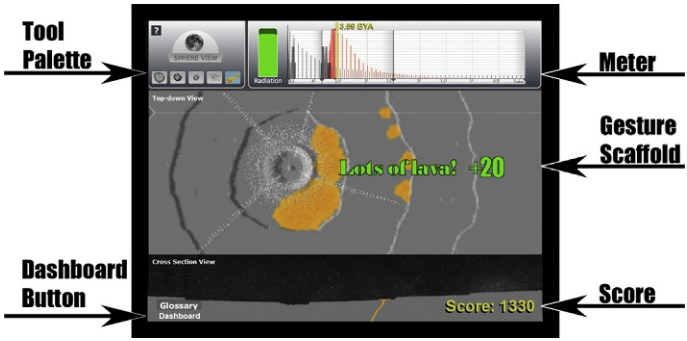

Figure 11.9 The Selene II Surface Features interface. The timeline is the meter for goal state (vertical lines, red for lava and gray for impact cratering) for impact cratering and volcanic activity (lava flow amount). The goal updates every second of game time, indicated by a timeline bar that moves to the right with current time. Selene II indicates player progress as shading (red for lava and gray for impact cratering). Colors cannot be represented in grayscale reproduction.

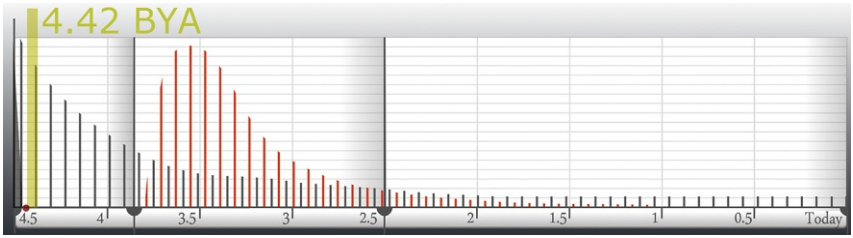

Figure 11.10 An enlargement of the Selene II Surface Features meter displaying the impact cratering and volcanism (lava) goals as vertical lines. In the game gray represents impact cratering and red, lava. Colors cannot be represented in grayscale reproduction. *Copyright 2010 Debbie Denise Reese. Used with permission.*

Figure 11.11 An enlargement of the Selene II Surface Features meter displaying the impact cratering and volcanism (lava) goals as vertical lines, the current time bar, and impact cratering and volcanism (lava) achievement by a hypothetical player (shading). In the game, gray represents impact cratering and red, lava. Colors cannot be represented in grayscale reproduction. *Copyright 2010 Debbie Denise Reese. Used with permission.*

Timed Report is an embedded assessment instrument. This means that it measures behavior during gameplay as an indicator of knowledge discovery and application. Embedded assessments have been characterized as stealth assessment (Shute, 2011; Shute & Ventura, 2013) because they "unobtrusively, accurately, and dynamically measure how players are progressing relative to targeted competencies" (Shute & Ventura, 2013, p. 5). The Timed Report posts every 10 s of gameplay, measuring player progress toward each active game goal. As in the *Selene Classic* version, the *Selene II* Timed Report posts processed data (−1, 0, 1). However, following recommendations by Larry V. Hedges, *Selene II* also posts raw data. Using the raw data, the primary *Selene II* Timed Report metric is percent progress toward each goal within each 10-unit time internal (Reese et al., 2012; Reese et al., 2015). The learning trajectory for constant progress toward a static game goal will look very much like the post-learning moment cumulative Timed Report in Figure 11.8, with a slope of 1. In Surface Features, the plot of gameplay for a player who consistently matches the game goal will be flat with a slope of zero. During Surface Features *Selene II* also collects and posts the amount of impact cratering and lava flow at the one-second level. These are the actual data used by *Selene II* in plotting player achievement on the Surface Features meters (Figures 11.10 and 11.11). A plot of one-second impact cratering and lava gameplay data is veridical to the meter and gameplay. One-second plots for case study players illustrate direct comparison of player trajectories to expert trajectories (dynamic goal states for impact cratering and volcanism).

All aspects of the Flowometer look and feel remain constant throughout all *Selene* revisions.

Manipulation: Scoring Fidelity

Because scoring motivates and reinforces players to seek goals, a game's scoring system seems to serve as a scaffold that induces goal-oriented behavior. Authentic video games provide layers of behavioral reinforcement to players through scoring systems that award points (or the equivalent) in response to player achievement. The industry standard in entertainment video games is an inflated scoring system (Schell, 2008) that keeps the player happy (and purchasing games). Case and pilot studies conducted in the CyGaMEs lab had suggested that instructional video game scoring must exhibit the same degree of fidelity as other components of the game world analog. We had found evidence that inflated scoring results in misaligned gameplay and poor performance (learning); aligned scoring results in viable gameplay and high achievement (manuscript in preparation). Scoring fidelity appears to be an essential component of alignment. The importance of scoring fidelity is predicted by pragmatic constraints theory (Holland, Holyoak, Nisbett, & Thagard, 1986; Holyoak, 1985; Holyoak, Lee, & Lu, 2010; Holyoak & Thagard, 1995). Theoretically, inflated scoring is an alignable difference between the game and targeted knowledge (Gentner & Markman, 1994, 1997). Ricardo and his classmates participated in a study that manipulated scoring fidelity to test the hypothesis that video game scoring fidelity acts as a pragmatic constraint on learning.

Our team had developed two versions of *Selene* Surface Features. The two versions are identical, except for the scoring system.

- *Aligned scoring*. If scoring determines learning, then scoring must accurately and appropriately guide learners to discover and apply targeted process and concepts. We label such a scoring system "aligned scoring." In the aligned scoring condition *Selene* rewards players for appropriate behavior (discovery and application of targeted science) with positive points. *Selene* awards bonus points for accurate gameplay, and the closer gameplay approaches impact cratering and lava flow goals, the greater the bonus. On the other hand, aligned scoring punishes the player when gestures cause impact cratering and lava activity that do not match goal states. For example, imagine a player launches four projectiles, and each causes lunar impact cratering to exceed the current goal state. Aligned scoring awards the player−40 points for each impact crater overage. Large, red numbers flash on the screen four times:−40,−40,−40,−40, and running score goes down (−160 points).
- *Inflated scoring*. The industry standard for scoring is biased toward positive points to make players feel good about playing (Schell, 2008). We label

such a system "inflated scoring." Game developers originally programmed *Selene* scoring to maximally reward and minimally punish. For example, consider inflated scoring when a player launches four projectiles that cause impact cratering to exceed the goal state. Inflated scoring awards +40 points for each impact crater. Large, green numbers flash on the screen four times: +40, +40, +40, +40, and running score goes up (+160 points). A red−10 also flashes once for the overage. The total change in running score goes up (+150).

Both Ricardo and his classmate, Juana, had been randomly assigned to the inflated scoring condition. Any post-game play (game iterations after completion of rounds 1 and 2) is reassigned to the aligned scoring condition. Pragmatic constraint theory would predict aligned scoring would assist players to construct viable mental models for targeted concepts.

Localization and Spanish Selene

In spring 2013, the CyGaMEs project introduced the Spanish version of *Selene*. Localization procedures conducted during translation of *Selene* into Spanish were designed to eliminate bias at the cultural level. Localization (Esselink, 2000) is the process of adapting a product to be linguistically and culturally appropriate to the target locale. Localization is identified in International Test Commission (ITC) guidelines (2010a, 2010b). Guidelines require that adaptations consider the "whole cultural context" in which an instrument is to be used (2010b, p. 1). In the case of *Selene*, the scope of localization included the instructional game and any interstitial language (e.g., registration, directions for playing the game, video translation and dubbing, textual components of graphics, and post-game descriptions of internet addresses for related external resources). In general, the main objective of video game localization is to maintain the look and feel of the original game. In addition, instructional video games used for instruction and research require accuracy and alignment. As recommended by O'Hagan and Mangiron Hevian (2004), the *Selene* localization process consisted of six different phases: preparation, localization, verification, review, game integration, and quality assessment. These distinct steps were aimed at addressing the various problems (Díaz Montón, 2006) that the translator faces during the localization of any video game. In order to ensure the quality of the localized version of *Selene*, CyGaMEs contracts with a professional translator who holds both a PhD in astrophysics (2002) and a Master's degree in translation (2010). She is a specialist in the localization process, and she is familiar with the astronomical concepts that constitute the basis of *Selene*. To further ensure the

overall quality and consistency between the different components of the video game, computer-assisted translation software together with a glossary of key terms and a translation memory was used. During linguistic review of the translated content, special attention was paid to the terminological consistency, the phraseology, the style and, in particular, the cross-references between functions, menus, options, buttons, and messages. The initial *Selene* localization process and translation were reviewed and approved in 2010 by a graduate committee at the University of Vic (Spain) specializing in translation for multimedia and scientific content. All translations were re-evaluated and improved when necessary during spring 2012 development of Spanish *Selene*.

MOTIVATING, REWARDING, AND INFORMING ACHIEVEMENT THROUGH BADGES, DASHBOARDS, ACHIEVEMENTS, AND LEADERBOARD

Badges

In 2013 CyGaMEs initiated a lunar geologist series of badges in collaboration with Badges for NASA Activities (CyGaMEs, 2013b, 2013d) with a two-stage rollout:

- Spring 2013: Three-star badge for completing all Accretion goals and two rounds of gameplay (two Accretion modules and two Surface Features modules);
- Summer 2014: Players who completed two rounds of gameplay and achieve all Accretion and Surface Features game goals qualify for the seven-star badge.

Algorithms use the Timed Report percentage progress toward game goals to calculate seven-star badge eligibility. A proficiency threshold criterion was set for each Surface Features goal. Players who complete *Selene* may log into the reporting system and claim their three- or seven-star badge. To date, only 1% of players have qualified for the seven-star badge.

Dashboard and Achievements

On March 17, 2014, CyGaMEs rolled out its dashboard and achievements (CyGaMEs, 2014a, 2014b). A player may earn an achievement for a learning goal by completing a segment and meeting a criterion. *Selene* awards 19 player achievement types (Figure 11.12). Players may earn each achievement multiple times. A player who earns all 19 achievement types earns

Figure 11.12 Selene II achievements. Colors cannot be represented in grayscale reproduction. *Copyright 2014 Debbie Denise Reese. Used with permission.*

lunar geologist status and that achievement button. A lunar geologist is equivalent to a seven-star badge, although the badge also requires a player complete two rounds of gameplay. The dashboard displays all achievements earned, current player progress, and highest game score (Figure 11.13). *Selene* displays earned achievements immediately after the player completes

Figure 11.13 A hypothetical Selene II dashboard, English language version. A player earning all 19 achievements earns lunar geologist status and that achievement button. Players may earn each achievement multiple times, represented by superscript above a badge. The lunar geologist is equivalent to the seven-star badge in the Badges for NASA Activities (number of badge stars indicated in upper right). The dashboard also displays a player's highest game score (upper right). Colors cannot be represented in grayscale reproduction. *Copyright 2014 Debbie Denise Reese. Used with permission.*

a game segment. This is a *game event*. A player may choose to display the dashboard at any time by clicking the "Dashboard" button. This is a *player dashboard gesture*.

The achievements were designed to cultivate a player's sense of mystery, wonder, and adventure. Astronomer Edwin Hubble (1929) was compelled by the *romance* of science. In this sense, the author has aspired to create an affective connection between science and the romantic.

Leaderboard

CyGaMEs rolled out its leaderboard in 2008 (CyGaMEs, 2013c), listing both the top 10 and top 100 player game scores. A player's game score is the final running game score at the end of each Surface Features module (Figures 11.3 and 11.9, lower right, for examples of running game score).

Annually, since July 2012, CyGaMEs staff move the previous leaderboard to an archive display and start a new board. This gives new players the opportunity to achieve leaderboard recognition. All CyGaMEs players are anonymously identified by access code and player identification number. To protect player anonymity even further, only scores are listed within the leaderboard. However, players may print their scores on player completion cards and dashboards, and this documentation provides support for volitional bragging rights.

Ricardo and his Classmates

Core case study player Ricardo is a 15-year-old boy. Ricardo and his 26 classmates are Spanish-speaking Europeans (12 girls and 15 boys; $age_{mean} = 15$, $age_{min} = 15$, $age_{max} = 17$). They all played Spanish *Selene II* during spring 2014. At registration, Ricardo reported he plays video games daily. On average, his classmates play less often (weekly), and one never plays video games. Ricardo rates his gameplay expertise as 52 on a scale from 0 (novice) to 100 (expert). The average expertise self-rating for the class is 44.5, and ratings run from 0 to 88. Classmate Juana provides data for comparison with Ricardo. She is also 15 years old. She reported that she plays video games constantly but ranked her expertise at 37.

Students in this sample registered for *Selene* through their science teacher, who had piloted the game with selected students in 2013. The success of that implementation led him to incorporate *Selene* into his curriculum, starting with spring 2014. CyGaMEs protocols required him to make provisions for students who did not wish to participate in CyGaMEs research or who lacked parental permission. The educator also gave his consent to participate in the research himself and prepared a written post-implementation report. A CyGaMEs researcher followed the report with a webinar interview.

When the teacher introduced his students to *Selene*, he explained instructional gameplay,

> *is a different form of learning in which you learn almost without realizing it and that, at the same time, Selene is a new form for evaluating and qualifying skills. By playing, students could learn curriculum concepts without having to attend classes or having to read the textbook.*

Within his report, this educator matched types of students with *Selene* performance:

(a) *Academically inclined students*: These students earn high grades on typical academic work, such as tests. Students who always want to get good

grades and usually get them had to play several times (or many times) to get the highest rating, the maximum points, goals, etc. They were methodical and constantly sought to meet requirements for an acceptable grade. Within these students, those who quickly completed *Selene* by earning three stars (the three-star badge) moved on to other activities. They did not intend to achieve all the objectives or learn more. They earned the lunar geologist three-star badge to achieve a good grade in the science unit. Then they moved on, devoting their time to something else.

(b) *Non-academic students*: These students typically do not score well on written tests and saw *Selene* as a new and different opportunity to improve their grades. It is clear that the opportunity to earn a high grade through gameplay encouraged some students.

(c) *Expert video gamers*: These students "play on a console as an extension of their hands." They were naturals and did not have to work hard to achieve good results in *Selene*.

(d) *Competitors*. Students who led the top of the leaderboard challenged each other to see who earned more points. It was as if they played a competition between themselves. Some of these students were surprised by the unexpected success of some of their classmates. Competitors were surprised by which players earned early success. The competitors were motivated to outperform those with early success.

Almost 4000 individuals have registered to play *Selene II*. Of these, only 55 qualify for seven-star badges (1%). Seven-star achievement and planetary geologist require equivalent achievement levels; 17 of these high achievers were Ricardo and his classmates (nine boys and eight girls).

Player Ricardo—A Competitor

Ricardo appears to be a competitor who came from behind to iteratively build a viable mental model and expertise, especially within the Surface Features module. Timed Report metrics, dashboards, and gameplay scores clearly document his persistence and improvement. Player logs suggest that Ricardo consulted the dashboard to build *Selene* expertise. He submitted 112 Flowometer reports. His subjective perceptions of experience during periods of learning did not categorize as flow. There is some evidence Ricardo experienced flow when he felt at the top of his game, controlling the game parameters. Patterns of high volume in player dashboard gestures during gameplay suggest Ricardo was building models of *Selene* expertise in applying Accretion and, especially, Surface Features concepts (see Table 11.1

and Appendix). Interleaving his learning trajectories, dashboard gestures, and Flowometer reports for Surface Features suggests Ricardo might have experienced eustress while using the dashboard to define and build expertise.

The following figures document the story of his achievement and affective response:

Table 11.1 Ricardo's replays and dashboard gestures by module, postgame, and round

Module	Postgame	Round	Replay	Dashboard gestures
Accretion				
	0			
		1	4	1
		2	1	4[a]
	1	–	5	1
	2	–	1	2
	3	–	0	1
	4	–	0	0
	5[b]	–	0	0
	6	–	0	1
	7[c]	–	0	1
Surface features				
	0			
		1	0	0
		2	0	1
	1	–	0	3
	2	–	0	6
	3	–	2	40[a]
	4	–	1	10[a]
	5[b]	–	0	7
	6	–	1	1
	7[c]	–	0	0
Non-gameplay				
	0			
		1	0	1
		2	0	2
	1	–	0	3
	2	–	0	2
	3	–	0	3
	4	–	0	2
	5[b]	–	0	2
	6	–	0	1
	7[c]	–	0	2

[a]Hypothesized: Defining expertise through dashboard.
[b]Earned lunar geologist (19 learning goals).
[c]Earned leaderboard first place.

- Figures 11.14 and 11.15 illustrate his goal achievement within the Accretion module.
- Figure 11.16 plots all his affective responses using the nine-channel format from flow theory.
- Figure 11.17 provides a nine-channel format for comparison player Juana.
- Figures 11.18–11.22 contain his *Selene* dashboards at critical incidents and the final dashboard for comparison player Juana.
- Figure 11.23 displays the *Selene* leaderboard at the time Ricardo earned first place.
- Figures 11.24 and 11.25 display a comparison between Ricardo's Surface Features module achievement and goal states at the one-second unit.

The Accretion Learning Moment

Figure 11.14 clearly illustrates Ricardo achieved the scale 1 Accretion learning moment. As illustrated in panel 14.a (post-game 0, replay 0), through data sequence number 45, his trajectory had been flat. Learning dynamics calculations (Reese et al., 2015) determine his rate of progress toward the goal before the learning moment, as $y' = 0$ with acceleration in learning $y'' = 0$. Change in learning progress (acceleration), because of the learning moment, is steep $y'' = 13.835$. After the learning moment his rate of learning progress (slope) is $y' = .998$, or approximately unity until progress reaches the goal (ceiling effect). This means that after the learning moment, almost every pre-goal slingshot gesture resulted in a unit of progress toward the mass goal. His successful performance replicates across 20 iterations of gameplay. (Note: Incomplete iterations may not exhibit a positive slope if gameplay was too short to establish the trajectory, as in panel 14 f.)

Ricardo posted a Flowometer report immediately before the learning moment (skill = 99 and challenge = 0). This is categorized as routine expertise (Figure 11.16a, dyad labeled 80.001 in lower right-hand corner of the routine expertise channel). Figure 11.14 suggests Ricardo's appraisal of his Accretion scale 1 proficiency was correct. Note that learning occurred within the pre-learning span of gameplay, but self-perceptions were not characterized by flow experience.

Meeting Simultaneous Accretion Goals (Scale 3) and Building Accretion Expertise

Accretion promotion is performance-based; players do not advance until they have simultaneously met segment 3 mass, radiation, and heat goals.

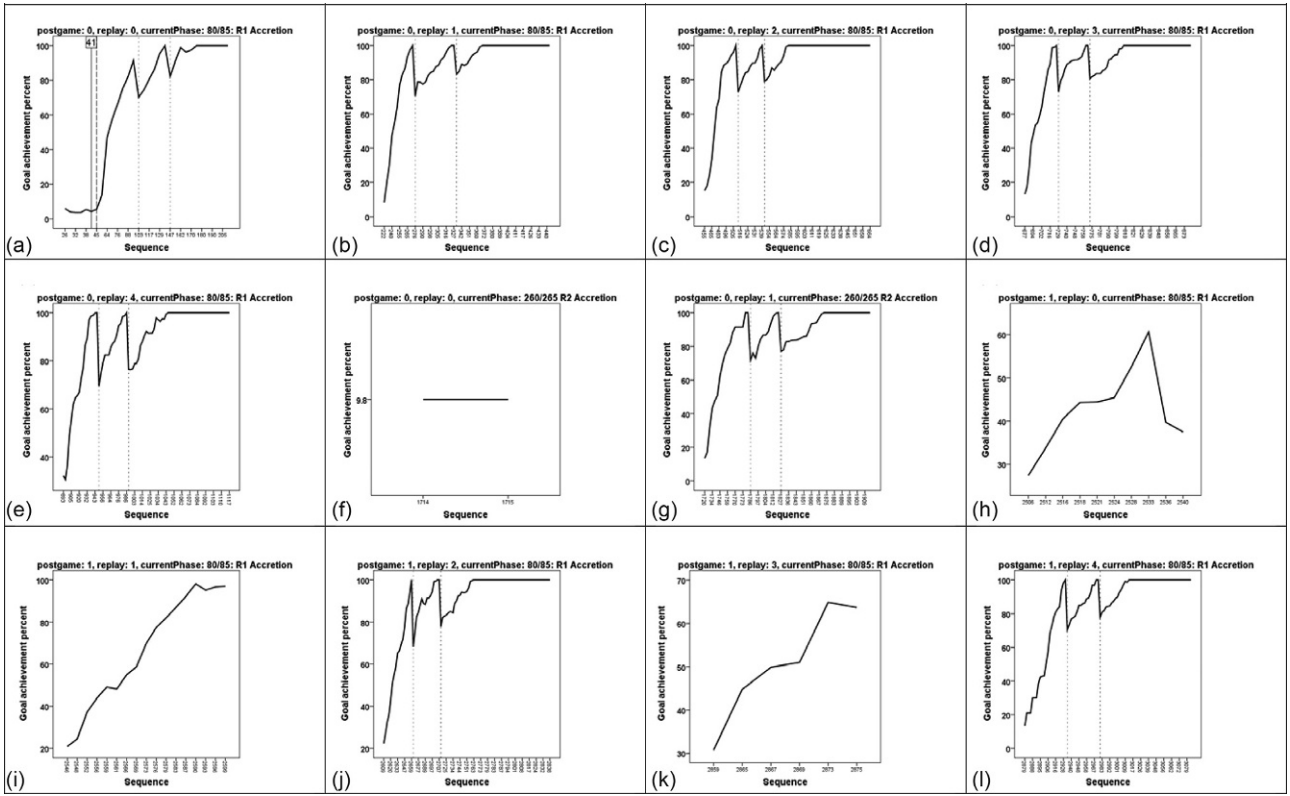

Figure 11.14 Player Ricardo's percent achievement toward Accretion mass goal over time (sequence), illustrating the learning moment in panel (a) at the dashed vertical line following the sequence #41 Flowometer measure (solid vertical line). Dotted vertical lines indicate a change of scale (scale 1-2 or scale 2-3) at promotion. Any dip in the mass line at a scale change indicates 100% at the previous scale is now 70% of the goal in the new scale. Figures without scale changes indicate an incomplete reply, that Ricardo exited Selene without completing the module.

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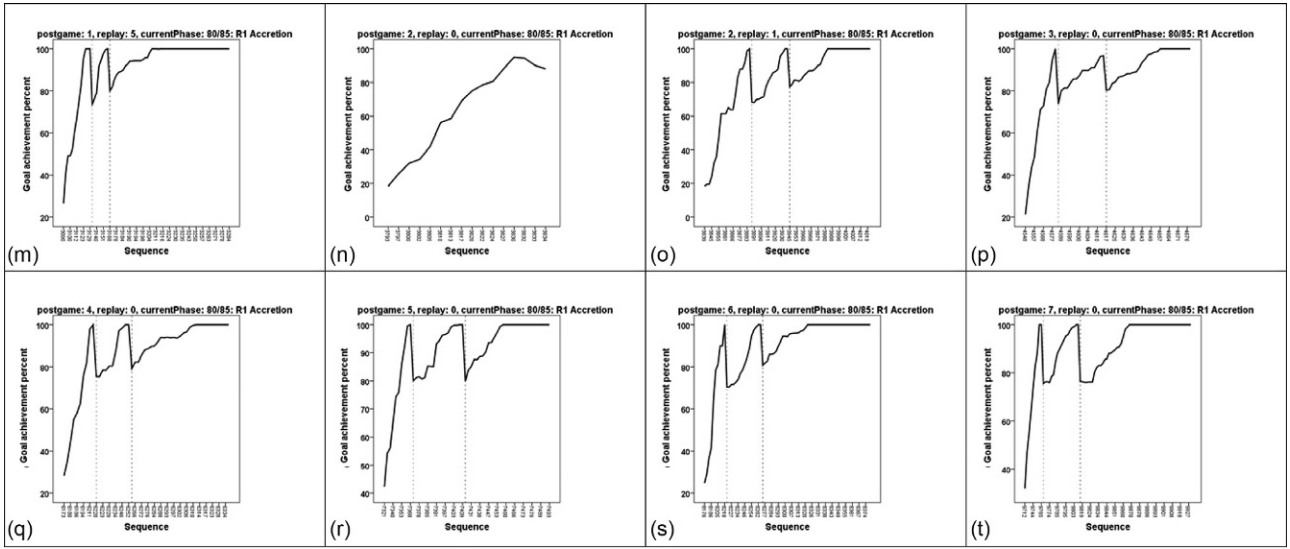

Figure 11.14—cont'd

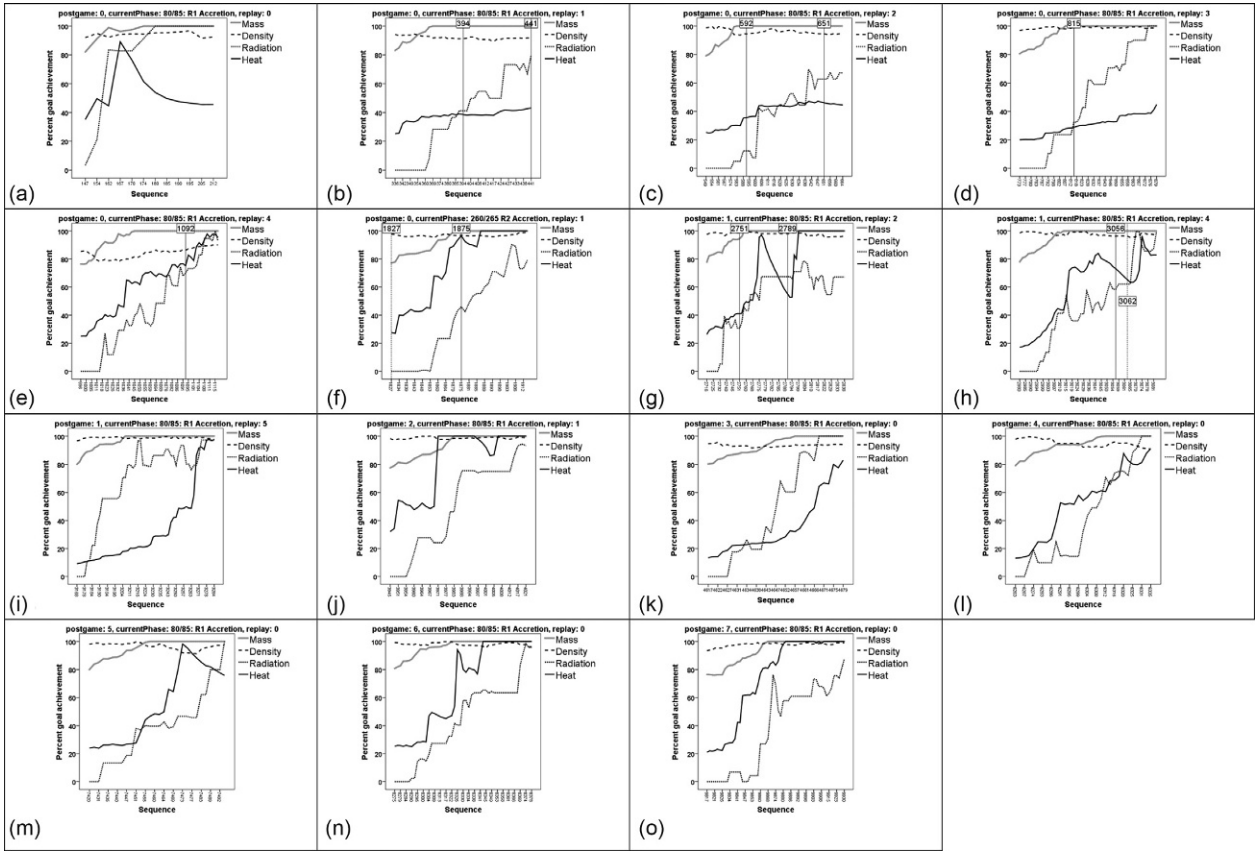

Figure 11.15 Player Ricardo's percent achievement toward four concurrent Accretion goals over time (sequence). Figures a-h: Solid vertical lines indicate a corresponding Flowometer report, dotted vertical lines indicate a corresponding player dashboard gesture, labels indicate closest preceding Timed Report sequence number.

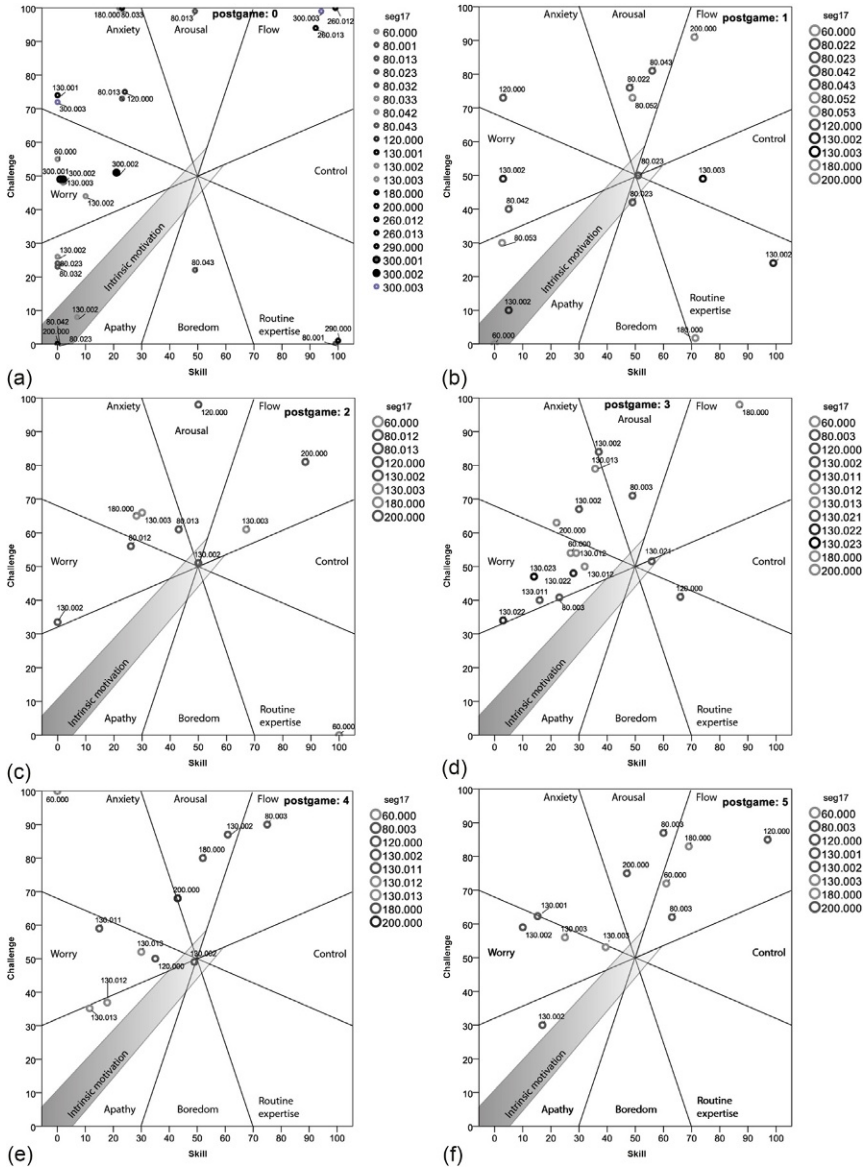

Figure 11.16 (a-h) Affective trajectory as case study player Ricardo earns lunar geologist status (all 19 achievements and goals). Seg17, game segment; 60, Solar System Accretion cinematic; 80, Accretion game round 1; 120, differentiation cinematic; 130, Surface Features round 1; 180, Magma Ocean instructional video; 200, Volcanism instructional video; 260, Accretion game round 2; 290, Differentiation cinematic round 2; 300, Surface Features game round 2. Thousandths place indicates time period or scale (1, 2, 3). Tenths and hundredths places indicate segment replay.

Continued

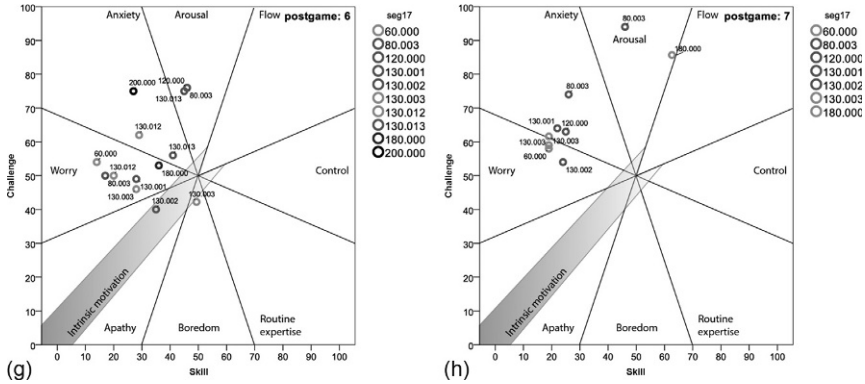

Figure 11.16—cont'd

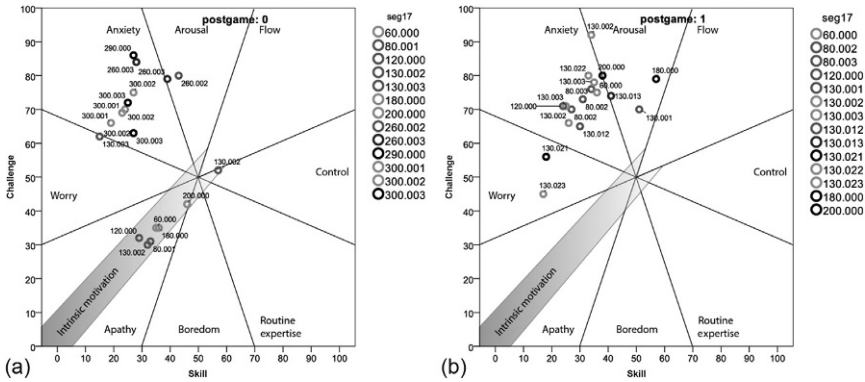

Figure 11.17 (a-b) Affective trajectory as comparison player Juana earns lunar geologist status (all 19 achievements and goals). Seg17, game segment; 60, Solar System Accretion cinematic; 80, Accretion game round 1; 120, Differentiation cinematic; 130, Surface Features round 1; 180, Magma Ocean instructional video; 200, Volcanism instructional video; 260, Accretion game round 2; 290, Differentiation cinematic round 2; 300, Surface Features game round 2. Thousandths place indicates time period or scale (1, 2, 3). Tenths and hundredths places indicate segment replay.

Although promotion does not require players to meet the density goal, the game (a) constantly prompts the player for the correct density choice and (b) provides scaffolds and point incentives for density choices (Figure 11.3). Players tend to score well on density ($N_{segment\ final\ scores} = 26{,}240$, $M = 93\%$, $SD = 0.06$, median $= 95\%$), suggesting they attempt to meet the goal, even though it is not required for promotion. Overall, Ricardo achieved higher density percentage than the typical player ($N_{segment\ final\ scores} = 30$, $M = 98\%$,

Figure 11.18 Dashboard—case study player Ricardo before earning lunar geologist at postgame = 3, replay = 2 (flow channels, see Figure 11.16d, performance see Figures 11.22e and 11.23e). Colors cannot be represented in grayscale reproduction. Use zoom feature in PDF to examine dashboard details.

Figure 11.19 Dashboard—case study player Ricardo earns lunar geologist at postgame = 5, replay = 0 (flow channels, see Figure 11.16f, performance see Figures 11.22g and 11.23g). Colors cannot be represented in grayscale reproduction. Use zoom feature in PDF to examine dashboard details.

Figure 11.20 Dashboard—case study player Ricardo's gameplay iteration while achieving leaderboard first place at postgame = 7, replay = 1, during Timed Period 3. Previous high score is displayed (postgame 6). Colors cannot be represented in grayscale reproduction. Use zoom feature in PDF to examine dashboard details.

Figure 11.21 Dashboard—case study player Ricardo's gameplay iteration achieves leaderboard first place at postgame = 7, replay = 0 (see flow channels, see in Figure 11.16h. See also leaderboard in Figure 11.17 and Surface Features performance in Figures 11.22j and 11.23j). Colors cannot be represented in grayscale reproduction. Use zoom feature in PDF to examine dashboard details.

Figure 11.22 Dashboard—comparison player Juana's dashboard earns lunar geologist at postgame = 1, replay = 2 (flow channels, Figure 11.16b). Colors cannot be represented in grayscale reproduction. Use zoom feature in PDF to examine dashboard details.

Figure 11.23 Case study player Ricardo's leaderboard at first place (score 16,405: right-hand column). Colors cannot be represented in grayscale reproduction.

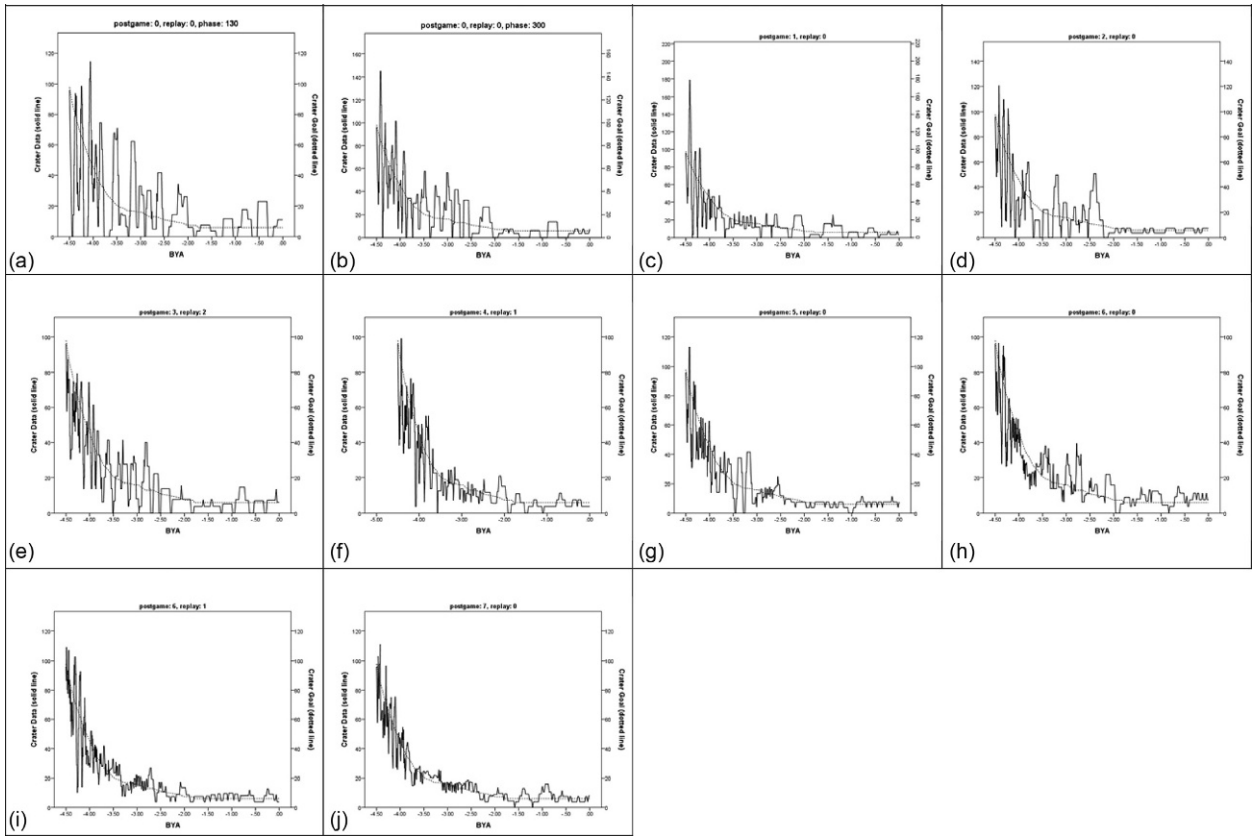

Figure 11.24 (a-j) Case study player Ricardo's Surface Features achievement comparing goal state (dotted line) to cratering learning goal achievement (solid line) for impact cratering across 10 iterations of Surface Features gameplay.

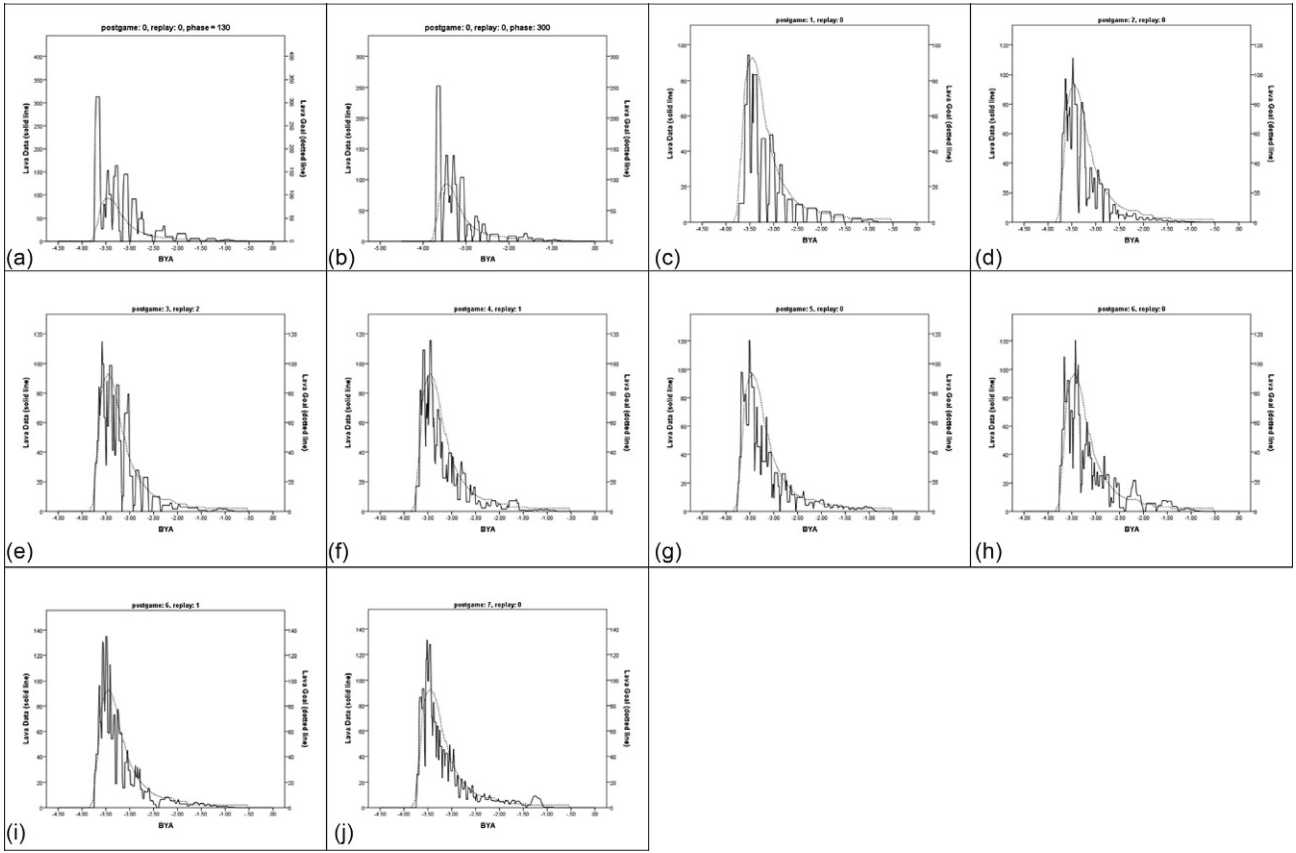

Figure 11.25 (a-j) Case study player Ricardo's Surface Features achievement comparing goal state (dotted line) to volcanism (lava) learning goal achievement (solid line) for impact cratering across 10 iterations of Surface Features gameplay.

SD = 0.03, median = 99%). During his first round of gameplay (post-game = 0), Ricardo required five attempts (four replays) to simultaneously meet the three goals of heat, mass, and radiation (Table 11.1). During replay 4, his Scale 2 density achievement dropped to 85%, accompanying a Flowometer report of intrinsic motivation (skill = 0, challenge = 1; see Figure 11.16a). His Scale 3 density achievement was also low (90.1%), accompanying a Flowometer report of boredom (skill = 49, challenge = 22; see Figure 11.16a). It was during this period that Ricardo adapted his mental model to support cognitive flexibility. Simply executing a model of low-velocity collisions, as realized at the Accretion learning moment, resulted in failure (losing the game with a dead moon). Adequately modeling the physics required Ricardo to maximize kinetic energy, while balancing the force of collisions with the growing Moon's force of gravity. His gameplay effort focused on meeting heat, mass, and radiation goals concurrently. His learning trajectory for these goals is clearly evident in Figure 11.15: compare panels 15a–d with the mastery in panel 15.e. As achievement increased, Ricardo's subjective experience trajectory moved from routine expertise to anxiety, to arousal, to intrinsic motivation, to apathy, to anxiety, to intrinsic motivation, and finally boredom (see Figure 11.16a: dyad 80.043 and Appendix).

At no time during Accretion learning did Ricardo's Flowometer reports categorize within the flow channel. However, while executing his round 2 Accretion gameplay, his flow ratings for both Scale 2 (mass and density goals) and Scale 3 (four goals, see Figure 11.15f) categorized as flow; see Appendix and

- For Scale 2 skill-challenge dyad (99,100), see Figure 11.16a segment 260.012;
- For Scale 3 skill-challenge dyad (92,94), see Figure 11.16a segment 260.013.

He also accessed the dashboard four times during this iteration of Accretion module gameplay. Since his goal achievement was stable, dashboard gestures suggest he was building his model of Accretion expertise.

Building Surface Features Expertise

Ricardo participated in the scoring fidelity study. His condition, inflated scoring, reduces the penalty for incorrect gameplay. For example, during round 1 Surface Features, Timed Period 2 (Figure 11.24, panel a), Ricardo's lava flow was 300 units, 250 units above the goal state of 50. Over three consecutive scoring periods, he lost a maximum of 30 points for exceeding the goal (one penalty per time period), but his score increased from 1360 points

to 1630 points. His flow dyad (0,26) collected during this gameplay period classified as apathy (see Appendix, Flow ID 12). He earned no cratering or lava achievements. He exceeded time period 1 and 2 lava placement penalties but did earn a time period 3 lava placement (lava penalty on the dashboard) achievement. The inflated scoring did not seem to enhance his mental model. He did not execute any dashboard gestures. Over the course of this module, his flow channel trajectory progressed into intrinsic motivation and worry.

At completion of round 2 Accretion, Ricardo had been logged into *Selene* for 2.5 h. He continued gameplay, investing another 24 min to play his round 2 Surfaces Features module. His impact cratering and lava flow trajectories demonstrate an attempt to model game goals (Figures 11.24 and 11.25, panels a and b), but far afield from mastery levels set on the dashboard as criteria for impact cratering and volcanism achievement. That Ricardo attempted to follow game goals is demonstrated by meeting round 2 criteria for the three lava placement goals, one for each Surface Features time period (see lava penalties achievements and sample dashboard, Figures 11.12 and 11.13). He checked the dashboard once, at sequence 2318. This dashboard gesture occurred between two Flowometer prompts:

- Flowometer prompt ID 23, segment = 300.002, dyad = (21,51), channel = worry;
- Flowometer prompt ID 24, segment = 300.003, dyad = (0,72), channel = anxiety.

At the close of the round 2 Surface Features module, he had earned three lava penalty achievement buttons. His skill and challenge ratings again classified as flow (94,99).

Ricardo began his post-game iterations of gameplay the next day. Surface Features achievement steadily improved over the next 21 days, through seven post-game iterations (Figures 11.24 and 11.25). Across these games his Surface Features Flowometer reports classified within worry, anxiety, or arousal channels 73% of the time (Table 11.2). His scores steadily improved (Table 11.3, all post-game scoring uses the aligned scoring algorithm).

Ricardo earned his first impact cratering and lava achievements during post-game = 1, time period 2. Figures 11.24c and 11.25c show his significant improvement in meeting both goals. Ricardo also earned all three lava placement achievements (maximum lava penalties) during this game.

During post-game 3 Ricardo initiated 40 dashboard gestures (Table 11.1), building his definition of Surface Features expertise. He used

Table 11.2 Ricardo's flowometer ratings for surface features module, postgame greater than 0: Frequency and percent of flowometer ratings within each channel (channels calculated using both nine and intrinsic motivation models)

	Flow channel model			
	Nine channel		Intrinsic motivation	
	Frequency	Percent	Frequency	Percent
Apathy	3	7	3	7
Boredom	1	2	1	2
Worry	20	49	20	49
Anxiety	6	15	6	15
Routine expertise	1	2	1	2
Control	2	5	1	2
Arousal	4	10	3	7
Intrinsic motivation	3	7	5	12
Flow	1	2	1	2
Total	41	100	41	100

Table 11.3 Case study players Ricardo and Juana: Highest game scores by postgame

	5358		5413	
Postgame	Score	Replay	Score	Replay
0, round 1	3200	0	2755	0
0, round 2	2905	0	3370	0
1	5560	0	13,420[a,b]	2
2	8165	0	–	–
3	8835	2	–	–
4	11,275	1	–	–
5	12,595[a]	0	–	–
6	13,300[c]	1	–	–
7	16,405[d]	0	–	–

Note: Leaderboard standing is determined at the time the score is earned. Standings and score rankings update continuously.
[a]Earned lunar geologist (19 learning goals).
[b]Earned leaderboard fifth place.
[c]Earned leaderboard fourth place.
[d]Earned leaderboard first place.

the dashboard as a strategy to monitor his progress. He exited the game, as if dissatisfied, and he initiated two replays. Figure 11.18 is a screen capture of the dashboard Ricardo viewed at the conclusion of post-game = 3. This dashboard displays the number of times Ricardo earned each achievement button and the high quality of his performance during this iteration.

Ricardo continued to monitor progress during post-game 4 (10 dashboard gestures, 1 replay). He earned lunar geologist at post-game 5 (seven dashboards, no replays, see Figure 11.19). Figure 11.24g displays his cratering goal achievement, and Figure 11.25g, his lava goal achievement. We continue to trace his progress toward victory (the dashboard, Figure 11.19, and goal achievement in Figures 11.24 and 11.25). At post-game 7, Ricardo earned the highest *Selene* leaderboard score (see dashboard in Figure 11.21). His Flowometer reports throughout the iteration classify as worry, anxiety, and arousal (see Appendix). He did not access the dashboard during gameplay. Given his post-game 3 and subsequent behavior, his investment of time and effort, and the high quality of his post-game 7 gameplay, it appears Ricardo was confident that he could rely on his internalized model of *Selene* expertise.

This is a significant accomplishment by both the player and the game.

Ricardo had earned the highest leaderboard standing of the year. His goal achievement is exceptional. He was certainly persistent, engaged, and invested. But, as he gained expertise, his self-perceptions of experience tended toward eustress rather than flow.

The Attitude Scale

Recall the science teacher of Ricardo, Juana, and their classmates classified his students into gamers, competitors, academically inclined students, and non-academic students. We developed an attitude scale to measure players' attitudes toward science, learning, video games, *Selene*, science video games for learning, and the Moon. We piloted the scale with his students. A total of 21 students logged into the *Selene II* reporting system and completed the 17-item instrument (0 = strongly disagree; 1 = disagree; 2 = somewhat disagree; 3 = neither disagree nor agree; 4 = somewhat agree; 5 = agree; 6 = strongly agree; see Figure 11.26). The 17 items are (Spanish followed by English translation, this sample of 21 players read only the Spanish version):

- *Me gusta la ciencia.*/I like science.
- *Me gusta estudiar ciencia en el colegio.*/I like to study science in school.
- *REV No me gusta estudiar ciencia cuando no estoy en el colegio.*/I do not like to study science when I am not in school.
- *Me gusta la Luna.*/I like the Moon.
- *REV No me gusta estudiar la Luna en el colegio.*/I do not like to study the Moon in school.
- *Me gusta estudiar la Luna cuando no estoy en el colegio.*/I like to study the Moon when I am not in school.

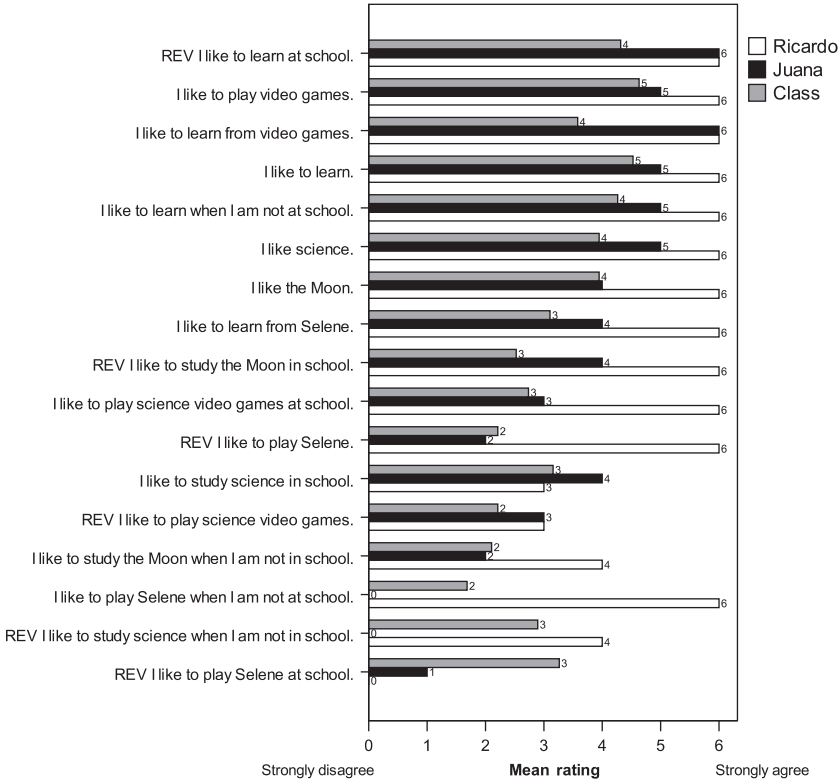

Figure 11.26 Attitude scale items, case study player Ricardo vs. comparison player Juana vs. class ($n = 20$). REV, reversed: stem is the reversed version. Note: 0 = strongly disagree, 1 = disagree, 2 = somewhat disagree, 3 = neither disagree nor agree, 4 = somewhat agree, 5 = agree, 6 = strongly agree.

- *Me gusta jugar videojuegos.*/I like to play video games.
- *REV No me gusta jugar videojuegos de ciencia.*/I do not like to play science video games.
- *Me gusta jugar videojuegos de ciencia en el colegio.*/I like to play science video games at school.
- *Me gusta aprender con videojuegos.*/I like to learn from video games.
- *REV No me gusta jugar Selene.*/I do not like to play *Selene*.
- *REV No me gusta jugar Selene en el colegio.*/I do not like to play *Selene* at school.
- *Me gusta jugar Selene cuando no estoy en el colegio.*/I like to play *Selene* when I am not at school.
- *Me gusta aprender con Selene.*/I like to learn from *Selene*.

- *Me gusta aprender.*/I like to learn.
- *REV No me gusta aprender en el colegio.*/I do not like to learn at school.
- *Me gusta aprender cuando no estoy en el colegio.*/I like to learn when I am not at school.

Our exploratory factor analysis using principal axis factoring and oblimin rotation with Kaiser normalization has revealed four possible subscales. The Cronbach alpha results reported below used the structure matrix, which included cross-loading factors:

- *Individual interest* ($\alpha = 0.89$) suggests the student invests discretionary time to study science, to study the Moon, and to play science video games. Individual interest was defined and has been studied extensively by Ann Renninger and her colleagues (Hidi & Renninger, 2006; Renninger, Hidi, & Krapp, 1992). The student with individual interest might invest a great deal of discretionary time and effort to master *Selene* and *Selene* science.
- *Like to study science or learn* ($\alpha = 0.88$) suggests the student likes science and/or likes to learn. Such a student might work hard to master *Selene* science.
- *Like video games* ($\alpha = 0.77$) suggests students like to play video games or learn from them. Students who were competitive about earning top *Selene* game scores might classify within this factor.
- *Academically inclined students* ($\alpha = 0.70$) suggests students like to learn or study the Moon at school. Students described by their science teacher as academically inclined, those who played *Selene* to get their good grade and move on, might classify within this factor.

Figures 11.26–11.28 compare individual items and subscales (a) between Ricardo and Juana and (b) between Ricardo and his classmates.

The most striking difference between Ricardo and his classmates is his highly developed individual interest ($M_{\text{Ricardo}} = 5$, $M_{Juana} = 2.1$, $M_{class} = 2.6$). This agrees with what we know about Ricardo, such as the 22 h he invested to master the game. His scores exceed those of his classmates on many individual items and all subscales. Indeed, he rated 11 items as a 6: strongly agree. A sum of subscores clearly shows Ricardo's attitude is more positive than his classmates (Figure 11.28). Ricardo's subscale scores remain higher than his classmates' scores, even if classmates are disaggregated into lunar geologists and those who did not qualify (Table 11.4). Lunar geologists do score higher than non-lunar geologists, but no differences are statistically significant at the 0.05 level unless Ricardo is included in the lunar geologist group.

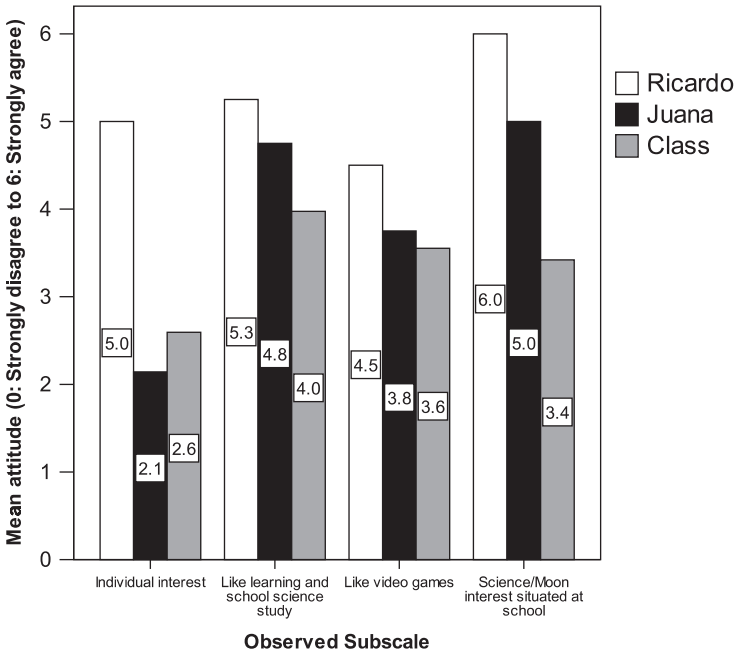

Figure 11.27 Attitude subscale mean scores, case study player Ricardo vs. comparison player Juana vs. class ($n = 20$). Note: 0 = strongly disagree, 1 = disagree, 2 = somewhat disagree, 3 = neither disagree nor agree, 4 = somewhat agree, 5 = agree, 6 = strongly agree.

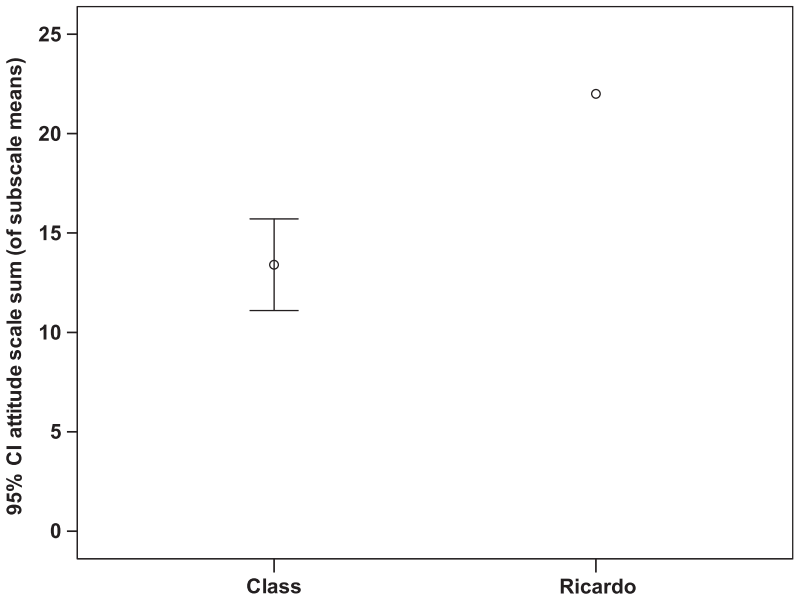

Figure 11.28 Attitude scale (sum of subscale means), case study player Ricardo vs. class mean ($n = 20$). Note: 0 = strongly disagree, 1 = disagree, 2 = somewhat disagree, 3 = neither disagree nor agree, 4 = somewhat agree, 5 = agree, 6 = strongly agree.

Table 11.4 Comparison of Ricardo's attitude subscale score to classmate subscale means for lunar geologists and non-lunar geologists

			Lunar geologist		
	Did not qualify		Others		5358
	Mean	*SD*	Mean	*SD*	Mean
Individual interest	2.2	1.7	2.8	1.4	5.0
Like to study science or learn	3.1	1.6	4.0	1.3	5.0
Like video gamess	3.1	1.4	4.1	1.9	6.0
Academically inclined	2.6	1.5	4.1	1.8	6.0
n	8	–	12	–	1

Ricardo reported he did not like to play *Selene* at school; neither did Juana. Unlike these two, their classmates were willing to play during class ($\text{rating}_{\text{Ricardo}} = 0$, $\text{rating}_{\text{Juana}} = 1$, $\text{rating}_{\text{class}} = 3.2$).

Juana did not like to study science when not at school. She did not like to play *Selene*, whether at school or not at school. She scored low on individual interest (2.1/6). She is more academically inclined than her peers ($M_{\text{Ricardo}} = 6$, $M_{Juana} = 5$, $M_{class} = 3.5$). Given her non-interest in *Selene* and relative non-interest in lunar science, she might be inclined to do what was necessary to earn a high grade on *Selene* and move on to other tasks. That said, both Ricardo and Juana strongly agreed they like to learn at school and like to learn from video games.

Comparison Classmate Juana: Differing Attitudes and Success Rates, Similar Flow Ratings

Juana's player logs and dashboard support Juana's classification as one of the academically inclined students. In fact, she seems to be archetypical of her teacher's description of the academically inclined student. She earned the lunar geologist level within post-game 1 after two replays (3 iterations) of Surface Features (see dashboard in Figure 11.22). Her post-game 1 score of 13,420 put her in 5th place at the time she earned it. This score is roughly equivalent to the score earned by Ricardo in post-game 7. During post-game 0, Juana had consulted the dashboard 12 times to build expertise (Table 11.5). During post-game 1 she consulted the dashboard seven times during replay 0, but only once during replay 1 and once during 2. This suggests she felt confident of her ability to use the surface meter to judge her level of expertise.

Juana was also strategic in her efforts. The time period 1 crater goal challenged her, as did time period 3 cratering and lava. Her dashboard

Table 11.5 Five players with highest number of dashboard activation requests (player gesture) per module by postgame and overall number of requests and mean across all dashboard-eligible players[a]

Player (PID)	Postgame	Module	*N*	Replays[b]	*Mean*
5358[c,d]					
	3	Surface features	41	4	–
	4	Surface features	10	2	–
	All	All	97		–
5413[c,e]					
	0, round 2	Surface features	12	0	–
	1	Surface features	9	2	–
	All	All	26		–
4286[c]					
	1	Surface features	9	2	–
	All	All	14		–
5327[c]					
	1	Surface Features	9	0	–
	All	All	13		–
5415[c]					
	0, round 1	Surface features	12	1	–
	All	–	20		–
All players[f]	All	All	409		4

[a]Processed on May 22, 2014, 8 a.m. Eastern Daylight Time.
[b]Players with replays exit out of the game before completing the module and log back in to repeat it.
[c]Spanish player.
[d]Core study player Ricardo.
[e]Comparison player Juana.
[f]$N = 100$.

(Figure 11.22) and graphs of lava and impact cratering over time (not provided) show that she concentrated her efforts on obtaining the Time Period 3 cratering and lava achievements. For example, she earned multiple achievements for time period 2 impact cratering (4) and lava flow (5), but only the one time period 1 cratering achievement she had earned early on during post-game 0, round 2.

Once Juana earned lunar geologist, she was finished. Unlike Ricardo, any motivation or excitement Juana felt about her 5th place standing on the leaderboard did not result in any additional gameplay.

Ricardo and Juana clearly situated their *Selene* achievement within different attitudes toward the game and interest in *Selene* and studying science and the Moon outside of academic requirements. Their behaviors during gameplay were different, and Juana exhibited greater facility at meeting game achievement criteria. In fact, 14 of the 16 class members who achieved lunar geologist had done so by post-game 1. One required three post-games.

And only Ricardo required five. Yet, Ricardo and Juana exhibit very similar patterns of flow channels (Figures 11.16 and 11.17). As with Ricardo, Juana's rating dyads for round 1 modules classify within intrinsic motivation. Juana's dyads for round 2 and post-game 1 classify within worry, anxiety, and arousal channels.

CONCLUSION AND DISCUSSION

One of the exciting affordances of cyberlearning technologies, such as instructional video games is the ability to structure data collection during video gameplay to support learning analytics. With appropriate specification and instrumentation (Reese & Gobert, 2012), player logs can produce information supporting inferences about learning and how people feel during learning. Such gameplay data represent authentic, *in situ* behavior logged during learning. Data can be designed for rigorous analyses that profile learners' feelings (subjective experience), while learners discover and apply new knowledge. Such informatics can guide design principles, design, development, implementation, adoption, and evaluation. They can provide information for assessment and mentoring. Perhaps most importantly, they can communicate directly with learners to guide personal discovery and application of new knowledge, decisions, meta-awareness, and self-regulatory executive functions. The *Selene* dashboard acted in just this manner. The dashboard provided just-in-time information. Players used this information to define and acquire expertise.

Using player logs of gameplay behavior and achievement, Flowometer reports, and an externally administered attitude survey, this case study examined records for three players to investigate the assumption that learning during instructional games is accompanied by self-perceptions that classify as flow experience. During and while applying fundamental Earth and space science concepts to reach levels of expertise, these players of the *Selene* instructional game often reported flow dimensions of skill and challenge that classify as worry, arousal, and anxiety. These concurrent levels of challenge and skill supported achievement, but they were not balanced and high, as would be required for flow states. Challenge was higher than the skill level. Because the players were successful, these states would categorize as a productive type of stress known as eustress.

Players constructed their mental models of targeted concepts and application of those concepts through successive inquiry using gameplay gestures to interact with and modify the game state. The game taught those concepts through scaffolds (changes in the game state, text messages, game-stopping

help, points, and running score). *Selene II* players used the dashboard to build expertise, to improve and refine their mental models. While defining their mental models of expertise, players often paused their gameplay to consult the *Selene* dashboard. Once expertise was reached, the players relied on the game meters.

Through gameplay and achievements, I hope ideas of science become the subject of daydreams. I seek to prepare youth so those marvelous dreams of today inspire the innovative deeds of tomorrow.

As Ricardo's round 2 log data demonstrated (see Appendix), player perceptions that categorize as flow may occur when players think they are manipulating the game to their own ends. However, these appraisals may be premature and naive. Ricardo required an additional 18.7 h to master *Selene*, to earn the top score in 3749 players. And as Ricardo achieved this goal, his final states did not categorize as flow; while climbing the summit of mastery, his states categorized as anxiety, worry, and arousal.

Learning is tough. Even in instructional games, learning can be tough. Learning can be rewarding. But, as these players demonstrated, learning takes tenacity, persistence, struggles against challenges. And as learners build skill and knowledge, as they refine and hone a model of expertise, they just may become more aware of and sensitive to the levels of challenges they dare to conquer.

ACKNOWLEDGMENTS

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APPENDIX

Number of Dashboard Gestures and Replays per Module with Channels (Nine-Channel Model and Intrinsic Motivation Model), Skill and Challenge Ratings, Score at Flowometer Prompt, and Situators (e.g., Time, Date, and Selene Location)

						Channel Model										
Flow ID	Flow response sequence	Postgame (Iteration)	Round	Segment[a]	Gameplay module	Nine	Intrinsic motivation	Skill	Challenge	Replay[b]	Dashboard gestures[b]	Score	Mo.	Day	Hour
0	20	0	1	60	—	Worry	Worry	0	55	0	1	0	2	28	9:05:44 AM
1	43	0	1	80.001	Accretion	RE	RE	99	0	4	1	-25	2	28	9:08:20 AM
2	393	0	1	80.013	Accretion	Anxiety	Anxiety	23	73	4	1	905	3	20	1:58:52 PM
3	443	0	1	80.013	Accretion	Arousal	Arousal	49	99	4	1	1085	3	20	2:02:15 PM
4	591	0	1	80.023	Accretion	IM	IM	0	0	4	1	745	3	20	2:11:35 PM
5	653	0	1	80.023	Accretion	Apathy	Apathy	0	24	4	1	1005	3	20	2:16:01 PM
6	752	0	1	80.032	Accretion	Apathy	Apathy	0	23	4	1	410	3	20	2:24:00 PM
7	817	0	1	80.033	Accretion	Anxiety	Anxiety	22	100	4	1	820	3	20	2:29:51 PM
8	988	0	1	80.042	Accretion	IM	IM	0	1	4	1	510	3	20	2:41:56 PM
9	1094	0	1	80.043	Accretion	Boredom	Boredom	49	22	4	1	1130	3	20	2:48:55 PM
10	1133	0	1	120	—	Anxiety	Anxiety	24	75	0	1	1260	3	20	2:52:50 PM
11	1238	0	1	130.001	SF	Anxiety	Anxiety	0	74	0	0	1360	3	20	2:59:31 PM
12	1309	0	1	130.002	SF	Apathy	Apathy	0	26	0	0	1630	3	20	3:02:33 PM
13	1460	0	1	130.002	SF	IM	IM	7	8	0	0	2550	3	20	3:08:46 PM
14	1521	0	1	130.002	SF	Worry	Worry	10	44	0	0	2600	3	20	3:12:35 PM
15	1620	0	1	130.003	SF	Worry	Worry	2	48	0	0	3050	3	20	3:18:09 PM
16	1690	0	1	180	—	Anxiety	Anxiety	23	100	0	1	3200	3	20	3:27:12 PM
17	1696	0	1	200	—	IM	IM	0	0	0	1	3200	3	20	3:33:16 PM
18	1798	0	2	260.012	Accretion	Flow	Flow	99	100	1	4	285	3	20	4:19:50 PM
19	1877	0	2	260.013	Accretion	Flow	Flow	92	94	1	4	870	3	20	4:25:01 PM

20	1931	0	2	290	—	RE	RE	100	1	0	2	1085	3	20	4:29:09 PM
21	1992	0	2	300.001	SF	Worry	Worry	1	49	0	1	1165	3	20	4:32:17 PM
22	2194	0	2	300.002	SF	Worry	Worry	2	49	0	1	1985	3	20	4:40:05 PM
23	2307	0	2	300.002	SF	Worry	Worry	21	51	0	1	2395	3	20	4:44:53 PM
24	2382	0	2	300.003	SF	Anxiety	Anxiety	0	72	0	1	2625	3	20	4:49:35 PM
25	2439	0	2	300.003	SF	Flow	Flow	94	99	0	1	2825	3	20	4:53:34 PM
26	2493	1	1	60	—	IM	IM	0	0	0	3	0	3	21	11:24:22 AM
27	2685	1	1	80.022	Accretion	Arousal	Arousal	48	76	5	1	380	3	21	11:44:28 AM
28	2752	1	1	80.023	Accretion	Boredom	Boredom	49	42	5	1	930	3	21	11:49:00 AM
29	2790	1	1	80.023	Accretion	Control	IM	51	50	5	1	1080	3	21	6:23:06 PM
30	2951	1	1	80.042	Accretion	Worry	Worry	5	40	5	1	335	3	21	6:45:42 PM
31	3058	1	1	80.043	Accretion	Arousal	Arousal	56	81	5	1	1025	3	21	6:53:09 PM
32	3160	1	1	80.052	Accretion	Arousal	Arousal	49	73	5	1	465	3	21	7:01:03 PM
33	3223	1	1	80.053	Accretion	Apathy	Apathy	4	28	5	1	1140	3	21	7:05:50 PM
34	3300	1	1	120	—	Anxiety	Anxiety	3	73	0	3	1195	3	21	7:12:03 PM
35	3467	1	1	130.002	SF	Worry	Worry	3	49	0	3	2325	3	21	7:20:44 PM
36	3555	1	1	130.002	SF	RE	RE	99	24	0	3	3340	3	21	7:24:42 PM
37	3620	1	1	130.002	SF	IM	IM	5	10	0	3	4230	3	21	7:27:50 PM
38	3732	1	1	130.003	SF	Control	Control	74	49	0	3	5400	3	21	7:35:16 PM
39	3759	1	1	180	—	RE	RE	73	2	0	3	5560	3	21	7:40:17 PM
40	3765	1	1	200	—	Flow	Flow	71	91	0	3	5560	3	21	7:46:24 PM
41	3783	2	1	60	—	RE	RE	100	0	0	2	0	3	22	5:45:00 AM
42	3929	2	1	80.012	Accretion	Worry	Worry	26	56	1	2	510	3	22	5:56:00 AM
43	4000	2	1	80.013	Accretion	Anxiety	Anxiety	43	61	1	2	1180	3	22	6:00:56 AM
44	4038	2	1	120	—	Arousal	Arousal	50	98	0	2	1275	3	22	6:04:33 AM
45	4194	2	1	130.002	SF	Arousal	IM	50	51	0	6	2005	3	22	6:11:57 AM

Continued

Number of Dashboard Gestures and Replays per Module with Channels (Nine-Channel Model and Intrinsic Motivation Model), Skill and Challenge Ratings, Score at Flowometer Prompt, and Situators (e.g., Time, Date, and Selene Location)—cont'd

						Channel Model										
Flow ID	Flow response sequence	Postgame (Iteration)	Round	Segment	Gameplay module	Nine	Intrinsic motivation	Skill	Challenge	Replay	Dashboard gestures	Score	Mo.	Day	Hour
46	4320	2	1	130.002	SF	Worry	Worry	0	31	0	6	3705	3	22	6:19:02 AM
47	4387	2	1	130.003	SF	Flow	Flow	67	61	0	6	4935	3	22	6:23:06 AM
48	4493	2	1	130.003	SF	Anxiety	Anxiety	30	66	0	6	8025	3	22	6:28:28 AM
49	4520	2	1	180	—	Anxiety	Anxiety	28	65	0	2	8165	3	22	6:34:04 AM
50	4525	2	1	200	—	Flow	Flow	88	81	0	2	8165	3	22	6:40:15 AM
51	4539	3	1	60	—	Worry	Worry	27	54	0	3	0	3	22	6:47:13 AM
52	4624	3	1	80.003	Accretion	Worry	Worry	23	39	0	1	540	3	22	6:54:24 AM
53	4668	3	1	80.003	Accretion	Arousal	Arousal	49	71	0	1	1220	3	22	6:59:11 AM
54	4695	3	1	120	—	RE	RE	66	41	0	3	1250	3	22	7:01:52 AM
55	4889	3	1	130.002	SF	Arousal	Arousal	37	84	2	40	2325	3	22	7:12:24 AM
56	5003	3	1	130.002	SF	Anxiety	Anxiety	30	67	2	40	4560	3	22	7:17:16 AM
57	5114	3	1	130.011	SF	Worry	Worry	16	40	2	40	1565	3	22	7:25:37 AM
58	5304	3	1	130.012	SF	Worry	Worry	32	50	2	40	3345	3	22	7:32:11 AM
59	5428	3	1	130.012	SF	Worry	Worry	29	54	2	40	5505	3	22	7:37:01 AM
60	5592	3	1	130.013	SF	Anxiety	Anxiety	36	79	2	40	8460	3	22	7:46:17 AM
61	5772	3	1	130.021	SF	Control	IM	55	52	2	40	2825	3	22	7:54:12 AM
62	5879	3	1	130.022	SF	Worry	Worry	3	34	2	40	4665	3	22	7:58:08 AM
63	5985	3	1	130.022	SF	Worry	Worry	28	48	2	40	6250	3	22	8:02:51 AM
64	6056	3	1	130.023	SF	Worry	Worry	14	47	2	40	7685	3	22	8:07:38 AM
65	6140	3	1	180	—	Flow	Flow	87	98	0	3	8835	3	22	8:15:58 AM
66	6150	3	1	200	—	Anxiety	Anxiety	22	63	0	3	0	3	22	10:44:00 AM

67	6163	4	1	60	—	Anxiety	Anxiety	0	100	0	2	0	3	22	10:50:18 AM
68	6270	4	1	80.003	Accretion	Flow	Flow	75	90	0	0	625	3	22	10:56:24 AM
69	6352	4	1	120	—	Worry	Worry	35	50	0	2	1310	3	22	11:02:21 AM
70	6559	4	1	130.002	SF	IM	IM	49	49	1	10	2855	3	22	11:11:51 AM
71	6638	4	1	130.002	SF	Arousal	Arousal	62	87	1	10	3635	3	22	11:15:01 AM
72	6843	4	1	130.011	SF	Worry	Worry	15	59	1	10	2055	3	22	11:25:28 AM
73	7002	4	1	130.012	SF	Apathy	Apathy	17	36	1	10	5015	3	22	11:31:33 AM
74	7155	4	1	130.013	SF	Worry	Worry	30	52	1	10	8655	3	22	11:38:14 AM
75	7236	4	1	130.013	SF	Apathy	Apathy	11	32	1	10	10835	3	22	11:42:22 AM
76	7284	4	1	180	—	Arousal	Arousal	52	80	0	2	0	3	22	12:14:27 PM
77	7289	4	1	200	—	Arousal	Arousal	43	68	0	2	0	3	22	12:21:13 PM
78	7308	5	1	60	—	Flow	Flow	61	72	0	2	0	3	22	12:28:34 PM
79	7430	5	1	80.003	Accretion	Flow	Flow	63	62	0	0	570	3	22	12:35:03 PM
80	7481	5	1	80.003	Accretion	Arousal	Arousal	60	87	0	0	1025	3	22	12:38:44 PM
81	7511	5	1	120	—	Flow	Flow	97	85	0	2	1310	3	22	12:41:09 PM
82	7625	5	1	130.001	SF	Worry	Worry	18	63	0	7	1930	3	22	12:47:35 PM
83	7828	5	1	130.002	SF	Worry	Worry	10	59	0	7	4655	3	22	12:55:02 PM
84	7881	5	1	130.002	SF	Apathy	Apathy	17	30	0	7	5335	3	22	12:57:43 PM
85	8017	5	1	130.003	SF	Worry	Worry	40	54	0	7	9975	3	22	1:04:28 PM
86	8096	5	1	130.003	SF	Worry	Worry	25	56	0	7	12375	3	22	1:08:20 PM
87	8149	5	1	180	—	Flow	Flow	69	83	0	2	12595	3	22	1:19:16 PM
88	8154	5	1	200	—	Arousal	Arousal	47	75	0	2	12595	3	22	1:26:33 PM
89	8167	6	1	60	—	Worry	Worry	14	54	0	1	0	3	22	6:15:38 PM
90	8306	6	1	80.003	Accretion	Worry	Worry	17	50	0	1	880	3	22	6:24:03 PM
91	8351	6	1	80.003	Accretion	Arousal	Arousal	46	76	0	1	1145	3	22	6:27:54 PM
92	8394	6	1	120	—	Arousal	Arousal	46	76	0	1	1300	3	22	6:31:49 PM
93	8565	6	1	130.001	SF	Worry	Worry	28	49	1	1	3575	3	22	6:37:46 PM

Continued

Number of Dashboard Gestures and Replays per Module with Channels (Nine-Channel Model and Intrinsic Motivation Model), Skill and Challenge Ratings, Score at Flowometer Prompt, and Situators (e.g., Time, Date, and Selene Location)—cont'd

						Channel Model									
Flow ID	Flow response sequence	Postgame (Iteration)	Round	Segment	Gameplay module	Nine	Intrinsic motivation	Skill	Challenge	Replay	Dashboard gestures	Score	Mo.	Day	Hour
94	8796	6	1	130.002	SF	IM	IM	35	40	1	1	8095	3	22	6:45:06 PM
95	8901	6	1	130.003	SF	Boredom	Boredom	48	42	1	1	9930	3	22	6:49:20 PM
96	8968	6	1	130.003	SF	Worry	Worry	28	46	1	1	11060	3	22	6:52:33 PM
97	9283	6	1	130.012	SF	Worry	Worry	20	50	1	1	4255	3	23	11:14:02 AM
98	9470	6	1	130.012	SF	Anxiety	Anxiety	29	62	1	1	9225	3	23	11:20:12 AM
99	9612	6	1	130.013	SF	Anxiety	Anxiety	41	56	1	1	12880	3	23	11:25:55 AM
100	9663	6	1	130.013	SF	Arousal	Arousal	45	75	1	1	13300	3	23	11:29:23 AM
101	9675	6	1	180	—	Worry	Worry	36	53	0	1	13300	3	23	11:33:59 AM
102	9680	6	1	200	—	Anxiety	Anxiety	27	75	0	1	13300	3	23	11:46:51 AM
103	9696	7	1	60	—	Worry	Worry	19	58	0	2	0	3	30	4:19:09 PM
104	9825	7	1	80.003	Accretion	Anxiety	Anxiety	26	74	0	1	600	4	9	4:12:43 PM
105	9889	7	1	80.003	Accretion	Arousal	Arousal	46	94	0	1	1240	4	9	4:17:34 PM
106	9947	7	1	120	—	Anxiety	Anxiety	25	63	0	2	1295	4	9	4:28:03 PM
107	10128	7	1	130.001	SF	Anxiety	Anxiety	22	64	0	0	3680	4	9	4:51:27 PM
108	10346	7	1	130.002	SF	Worry	Worry	24	54	0	0	9990	4	9	4:58:29 PM
109	10476	7	1	130.003	SF	Worry	Worry	19	59	0	0	14015	4	9	5:03:30 PM
110	10567	7	1	130.003	SF	Worry	Worry	19	60	0	0	15985	4	9	5:06:48 PM
111	10642	7	1	180	—	Arousal	Arousal	64	85	0	2	16405	4	9	5:15:15 PM

Note: Mo = Month; 60 = Solar System Accretion cinematic; 80/260 = Accretion game; 120/290 = Differentiation cinematic; 130 = Surface Features game; 180 = Magma Ocean instructional video; 200 = Volcanism instructional video; SF = Surface Features; IM = Intrinsic Motivation; RE = Routine Expertise.

[a]Thousandths place indicates module time period or scale (1. 2. 3), tenths place indicates number of replays.

[b]Number of within module Replay and number of Dashboard Gestures are repeated and appear on every row within a module.

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CHAPTER 12

Collaboration and Emotion in *Way*

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INTRODUCTION

In this chapter, we explore how participants use nonverbal cues to express emotion and to collaborate with each other, in an online game, *Way*. We posit that observing how people express emotion and work together to solve problems in an online collaborative game, such as *Way*, can help us to better design future collaborative games. Emotion is a key component of collaboration, since individuals use emotional cues to help regulate group activity (Van Kleef, 2009), and these cues need to be supported through the design of a collaborative game or other online activity involving multiple people.

Way is an online synchronous game where two players play the game, and each player controls one avatar. In the game, each player relies heavily on one another to play. Both players collaborate to complete a series of obstacles, such as hidden ledges and blocks to jumpon. Each player can only complete the game with the help and guidance of the other player; however, the game does not allow the players to communicate verbally or through written text. Players can only use their avatar to make gestures (raise arms up or down, move to the right or left), jump, and make a brief noise (called a "shout"). There are three emotion icons in the middle of the board that are available to the players. The emotions include a happy face, a confusion face, and a frown face (see Figure 12.1). Each player needs to be able to show the other player "the way" to collaboratively solve problems and overcome obstacles, through a creative and contextual use of gestures, movement, emotion icons, and noise. The player's identities are anonymous to each other, and there is no profile or avatar creation tool that defines one as being a particular gender, race, ethnicity, or nationality. Pairs of collaborators are randomly matched based on when the player loads the game.

The idea that participants profit from online collaborative learning continues to gain popularity, and some, although not extensive, empirical evidence exists to support it (Kapur, 2008; Kuhn & Udell, 2003). The online

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Figure 12.1 This is an image of *Way*, with a split screen. Your avatar is on the top while the other player's is on the bottom. The emotion icons (emoticons) are in the middle of the interface. *Courtesy of Chris Bell, Coco & Co.*

collaboration environment can bring together learners from different locations and provide structure for their interactions.

Computer-mediated environments "turn communication into substance" (Dillenbourg, 2005) by creating an artifact of the learning process, which can be reflected upon to further learning. In a sense, the cognitive load required by collaborators in a face-to-face environment is lessened, so the cognitive resources can focus on the activities that lead to reaching learning goals.

In the next sections, we describe previous research related to collaboration, emotion, and nonverbal communication, particularly in online environments.

NONVERBAL COMMUNICATION AND EMOTIONS

Nonverbal communication refers to the behavioral elements of human-to-human messages, besides spoken words. One's appearance, posture, and facial expressions send messages to others, and provide further cues to meaning. Research suggests that nonverbal behavior accounts for between 60% and 70% of all meaning (Mehrabian, 1981). Researchers argue that gesturing is actually an intrinsic part of the communicative process, which helps to decrease cognitive load by allowing speakers the ability to replace elements

of speech with gestures, even if we are not conscious of the gestures we produce (Cassell, Sullivan, Prevost, & Churchill, 2001; Goldin-Meadow, 2003).

Much of our emotional communication also comes from nonverbal sources. Facial expressions are considered to be the most reliable nonverbal source (Ekman, 1992) and this has particular implications for collaborative work. Nonverbal emotional expressivity has been found to be a reliable signal of cooperation (Schug, Matsumoto, Horita, Yamagishi, & Bonnet, 2010). Schug et al. videotaped the facial responses while playing the ultimatum game as the "proposer" role. It was found that cooperators displayed more emotional expressivity (not limited to positive emotional expressivity) compared with noncooperators.

The physical expression of emotions occurs beyond the face, involving the body as a whole, through body movements and gestures. de Meijer (1989) provides empirical evidence on the relation between emotions and body movements. In this study, participants viewed silent video recordings of body movements differing on dimensions (parts of body, trunk movement, for example) and quality of movement (fast or slow, for example). Participants demonstrated the ability to discern emotional states from the visual stimuli alone.

Different gestures are also associated with different emotional states, such as interest and disagreement (Bull, 1987). Observers can distinguish emotions from others' movements, even when provided as part of the target's body in an image (Pollick, Paterson, Bruderlin, & Sanford, 2001). While individuals are not always aware of the expression on their face, or the physical state of their body or gestures, in virtual environments, avatar appearance should be considered intentional, since the player is required to make conscious decisions on how their avatar behaves both on the verbal plane and nonverbal plane (Verhulsdonck & Morie, 2009). However, we must question whether the increased attention to gesturing stays true to the promise of computer-supported collaborative learning environments by freeing up the learner to concentrate on learning. In other words, does the necessity to intentionally express emotions via the avatar (which costs time and attention) detract from, or enhance, the collaborative process?

EMOTIONS IN NONVERBAL ONLINE ENVIRONMENTS

The ability to distinguish among emotions even extends to computer-generated avatars (Coulson, 2004). In a study investigating the ability to distinguish emotions of avatars, participants were asked to choose from a list

of the six primary emotions (Ekman, 1992) to label a computer avatar representing the posture of one of the emotions and oriented at different angles relative to the viewer (e.g., from the front or side). Participants demonstrated the ability to accurately distinguish between the emotions with the distinction between happiness and surprise providing the most difficulty (Coulson, 2004).

The feeling of being understood emotionally by a partner is another component of emotional understanding in general, including in an online environment. When playing a game with an opponent on the computer (in this case, a computer-driven opponent, not a person), human players report feeling more "understood" when the opponent recognizes their emotional state (Balzarotti, Piccini, Andreoni, & Ciceri, 2014). This contributes to emotional attunement (Ciceri & Biassoni, 2006), where partners in communication recognize the intentionality of the other and adjust their behavior accordingly.

Based on these two ideas, we could hypothesize that the manipulation of the avatar's gestures should help foster the ability to both communicate one's own emotions as well as to understand others' emotional states, which should enhance the collaborative experience.

ONLINE GAMES, EMOTIONS, AND LEARNING

There are a number of reasons why investigating online games may be particularly useful for better understanding online collaboration and problem-solving. Previous research has suggested that online gamers must adapt socially to the new modalities, reorganize and re-examine how meaning is made within this virtual environment, and consider how to use new cues to provide and interpret meaning, such as body movement, gesture, repetition, and tools within their game environments (Keating & Sunakawa, 2010). Investigating online games can provide new insights in how to better design a wide range of virtual spaces for collaboration, including games.

Moreover, online games, such as Massively Multiplayer Online Role-Playing Games (MMORGs), may themselves be practice fields for learning and virtual collaboration, whether in an institutional setting or workplace (Ducheneaut, Yee, Nickell, & Moore, 2007; Shaffer, 2006). Games, simulations, and virtual worlds can provide a context with which to practice and participate in authentic problems (Ducheneaut et al., 2007; McCreery, Schrader, & Krach, 2011; Schrader & Zheng, 2006; Williams et al., 2006). For example, in the multi-user virtual environment River City, middle-school kids use avatars and interact with digital artifacts and each

other, to work together within a virtual environment, to solve scientific problems (Ketelhut, Nelson, Clarke, & Dede, 2010; Schrader & Zheng, 2006). Online game players often coordinate resources among players to solve complex problems, such as in the example of guilds in *World of Warcraft*, where multiple people may need to work together to coordinate individual, distinct actions to defeat one boss (Ducheneaut et al., 2007). This type of activity has been viewed as practice for the type of distributive work tasks needed in the twenty-first century office (Reeves & Read, 2009).

Games may even be more amenable to innovative problem-solving because they can also provide a safe space with which to experiment, make mistakes, and try out new ways to solve a problem, without the risks of real-world implications (Salen & Zimmerman, 2005). Participation in games has been shown to collaboratively solve real-world problems (Landwehr, Spraragen, Ranganathan, Carley, & Zyda, 2013), such as in the case of a protein folding game called *Foldit* (Cooper et al., 2010).

METHODOLOGY

A multiple case study was conducted to investigate collaboration in *Way* (2012), an online synchronous game developed by Coco & Co. Our case study analysis uses a type of qualitative inquiry called "thick" description (Cho & Trent, 2006; Geertz, 1973), which in this study, involves a very detailed account of gameplay, including a description of the context and player-to-player relationships. Four case studies of player's experiences with *Way* were described and analyzed. The sources of the data are the researcher's detailed field notes and the participant's "talk aloud" during the game play, which involves the participants speaking aloud their thoughts, actions, and behaviors as they play the game. Presenting evidence from both the researchers' and participants' perspective facilitates a triangulation of descriptive data creating a recursive check on each single source of data, which is the major validity criteria for such qualitative research (Cho & Trent, 2006). Presenting the experiences of multiple participants fosters reliability (Guba & Lincoln, 1981).

Participants

Four participants were recruited and completed the study. Researchers recruited participants by posting messages to mailing lists and posting paper flyers at a mid-sized liberal arts college in northeastern United States. All participants were native English speakers, male, ages 18-34 years old, who play games regularly (at least 1 hour/week), have played online multi-player games involving avatars previously, and had never played *Way*.

Procedure

All four participants were assigned to play *Way* until they completed the full game (which takes approximately 10-15 minutes) or until the game session ended or was terminated. Three of the four participants were able to complete the game to the end. The participants all played this game on the college campus, while being observed by the researcher, as well as videotaped and audio-recorded. While playing the game, each participant conducted a "talk aloud," or explained out loud their actions and thoughts while they played. All participants were interviewed after completing the game, answering questions about their overall experience, their general strategies in playing the game, and the types of similar games they have played. In addition, participants filled out a short survey prior to playing the game, which covered demographic information and their previous gameplaying experiences.

In the four game sessions, only the recruited participants were observed playing the game. The participant's partner was not interviewed or observed, as s/he was anonymously controlling his/her avatar and could not be physically observed or verbally communicated with by the interviewer—before, during, or after the game play.

The Game

Way was published by an independent game company called Coco & Company in 2012. As of June 2014, the game is currently accessible online via the website: www.makeourway.com, and the Alpha 1.3 version release was downloaded and played for the purposes of this study.

Way is an online, multiplayer platform game, which means that it involves a player controlling an avatar who is navigating (e.g., running and jumping) across different platforms, by avoiding obstacles, pitfalls or jumps. In *Way*, two participants, in two different locations, anonymously collaborate synchronously to navigate through a series of boards. To play, a player downloads the game and then is able to access the game's server, joining a queue. Once the player enters the game's queue, the player is then matched with the next player who joins. Once the match occurs, the game starts immediately. The players cannot choose their partners, nor do they learn any identifiable details about their in-game collaborator. Each player controls a noncustomizable avatar that can jump up, move right and left, raise arms up and down, and make a short "shout" noise. In addition, the

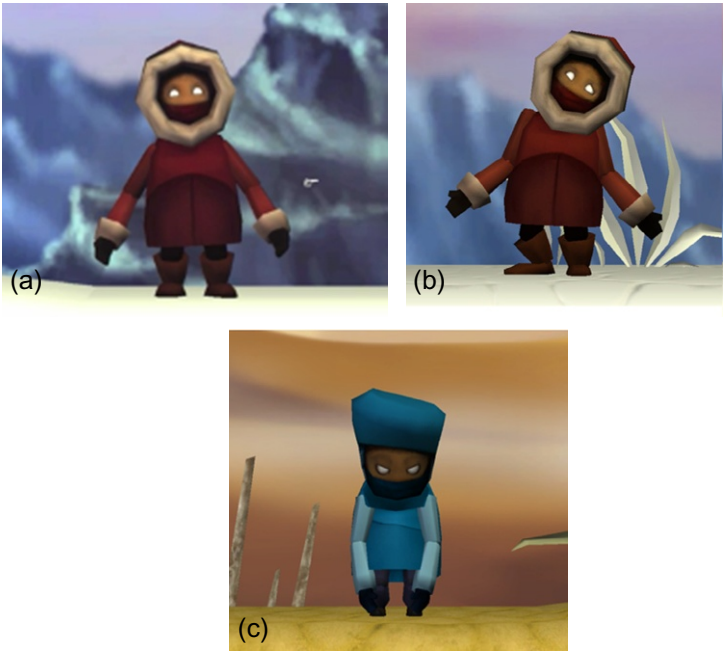

Figure 12.2 The three gestures that the avatar completes when the emotion icon is pressed. (a) Happy, (b) confused, and (c) sad. *Courtesy of Chris Bell, Coco & Co.*

interface has a zoom feature that allows the player to zoom in and out. The game also includes three emotion icons (Figure 12.2):

1. A happy face, which, when clicked, leads one's avatar to hold a wider stance and bouncing legs.
2. A confusion face, which, when clicked, leads one's avatar to shrug.
3. A frown face, which, when clicked, leads one's avatar to slump and look downwards.

The first board of *Way* (a tutorial) teaches the player how to move right, left, and follow an arrow graphic, as well as find an exit (see Figure 12.3). The tutorial does not include any instruction on the emotion icons. After this short tutorial, the board splits into two screens, a top half and a bottom half. Once the screen splits, the player can view their avatar and its interactions with the game on the top half of their screen. Simultaneously, the player can view their partner player's avatar, and its interactions with the board, on the bottom half of the screen. Throughout the game, the two players cannot speak verbally or via text, and instead can only use limited gestures, sound, and movement, as well as their interactions with the game board, to communicate to each other.

Figure 12.3 The tutorial level in *Way*.

Once the board splits into two, there are no instructions given to the player directly from the game; instead, any instructions come from the player's partner actions, coupled with the game's context. Throughout each of the next boards, the two players must rely on each other to see hidden obstacles or complete tasks. For example, in one board, a player can show the other player where the platforms are to use to jump up to the exit. One player can view the platforms, but the other player needs to jump (see Figure 12.4). In another example, one player must show the other player

Figure 12.4 An example of a split screen, collaborative problem, which can only be solved by the two players working together.

where moving spikes are—spikes which would otherwise be invisible and kill the player who gets hit by them. Each player takes a turn running through and avoiding the spikes, or waiting for the other player to run through the spikes, while potentially communicating the location of the spikes to the other player.

If one player gets killed, either by falling or getting hit by an obstacle (such as a spike), s/he immediately re-spawns, or comes back alive, and the two players need to restart a portion of the board. The only way the game completely fails (i.e., the game ends) is if either player disconnects from the game, either on purpose or through a technical failure. Once this happens, the game becomes impossible to complete, and the remaining player becomes stranded on the board.

This means that each player must rely on the other player not only to complete the board's obstacles, but also to complete the entire game. If either player disconnects, the player must ultimately disconnect as well, restart the game, and be randomly assigned to a new partner.

If the two players are successful and complete all the boards of the game, the final board involves viewing the credits and climbing to an area where they can finally interact in the same game space (rather than be in separate split screens). In this area, they can jump over each other, and use a shared online "chalkboard" to scribble messages to each other (they still must use the mouse to write the words, rather than the keyboard to type) (see Figure 12.5).

Figure 12.5 The final level, where the two players can write words to each other, or draw pictures.

There is, however, no audio from either player or other form of oral communication.

Therefore, throughout the game, the only way that players can communicate or interpret emotion is via:

1. The limited gestures of their avatar, including moving either one or two arms up and down, or to the right or left. The avatar can also move to the right and left, and jump. Avatar heads can also look up and down.
2. Using a "shout," which is an audio sound file that can be accessed with the push of a button on the game's interface.
3. Repetition or rhythmic use of any movements or the audio "shout."
4. Press an emotion icon button or identify that one's partner must have hit one of the three emotion buttons by watching the other's avatar either bounce more, shrug, or slump, as described above.

In the following sections, we will discuss the four play experiences of the participants, as well as describe the themes that emerged.

RESULTS

Participant One

Participant One joins the game and immediately starts to follow the other avatar's movements. He explains that he knew what to do because the other player "pointed to" where he needs to go (the other avatar gestured by lifting one of his arms out toward the direction that he needed to go). Participant One explains out loud that he is making the assumption that because he can see the other player's avatar (on the bottom half of the screen), that the other player can also see him. Thus, he uses his avatar to make a gesture to point to where the other player needs to go when it is the other player's turn to complete a portion of the board.

Participant One expresses that he feels responsible for making sure that he listens to the other player's "signals," and he wants to make sure he gives the correct signals to his partner. At one point, Participant One mistakenly gives the other player the wrong signal when they approach the board with the spikes, which makes him feel guilty because "he doesn't want the other player to mess up." Participant One also expressed worry because he has been telling the other player where to go and feels that he is "bad at it." As a result of Participant One's incorrect gestures, the other player gets killed a few times. Participant One was grateful that, despite his mistakes, his partner player seemed to remain calm and patient with him until he was able to communicate the correct signal needed to overcome the spike

obstacles. Participant One explains that, "having that person there, I didn't want to fail and I didn't want to fail them. Instead of just solving a puzzle, I was part of a team. I can't let them down and they helped me through it." This feeling of responsibility to the other player also made Participant One more engaged in the game. He explains, "It gave me more reason to focus on the game and really concentrate to do well, and there were parts with timing, and to time it correctly to make sure you both got through." The researchers are not aware of any points during the game where Participant One used one of the three emotion "buttons" or identified the participant as having used one.

Participant One, and his partner, are ultimately successful and complete the game together. This means that they are able to join together in the final room, where they can scribble messages to each other. The other player uses the chalkboard at the end of the game and draws a map that looks like Eastern Europe, denoting where he or she is from. The other player also writes "GG" for "good game," and Participant One responds by writing, "thanks for the game." The other player writes, "it's the end, sad." Participant One writes that "it was fun" and "have a good night" because he explains aloud his assumption that it is late in the other player's location. The two players continue to exchange some questions and answers (through writing on the chalkboard), despite a slight language and culture barrier, until they finally log off. They spent more time trying to write out questions and answers to each other than actually playing the game, and Participant One seemed hesitant to log off.

Participant One expresses aloud that he enjoyed learning about the other player at the end of the game, rather than before the game. He felt that playing the game prior to meeting the other player removed any potential biases. He explains, "This way, you don't make any assumptions. You've already done it, you're already through. Like, this guy was from Poland, so it's possible to be like 'Oh this guy is from Poland, ah!'" In other words, he may have evaluated the person's in-game actions based on any biases he had about Poland and Polish people, rather than trying to understand his partner as a person. Participant One also expressed that once he completed the game with this anonymous person, it made him feel more comfortable sharing his own personal information with his partner once the game was over.

Overall, Participant One explains that he liked how both players were simultaneously learning how to play the game, while at the same time, also teaching each other. The fact that there was a real person controlling the avatar was essential, because it made him feel as though it was a shared learning

experience, rather than individually learning from an NPC (nonplayer character). He was pleased and happy with his overall experience with *Way*.

Participant Two

Participant Two immediately started observing what his partner's avatar did in the game to figure out how to complete each task in the game. He also looked at his partner avatar's actions within the context of the game to interpret how to play it. For example, Participant Two looked at a hieroglyphic-type image in the game to figure out what he needed to do with his mouse. He also expresses his realization that what he does in the board affects the other person's game as well, and explains that he has to "hold myself until the other guy does the same pattern, otherwise the doors won't open" for both of them to complete the board.

Participant Two also observes the gestures of the other player, and explains that he was "led by example … make sure my arms are up and follow the pattern." He discovers that sometimes he has to help his partner and sometimes his partner needs to help him, and that means that they both sometimes need to wait for the other person to complete a task, or even to figure out what task they need to complete. Participant Two is able to wait for his partner to catch up, but he is eager to move forward in the game.

Participant Two, at one point, makes an initial hypothesis that the other player can see the same platforms that he can see. After a few minutes of the other player's trials and errors, Participant Two discovers that he actually sees different platforms than his partner, and needs to use gestures (via his avatar) to show the player where the "step" platforms are located. He explains, "Ah ha. I see where I went wrong." Participant Two now tries a new tactic, which involves standing below each of the "step" platforms and raising his avatar's arms under them. Now the partner player is able to figure out where the invisible platforms are located so s/he can jump to a higher part of the board. The two players take turns pointing to each other (via their avatars) where the invisible platforms are located, since they can each see only half of them.

At another point in the game, Participant Two tries to gesture to the other player (using his avatar to point), but the other player does not respond in the correct manner. Participant Two repeats his gestures, and continues to try to show (via pointing) what the other player should do. As he repeats the gestures, Participant Two seems visibly frustrated. Participant Two repeats his gestures, but does not vary them. Eventually, the other player learns what he needs to do, and Participant Two expresses that it would have been nice if

the other player grasped some concepts a little faster. Participant Two explains that he is "very impatient" and that his strategy for dealing with his impatience was to "wait it out and watch [his partner's avatar's] every move and giving him hints. He was giving me hints too … later on there were multiple times where I wouldn't listen either." The researchers are not aware of any points during the game where Participant Two used one of the three emotion "buttons" or identified the participant as having used one.

Both the players are successful in completing the game together, but Participant Two expresses that because he raced to the end of the shared platform first, this gave him great satisfaction. Participant Two felt that he was the only true winner of the game, and was very happy he won.

At the end of the game, the pair of players write to each other on the virtual "chalkboard." Participant Two writes, "Hello friend" and explains that he "made a friend. Interesting how you meet a person you may never meet in real life but you help each other get to the end … because we helped each other through a dangerous ordeal. We found we had a common quest, we had to reach a common goal and in the end, good job." Participant Two also draws a smiley face.

For a longer length than the actual game play, the two players continue to write queries about each other, such as their nationality, gender, location, and the language they speak. Participant Two is engaged in learning about his game partner, and like Participant One, seems hesitant about finally ending the conversation with this new friend by shutting down the game.

Participant Three

Participant Three plays *Way* and soon explains out loud that he needs to listen to the other player and, he explains, "point for him" as well. Not too far into the game, Participant Three has trouble understanding what his partner is communicating. The partner player points upward, Participant Three jumps upward instead of looking upward, and the partner uses the game's "shout" noise. The partner continues to point upward, not changing his/her tactic, but also continues to "shout" when Participant Three repeatedly does the wrong action. Participant Three expresses that he feels frustrated because he is unable to follow his partner's directions, but continues to jump repeatedly. The partner tries the pointing upward gesture for a few more minutes, and again Participant Three misinterprets it. The researchers are not aware of any points during the game where Participant Three used one of the three emotion "buttons" or identified the participant

as having used one. The partner player abruptly leaves the game (terminates the session), leaving Participant Three in the game alone and stuck on the board.

Participant Three explains aloud that his partner "should have been more descriptive" and was not communicating well with him because he "couldn't figure out what he was getting at." Although this made him "sad," he explains that he does not "blame [his partner] at all … Well he could have been more patient, but it's a little frustrating … telling someone what to do and you think you're right and the person on the other side can't get your side and they think they're right." Participant Three explains that although the other player did not give him enough chances, he empathized with his partner's frustration (Participant Three had interpreted that his partner was frustrated and angry at him). Participant Three blamed himself for misinterpreting his partner, and expressed that he understood why the partner decided to leave the game.

Participant Four

Participant Four observes his partner player's avatar to learn about the game. He watches this player to learn where he needs to go, what he needs to do, and what actions he should take. He explains, "He would point where the pillars were falling, and [where] the platforms [are located]." He quickly hypothesizes that the other player is a regular *Way* player, because the other player's gestures seem direct and clear, which makes the participant feel nervous. He explains, "I feel like this person's played it before" and he also explains that the player was a good communicator. On the other hand, Participant Four expressed concern that he was not as successful at communicating, especially at first when he "didn't know what I was doing."

Participant Four expressed that he felt responsible to help his partner because he needed "to help [him] get through the game," and he felt like he trusted that this other person was not trying to "make [him] die on purpose." To more quickly learn how to play the game, since he was new to this environment, Participant Four drew on his knowledge of other cooperative games that he had played before, such as *Portal II*. For example, there were moments when he knew that he had to step on a switch to help out his partner, because he had remembered doing something similar with a partner in *Portal II*. In that experience, he often played *Portal II* with a friend, where they were able to give each other verbal instructions over Skype, or, if they were in the same room with each other, out loud. Throughout the game, Participant Four felt that he was not a worthy enough partner to match the

more-experienced partner, according to him, and he was worried and self-conscious about his game performance. The researchers are not aware of any points during the game where Participant Four used one of the three emotion "buttons" or identified the participant as having used one. Participant Four and his partner completed the game, but did not use the virtual chalkboard to write messages to each other.

DISCUSSION

Way is a very unique game, in that it removes the ability to see or hear your game partner. Participants are unable to communicate orally or via text-based communication, and instead can use the limited gestures and sound of their avatar to express or interpret emotion, information, or instructions. The game, therefore, is able to highlight the types of ways we can communicate, emote, interpret emotions, share information, and collaboratively solve complex problems in online games, without needing to be co-located, to speak the same language, to see each other, or to hear each other. This has implications for understanding, using, and designing online games, as well as potentially other virtual environments, particularly for emotional expressiveness, collaboration, and problem-solving, and how they may interrelate. Future studies should recruit more participants and provide them with a standardized opponent to increase empirical control of extraneous variables affecting our understanding of emotions and gesture in an online nonverbal environment. Based on this exploratory case study of *Way*, a number of themes have emerged, each of which should be researched further.

Shared Problems and Goals Imbues Participants with a Sense of Responsibility

In *Way*, participants shared a common goal of getting to the end of the board, as well as sub-goals, such as reaching a high platform together, or finding a door that leads to the next level. Sharing a set of problems, activities, tasks, and goals seemed to encourage the players to work together.

Moreover, each player had slightly different roles and responsibilities. One player may have been able to see only half the platforms and needed to rely on the other player to point to the other platforms. One player could see one set of spikes but not the other. Players took turns learning and teaching from each other, which helped them practice relying on each other, communicating with each other, and gaining trust with each other.

On the other hand, this heightened sense of responsibility also could lead to guilt, shame and lowered self-efficacy if the person feels that they are misinterpreting or letting down the other person. Intense negative emotions could affect problem-solving (Spering, Wagener, & Funke, 2005) by affecting strategy-choice of individuals, particularly in collaborative situations (Van Kleef, 2009). The consequences of making mistakes cannot be so dire such that one of the people gets overwhelmed by anger, guilt or sadness, and is unable to search for new solutions or continue to collaborate.

Thus, the environment and tasks that a participant engages with needs to be designed in such a way that participants can experiment with different possibilities without fear. They need to be able to make mistakes with each other, without dire consequences, such as the sudden ending of a game, or even significant social ramifications. For example, in one of the case studies, a participant did not interpret his partner's communications immediately. Early in his experience with *Way*, he tried to listen to his partner's gestures, but continued to make an incorrect move. After only a few times, the partner used a "shout" expression and then logged out of the game, causing both of them to fail the game, as it cannot be completed by a single player. Thus, this caused dire consequences for both participants, and the consequence ("game over") did not fit the actions of either partner.

Designers should consider how to create environments where participants must continually take turns teaching and learning from each other, by either distributing knowledge appropriately, assigning participants differing roles, encouraging participants to share and explain their unique experiences, and/or empowering participants to feel as though their perspectives and actions matter, and can have a mutually beneficial effect on others in their virtual community. Both players need to feel responsible for each other, but not so overwhelmed by their responsibility or the consequences such that any mistakes cause intense negative emotional responses.

Designers should also consider how to design an environment where the social stakes are low, and participants cannot easily avoid or give up on communicating effectively. Consequences for mini-failures should not result in a "game over" situation so easily. However, frustration or anger at a lack of understanding can be common and should be mitigated by the environment's design. Designers should consider what an appropriate "out" should be if participants have communicated repeatedly but are still not understanding each other. Perhaps the experience needs to then allow for further communication options, or a mentor, or a more experienced participant needs to get involved to provide just-in-time information.

A Limited, Common Set of Gestures and Controls Can Be Emotionally Expressive

Each player in *Way* shared a limited set of gestures, movements, and articulations, including moving right and left, moving arms up and down, giving a "shout" noise, and jumping. There was no verbal or written communication allowed. For example, players could lift their avatar's arm to signal pointing to express where the other player should go, but they could not speak or write further instructions. This sometimes led to misinterpretation—for example, was the other player's avatar pointing upward because the player needed to look upward, move their arm upward, jump upward, or something else? However, most of the time, after using trial and error, as well as the game's context and their previous knowledge, the participants were able to understand what each other was expressing. Limiting the movements enabled the players to focus on quickly signaling and observing each other, and then move their own avatar accordingly. Players repeated their signal when necessary, or sometimes tried other movements. Because the gestures were based on universal human body movement, anyone, regardless of their language or literacy ability, could play the game and communicate with each other.

Limited gestures also affected the ways a player could express their emotional state—and could potentially affect one's interpretation of the other's state. For example, repeating gestures rapidly and the concomitant "shout" done by the partner suggested to Participant Three that the other player was frustrated and angry. Instead of looking for alternate solutions, Participant Three seemed overwhelmed by the feeling of letting the other person down and their own frustration, and they were unable to find the correct solution. The partner shut down the game, further confirming to Participant Three that the partner was angry. However, since we do not ever meet or know who the partner was, there is no way to confirm that the emotions Participant Three interpreted are accurate. It is possible that Participant Three overestimated the intensity of the partner's negative emotions, which contributed to his functional fixedness and inability to find a new solution to the problem he was facing. Including only a "shout" as an audio version of a negative emotional expression limited the emotional interactions—there were no sound files in *Way* that expressed happiness or confusion, for example. Despite the limited interactions, participants did express aloud a variety of emotions that they were feeling, or that they believed their partner was feeling, though with this limited sample, they seemed to focus more on expressing the negative emotions.

That said, there was an opportunity for participants to express happiness, sadness, or confusion by clicking the relevant emoticon buttons on the game's interface, which would have signaled their avatar to gesture. However, the researchers are not aware that any of the participants ever pressed these buttons. In addition, the researchers are not aware that any of the participants identified that the partner had hit any of those emoticon buttons. There are a few possible reasons for this. First, the participants were too focused on playing the game and trying to "listen" to what the partner's avatars were communicating. Second, the emoticons were not emphasized during the tutorial. Third, the emoticon buttons were not involved in the actual gameplay. Pressing or not pressing them was not relevant to the actual problem-solving or tasks in the game, whereas the other gestures (pointing, jumping, moving) were necessary to complete the game. The "shout" would automatically happen if a player pressed down, which was necessary for some of the movements. Fourth, it may not have been clear that the other player had pressed an emoticon, as the only indication that it was pressed seemed to be based on how the partner's avatar responded. The avatars did not have facial expressions, and were only able to gesture with their arms, legs, and head. Also, the "happy face" gesture was not very distinct from the "resting gesture," in that the arms are just outward a little more (see Figure 12.6).

The confusion and sadness postures may have also not been obvious if the player's avatar was moving around, jumping or otherwise mid-activity. Finally, the act of actually using the mouse to hit the emoticon buttons was disruptive to the game play, in that it was harder to hit it if you were in the middle of jumping, gesturing, or doing another movement as part of the game.

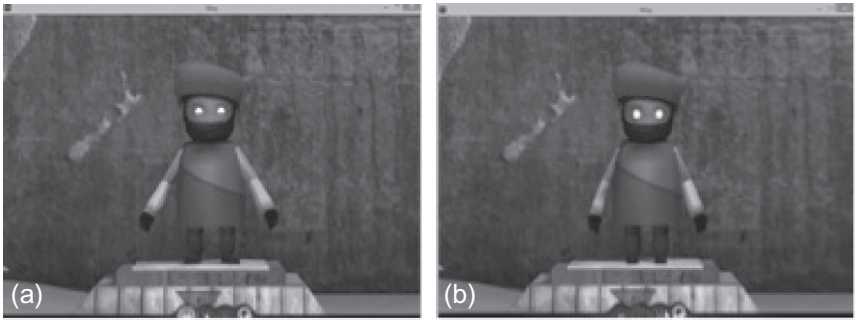

Figure 12.6 The happy face (a) and the neutral (resting) face (b) of the avatar.

Designers who are creating environments and activities that will be used by those who do not speak the same language should consider how they could encourage participants to use a shared set of universal expressions, and to ensure that misinterpretations of emotional states are minimized. The designers of *Way* clearly thought that emotion communication was important, but they did not integrate it enough into the gameplay. It also should have been more obvious that an emotion was being communicated. Having the avatar make bodily gestures may not be enough in an online game environment to clearly express one's emotions, particularly because the avatars did not have facial expressions as well.

Shared Contextual Clues and Knowledge also Helped Collaboration and Emotional Expression

Beyond being able to mimic and express the same limited amount of movements and gestures, the players in *Way* shared similar game environments. Simultaneously, players could view their own environments, and were able to view each other's environments, helping to facilitate any communication necessary to complete tasks or overcome obstacles in the game's boards. The ability to view the other's environment helped the players use the context of the game, coupled with their gestures and movements, to express to the other what need to be done, shortening the learning and teaching cycle. The split screen set up also encouraged the players to step into each other's shoes, and consider how the other player perceived his/her own environment. For example, at one point, Participant Two wondered if the other player could see certain platforms. Based on his observations of the other player, he realized that the other player could not see the same platforms that he could see. The player was better able to empathize with his partner's perspective, and as a result, more effectively communicate with his partner by giving him/her the specific knowledge that s/he required. A heightened ability to be in the other player's shoes may have also contributed to each participant's readiness to identify his partner's emotional states. They each seemed to express aloud their interpretations of their partner's emotions, suggesting that it was important for them to know what their partner was both thinking and feeling. It is possible that the limited feedback (no oral communication and no physical presence) contributed to this, but the shared nature of the board and problems may have also encouraged the participants to step into their partner's affective perspectives. More research to unpack this should be conducted.

Designers should consider how to encourage empathy through a shared environment or the ability to view another's perspective and emotional states, such that they can each more clearly identify each other's problems and needs, and more effectively share knowledge and information.

Pairing Participants Based on Expertise Needs to be Carefully Considered

On the one hand, participants engaged in collaborative problem-solving may benefit if both participants are at the same level of knowledge. For example, one participant in *Way* explained that he felt more comfortable making mistakes and struggling with the tasks, because he observed that his partner was also making some mistakes, and that they were learning together in a shared experience. Because both participants were novices, stumbling through a challenging experience together for the first time, he also seemed to feel connected to his partner. Having access to peers with similar experience levels appears to facilitate engaged learning as well as completion of complex tasks, even if it is a "blind leading the blind" situation. Designers should consider how to make participants in virtual environments feel that there is another peer struggling with the same challenges, and feel comfortable making mistakes or misinterpretations, taking risks, and experimenting with different possibilities, as this can support collaborative problem-solving and facilitate engaged learning. The affective component of being a novice needs to be considered.

On the other hand, while novice-to-novice peer communication and learning could be effective in collaborative problem-solving, pairing a novice with a more experienced peer or mentor could also be useful. In one of the case studies of *Way*, a participant deduced that his partner participant was a more experienced player, because the other player seemed to know exactly how to direct him immediately. Rather than both participants struggling to both learn and teach, the other player took the role of teacher, and the participant was the novice learner. This facilitated the participant's learning to some extent, because he immediately knew what to do, without worrying that his partner would give him erroneous information. However, this also intimidated him and made him more worried that he could not make any mistakes. Designers should consider at which points collaborative learning is better supported with a mentor or teacher who can help guide the task, or how to help the participant novices feel comfortable making mistakes and taking risks, despite their participation with more knowledgeable partner(s).

Participants May Express More Trust and Positive Emotions as a Result of Successful Collaborative Activities

In *Way*, participants share common goals and sub-goals. These goals could only be met with the help of the other participant. Participants felt motivated to help guide their partner in part because of social pressure—they knew that their partner relied on them for knowledge and information, and they knew that the other player was providing them with information, so they felt obligated, socially, to provide help. The game's structure, however, also motivated collaboration because each game goal could only be met if the participants provided that support. Both people won together or both people lost together. The system of the game itself—its goals and mechanics—motivated collaboration. Thus, the game's system, along with the expectations and norms that are already present in our everyday social system, worked together to encourage collaboration.

In one of the instances, however, Participant Three's partner did not continue to feel obligated to keep teaching him, and he decided log off, thereby forcing both players to fail at the game. For the partner, it was perhaps too easy to quit the current game, re-enter the game, and potentially play with a newer, possibly faster player.

Moreover, participants in *Way* seemed to gradually earn each other's trust by collaboratively guiding each other through the dangers of a game board. They developed a relationship through shared activities, and, as a result, felt more attached to each other. The continual need to rely on each other to get through to the next portion of the game helped the participants feel more comfortable with learning about not just the game and its tasks, but about each other. In fact, participants may also be primed to reveal more personal information about themselves after having completed the tasks together. One of the participants even called his partner a friend, on the basis of their shared journey through the game. It is possible that this type of shared problem-solving may contribute to further desire to share emotional states—the participants became more emotionally vulnerable through shared cognitive tasks.

The results of this study also suggest that removing personal information about the person, such as race, nationality or gender, and instead allowing people to get to know each other through participation in shared tasks, may also help them overcome any biases or assumptions they have, and seek to learn more about the individual person. Moreover, hiding any personal information about the participants may have made the participants more engaged in the collaborative tasks, more empathetic to his or her partner,

more emotionally aware, and then more trusting of the participant once personal information was revealed. Further empirical work needs to be conducted as to the affordances of removing personal information as a large body of research, particularly in the area of cross-cultural collaboration, suggests that more personal knowledge about the partner in a dyadic interaction leads to better collaboration (Chua, Morris, & Mor, 2012). It is possible that the nature of the collaborative task determines the level of personal information providing benefit.

Thus, designers of online learning and work environments should consider how to enable participants to build trust through shared activities, and whether it should involve first divulging personal characteristics, such race or gender. By initially providing learners or colleagues with a shared set of tasks and goals, they can potentially more quickly and deeply form interpersonal relationships, earn trust, become more empathetic and emotionally aware of each other. This study illustrates that, potentially, in an online environment, people who form relationships based on shared or similar tasks and goals can form relationships and build trust more quickly than those who form relationships on the basis of characteristics, such as gender, race or nationality. More research into how online participants form and maintain relationships is needed, as it has significant implications for online collaborative learning and problem-solving.

CONCLUSION

The purpose of this exploratory study was to investigate player interactions with a video game, *Way*, to understand how emotion, collaboration, and nonverbal communication may work together in an online game. *Way* enables participants to solve problems and meet goals without any verbal or written communication between them. The five themes culled from this study have implications for understanding how to better design online collaborative learning and work situations, particularly where participants cannot speak or write to each other, due to language, technical, or other barriers.

Future research should consider each of the five themes and investigate further emotion and collaborative problem-solving in online environments. Further understanding of the phenomena discussed above and the themes that emerged and design principles, could be achieved by an expanded empirical study, such as one involving a number of participants in a controlled experiment. All results should be considered directional and descriptive, given the limited sample size.

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CHAPTER 13

Evaluating the Use of a Prosocial Digital Game to Identify and Compare Preschool Children's Social and Emotional Skills

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INTRODUCTION

Research into the effect of games on prosocial behavior has concentrated on video games (Gentile et al., 2009) and usually focuses on the content of the games with children older than those starting school. Gentile et al. (2009) suggest that games in which the characters help and support each other should increase both short- and long-term behaviors. This is supported by the work of Greitemeyer and Osswald (2010), who found an increase in prosocial behavior among adults playing prosocial video games. This study uses cartoon depictions of emotion scenarios to provide a fun way of engaging preschool children and at the same test their social competence performance. The design here is a digital interactive game that tests the cognitive and affective understanding of social competency constructs, such as theory of mind (ToM), perspective taking, emotion recognition, and empathy, taking the standard psychology tests and designing digital equivalent tests. ToM is the ability to attribute mental states to oneself and others and to understand that others have desires and beliefs that differ from their own (Baron-Cohen, Leslie, & Frith, 1985). Empathy is the capacity to share or even recognize other's feelings, while perspective taking is perceiving physical, social, or emotional situations from a point of view other than one's own (Selman, 1971). The ability to perceive other's emotions is one of the earliest skills developed by children. Most children can discriminate the facial expressions for happiness, sadness, anger, and fear, by the time they reach preschool years (Ekman, 1971; Odom & Lemond, 1972).

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The performance of preschool children on the analog and digital versions is compared and evaluated with relation to the teacher's observations of behavior on a standard school behavior scale (social competence and behavior evaluation—SCBE).

Understanding the emotional states of others is a key aspect of social development (Burger, 2010; Ekman, 1971; McClure, 2000). Most children arriving at preschool have learned basic social competencies. Social competencies enable social interaction with their peers and adults. Some children arrive lacking the skills to socially interact. Multiple types of problems can occur when children lack the social competencies that are needed to engage with their peers and adults. Our goal, for this study, was to investigate how well technology could replicate standard affective and social cognition tests with the purpose of identifying children's social emotional skills at an early age. Further, our investigation sought to determine what types of intervention, involving the development of social emotional skills, we could give teachers, to help children practice these skills in a fun and engaging way, using games.

Basically, the aim of this study was to design and build a cartoon-based interactive touch screen game for preschool children, so that we could identify and measure cognitive and affective developmental competencies. To date, most school-based applications focus their research on educational concepts (Gelderblom & Kotzé, 2009), but this study includes a social domain measure to assess preschool children's social competency levels. The research approach was multidisciplinary, using insights from education, developmental psychology, and interaction design. Drawing on multiple approaches, the goal was to design an interactive digital game so that we could compare a range of developmental competencies (ToM, perspective taking, emotion recognition, and empathy) with traditional analog tests in 29 children in a preschool in the North of England, UK. Our approach is novel, in that it compares social emotional competencies by using tests in digital and analog format. The ultimate purpose for this study was to assess whether developmental milestones, such as ToM, can be detected at a younger age using technology, and whether a combination of social competency tests in digital format can be used to identify and help children enhance social competency skills.

Relationships Between Affective and Cognitive Precursors of Social Skills

Vygotsky (1987) identified the preschool years as a time when children start to use cognitive strategies to control their emotions. During the preschool

years, children develop the ability to self-regulate, engage in self-guidance and behave in socially responsible ways (Kopp, 1991). This complex set of skills is developed in the first 3 years of life, and enables preschool children to interact socially with, and learn from, others. These skills include the ability to see things from another person's perspective, to understand what another person perceives (ToM), the ability to recognize emotions (Ekman, 1971), and the ability to feel and share another person's emotion (empathy). In time, these skills will enable children to understand the perspectives, motives, and mental states of others. The development of these meta-representational abilities is the key to understanding the minds of others. This ability depends on shared social activities, such as pretending and language, at first with the mother or primary caregiver and later, with peers (Goswami, 2008).

There is debate in the psychology literature (Omdahl, 1995; Shantz, 1975) on identifying whether perspective taking is purely cognitive or has an affective component that is afforded by the understanding of others' minds (Baron-Cohen et al., 1985). Understanding the mental states of others requires an understanding of affect, the experience of feeling of both negative and positive emotions (Tomkins, 1962). In a study with adults, Oswald (1996) found that affective-perspective taking is more effective than cognitive-perspective taking to learn how to empathize with others and help others altruistically. From Oswald's study, we can conclude that empathy is a fundamental component of social emotional experience, and plays a vital role in social interaction and has both cognitive and affective components (Szalavitz & Perry, 2010). The cognitive component of empathy overlaps with the construct of perspective taking, the ability to put oneself into the mind of another individual and imagine what that person is thinking or feeling. By testing all four constructs together, the results may reveal any interrelationship between the constructs.

In adulthood, the ability to correctly identify and use, understand, and manage emotions involves a high level of emotional intelligence (EI; Mayer, Salovey, & Caruso, 2000). How children develop into fully socially competent adults demonstrating these EI capabilities is not fully understood. Most of the research in EI has been conducted in adults and older children and usually demands a degree of literacy beyond 3-year-olds. Although prior studies have focused on adults and older children, we argue that we can test for affective and cognitive skills associated with the development of social competence using cartoons in digital and analog formats specifically designed for preschool children.

Interaction Design for Preschool Children

There is a subset of children, diagnosed as having autistic spectrum disorder (ASD), for whom technologies are important in order to enhance their social development. Ploog, Scharf, Nelson, and Brooks (2013) reviewed how the use of computer-assisted technologies (CAT) could be used to enhance the social and communicative development in children with ASD. Nelson's study may give insights that also aid the discussion for the design and development of games that would facilitate the social engagement of diverse groups of children. The authors characterize children with ASD as having deficits in language and social skills and they highlight that one of the key questions is whether CAT is more effective than traditional teaching and training methods. Arguably, there is a lack of rigorous assessment of the efficacy of such methods, compared with traditional methods.

Children arriving at mainstream nursery school have different levels of prior engagement with technology (Mayer et al., 2000). The lack of experience with or exposure to digital technology may further confound children's readiness for school learning and socializing, if they are lacking social competency skills. Researchers and practitioners argue that some children arrive at school with different levels of exposure to rich verbal language and social skills (Burger, 2010) and some who may also have been recently diagnosed as being on the ASD spectrum, lack the ability to develop a functional ToM and, as a result may have difficulty in socializing with their peers and adults (Dawson et al., 2004). If a child lacks the ability to practice appropriate social skills, he or she may have difficulties adjusting and getting along with peers. As stated earlier, understanding the emotional states of others is a key aspect of social development, and attention to these social skills is essential to help children engage and enhance formal learning and education through effective collaboration between and among peers. Game designers for preschool children should take into account that some of the children may not possess the ability to read and they may also have different ability levels involving social and openness to new experiences and motivation to learn. Motivation and social skills are some of the key factors for proper social development and learning.

Malone and Lepper's (1987) research on the use of games and motivation led to Keller's (1987) model of motivation. This model lists the motivational aspects as: curiosity, challenge, confidence, and control. Applications that motivate tend to engage children's natural curiosity and interest in novelty, and also provide challenge, control, and reward.

The situation in which these social competencies, such as motivation, can be developed in school is important to the design process for games. In the context of affective, and prosocial interfaces for preschool children, a particular design could use the surprise factor to arouse curiosity and provoke interactions that are not too easy or difficult. Providing children with interactions that are not too easy or difficult could keep them engaged and possibly reduce demotivation. Balancing easy and difficult is not the only motivating factor: self-efficacy is also important. Bandura (1977) points out that a good design would be to set tasks that are linked to the child's previous experiences. The aspect of control is also important for preschool children. Higgins (2006) found that if a game offers control involving an engaging game format, technology has the potential to provide the motivation to play and the possibility of value would come from experience and engagement. There are many factors other than the elements mentioned above that contribute to learning with technology/digital media, and improve social skills, but only a few can be discussed in this chapter.

Lee, Wartella, and Caplovitz (2002) argue that the classification of digital media for children is very wide-ranging and that a classification system is needed that identifies levels and types of interactivity to help link interactive features to cognitive processing and outcomes. There have been some applications designed to address social competencies, but primarily designed for children who are assisted by an adult. In this chapter, the main research question is: Can we use digital technology to inform teachers in preschools of the social competencies of children, and do these tests perform as well as the standard psychology tests? There are three hypotheses:

Hypothesis 1 Presentation affects performance on tests of ToM, empathy, emotion recognition, and perspective taking.

Hypothesis 2 Scores on the digital tests can be related to the SCBE scores.

Hypothesis 3 Results for performance with empathy, perspective taking, ToM and emotion recognition tasks show common factors.

METHOD

Participants

The children ($N=29$: 15 girls, 14 boys) were recruited from a nursery school in the North of England. Their ages ranged from 3 years 3 months to 4 years 2 months ($M=43.6$ months; SD $=3.4$). The children attended either morning, afternoon, or all-day nursery sessions. Ethical approval for the study was obtained from the University Ethics Committee for the

administration of digital and analog tests of emotion identification (faces), perspective taking, empathy, and ToM.

Materials and Procedure

Analog Tests of Emotion Recognition, ToM, Perspective Taking, and Empathy

A quiet reading room was set aside to do the tests. Children appeared to be happy to enter the room, which was located just off the main play area. Tests were described as "some games we are going to play".

Emotion Recognition

The children were shown four stock pictures of faces expressing happiness, sadness, anger, and surprise. These were selected from stock photographs used in the MSCEIT EI test (Mayer et al., 2000) except for the one for happiness, as initial trials showed some confusion with the adult face, so this was substituted for a smiling child (again from royalty-free stock photographs). The children were asked to select a happy face, sad face, angry face, and surprised face. The order in which the emotions were presented was counterbalanced between the children. They scored 1 for each correctly identified face. At the end of the session, if they had incorrectly identified the emotions, they were shown the correct faces.

Theory of Mind

The children were given two standard first order ToM false belief tasks. One task was based on a standard change-of-location task (Baron-Cohen et al., 1985) in which a doll called Sally and a teddy bear called Harry were used to role play hiding objects in a box and behind a cushion. Harry and Sally hid a toy chick in the box and then Harry was shown leaving the room. Sally then moved the chick and hid it under the cushion. The child was asked where Harry would look for the chick when he came back in. The child scored 1 for identifying that Harry would look in the box and 0 for under the cushion. The second task was based on an unexpected object paradigm (Gopnik & Astington, 1988). The children were shown an egg box containing coins then closed the box, then asked what they thought their teacher would think was in the box. The child scored 1 for saying eggs, 0 for saying coins.

Perspective Taking

The children were shown three everyday objects (a children's bowl, a screwdriver, and a hairbrush). They were questioned what would Mummy like as

a Christmas present, then what would Daddy or Grandad choose. They scored 1 for each item if the appropriate present was chosen.

Empathy

The first task asked the child if they had ever seen someone crying in the nursery. If the answer was yes, they were asked what they would do if they saw someone crying. They scored 1 for answering an appropriate empathic response (e.g., "give her a cuddle" or "tell the teacher") and 0 for ignoring the situation or failing to answer. If they answered no, they were asked if they had seen someone at home crying and again if the answer was no they scored 0. For the second task, the child was shown a toy puppy with a bandaged paw and was asked whether they had a cat or dog at home, and if so what would they do if the cat or dog was injured/crying. If they did not have a pet at home, they were asked what they would do if they saw an injured or distressed animal. They scored 1 for any appropriate empathic response, 0 for not answering, or an inappropriate response.

Digital Tests of Emotion Recognition, ToM, Perspective Taking, and Empathy

The digital versions were in the form of cartoon scenarios, especially designed for the study, presented on an Iiyama 19" ProLite LCD touch screen monitor that allowed the children's interaction with the software. Although touch screen technology is not new, earlier touchpads were usually designed for use with a stylus. This is not an ideal tool for small fingers and as the popularity of the iPhone apps have demonstrated, using fingers as tools is much more intuitive and usable. A pilot test was conducted with a 3-year-old girl with the "Wheels on the bus" app on the iPhone. She proved adept at interacting with the characters and screens, even though the screen is so small. The school had computers for the children to use with access to shows from "cBeebies" (a BBC children's program). The vertically mounted LCD touch screen monitor allowed the children to engage in a novel way of interacting with a computer. The screen was placed on a low shelf that housed the other computers used by the children, so that the researcher and children could participate at the same level. The software was written in Visual Basic 2008, with backgrounds simulating a school environment and characters drawn to represent children of the same approximate age as the participating children. The screens included buttons that the pupils could touch to make characters and objects appear and disappear, and objects could also be manipulated by touching them to initiate a move.

The original intention was to allow the child to drag the object (the cushion to hide the ball in the Sally test) but pilot tests showed that the child could not easily keep touching the object and dragging it to its destination. The program consisted of six screens: a front screen that allowed navigation to all the other screens and also to the test data screen (for the researcher to enter the data). The other screens comprised screens for the tasks of identifying emotions (the pupils had to identify four emotions: happy, sad, angry, and surprised). Each of the other constructs, empathy, perspective taking (Figure 13.1), and ToM (Figure 13.2), was tested twice.

Teacher Evaluations Using the SCBE

The nursery coordinator completed the *Social Competence and Behavior Evaluation Preschool Edition* (LaFreniere & Dumas, 2003) measures for each child. This is a standard psychometric scale, validated for use in school and clinical settings. It is a standardized instrument designed to assess patterns of social competence, affective expression and adjustment difficulties in children aged 30-78 months. The scale comprises eight basic scales: depressive-

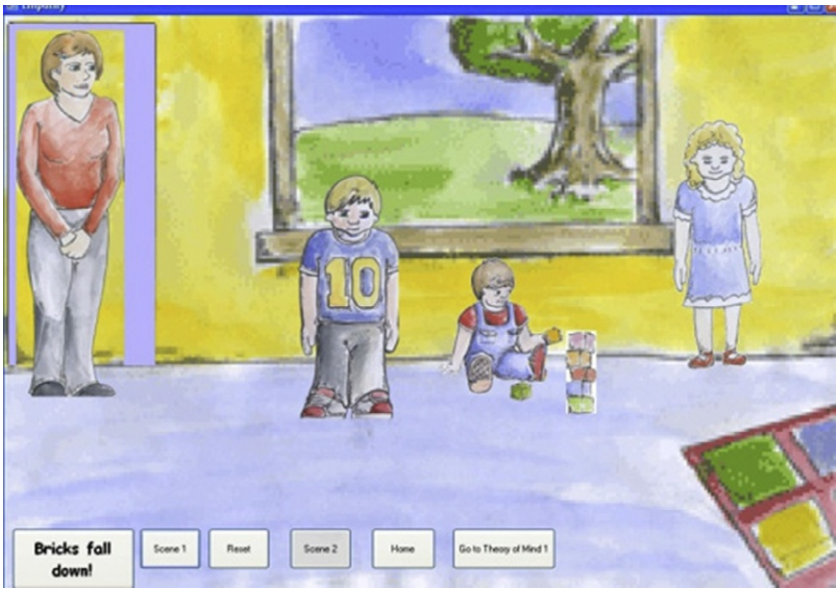

Figure 13.1 Perspective taking and empathy scenario from the game—the children pressed a button and the blocks fell down and a small boy child is shown crying. The participant is asked why do they think the boy is crying (empathy) and who in the scene would help build the blocks (perspective taking)?

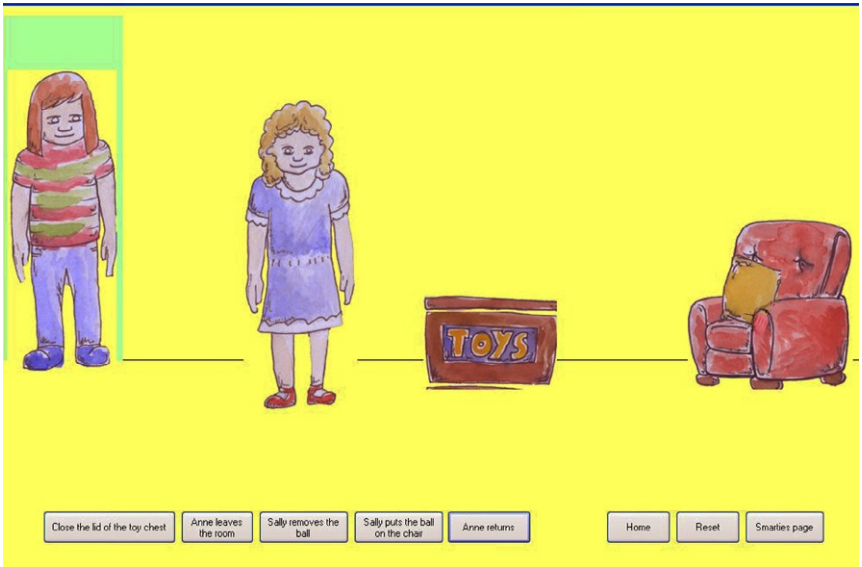

Figure 13.2 Final scene from a theory of mind test, where a ball was put into the toy chest. Anne returns and the ball has been hidden in a different place (on the chair).

joyful; anxious-secure; angry-tolerant; isolated-integrated; aggressive-calm; egotistic-prosocial; oppositional-cooperative; and dependent-autonomous. Combinations of these scores produce summary scales of social competence, internalizing problems, and externalizing problems, and a total of these three scores gives the general adaptation (SCBE) score.

RESULTS

Presentation Affects Performance on Tests of ToM, Empathy, Emotion Recognition and Perspective Taking (Hypothesis 1)

The affect of presentation and test type on the test score was investigated to test Hypothesis 1; test type and presentation were the between-subjects variables. The test type had four levels (emotion recognition, perspective taking, empathy, and ToM); presentation had two levels (analog and digital). The within-subject variable gender had two levels. The scores for the analog and digital tests are shown in Table 13.3. The scores are identical for perspective taking (digital: $M = 1.66$; $SD = 0.61$; analog: $M = 1.66$; $SD = 0.61$). The ToM scores show a higher mean score for the analog version, $M = 0.55$; $SD = 0.83$, compared with the digital version, $M = 0.31$; $SD = 0.54$.

For the repeated measures component test type, Mauchly's test indicated that the assumption of sphericity had been violated for test (χ^2 (5) = 19.528; $p = 0.002$) and so the Greenhouse-Geisser estimate of sphericity ($\varepsilon = 0.688$) was used to correct the degrees of freedom for this part of the analysis. A $2 \times 4 \times 2$ factorial mixed ANOVA revealed that there was a main effect of test, $F(2.06, 55.71) = 36.17$, $p < 0.01$; a main effect of presentation, $F(1, 27) = 12.12$, $p < 0.05$ (Figure 13.3) and an interaction effect of presentation and test, $F(1.93, 52.10) = 6.76$, $p < 0.01$. There was a nonsignificant (ns) main effect of gender, $F(1, 27) < 1$, ns. Analysis of pairwise comparisons (Bonferroni, $p < 0.05$) shows all tests to be significantly different from each other. Scores were higher with the digital presentations for two of the measures: emotion recognition and empathy. The mean scores were the same for both presentations for perspective taking. ToM was the only measure that showed a lower mean score for the digital presentation. There were no substantial differences in the performance between the girls and the boys. They have the same mean score for the ToM tasks.

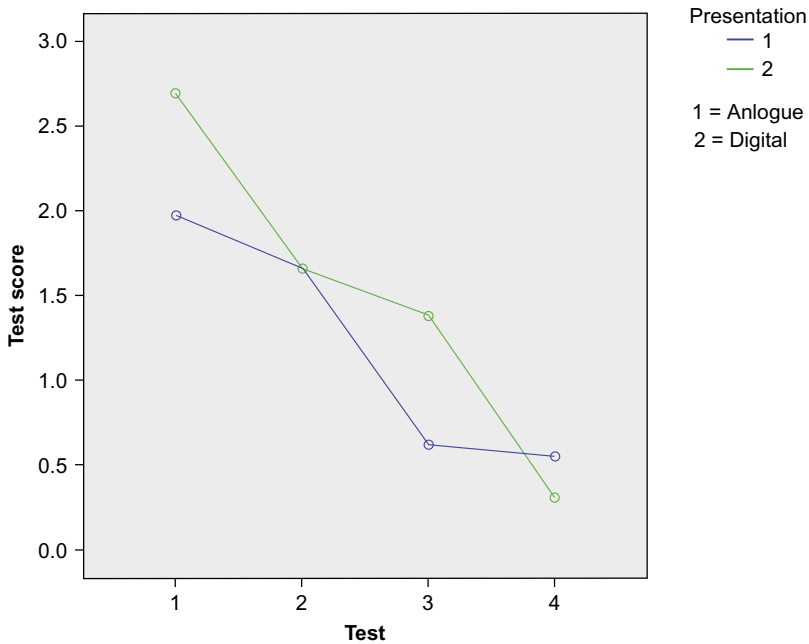

Figure 13.3 Interaction between presentation and test.

Scores (Figure 13.3) were higher with the digital presentations for two of the measures: emotion recognition and empathy. The mean scores were the same for both presentations for perspective taking. ToM was the only measure that showed a lower mean score for the digital presentation.

Correlations of Digital and Analog Versions of ToM, Face Recognition and Teacher Assessment scores

A correlational analysis of the total scores of the test data (presentation data combined) with scores from the teacher-evaluated SCBE scores (data presented later) and age were performed. As the SCBE data (Table 13.3) were not normally distributed it was decided to conduct a nonparametric Kendall's tau. An additional consideration in this decision was that the nature of the research test data meant that there would be several tied ranks (Field, 2009). Tables 13.1 and 13.2 show the significant and nonsignificant correlations.

Table 13.1 Correlations between scores for digital and analog versions of the theory of mind and face recognition tasks and SCBE scores (full and social competence subset)

	Analog ToM	Digital ToM	Analog faces	Digital faces	SCBE	Social competence
Analog ToM	1 . 29	.527** 0.003 29	−0.129 0.439 29	0.067 0.687 29	−0.061 0.686 29	−0.017 0.911 29
Digital ToM	.527** 0.003 29	1 . 29	−0.229 0.179 29	−0.196 0.249 29	−0.019 0.904 29	0.06 0.698 29
Analog Faces	−0.129 0.439 29	−0.229 0.179 29	1 . 29	0.198 0.211 29	−0.014 0.922 29	−0.026 0.859 29
Digital Faces	0.067 0.687 29	−0.196 0.249 29	0.198 0.211 29	1 . 29	0.241 0.095 29	0.219 0.13 29
SCBE	−0.061 0.686 29	−0.019 0.904 29	−0.014 0.922 29	0.241 0.095 29	1 . 29	.769** 0 29
Social Competence	−0.017 0.911 29	0.06 0.698 29	−0.026 0.859 29	0.219 0.13 29	.769** 0 29	1 . 29

** Correlation is significant at the 0.01 level (2-tailed).

Table 13.2 Correlations between scores for digital and analog versions of the empathy and perspective taking tasks and SCBE scores (full and social competence subset)

	Total analog perspective taking	Total digital perspective taking	Total analog empathy	Total digital empathy	Total SCBE	Social competence
Total analog perspective taking	1.000	0.151 0.471	0.203 0.331	0.502** 0.011	−0.126 0.549	−0.174 0.407
Total digital perspective taking	0.151 0.471	1.000	−0.007 0.974	0.681* 0.000	0.463** 0.020	0.468** 0.018
Total analog empathy	0.203 0.331	−0.007 0.974	1.000	0.208 0.318	0.212 0.310	0.116 0.580
Total digital empathy	0.502** 0.011	0.681* 0.000	0.208 0.318	1.000	0.160 0.444	0.146 0.485
Social Competence	−0.174 0.407	0.468** 0.018	0.116 0.580	0.146 0.485	0.908* 0.000	1.000
Total SCBE	−0.126 0.549 25	0.463** 0.020 25	0.212 0.310 25	0.160 0.444 25	1.000 25	0.908* 0.000 25

*Correlation is significant at the 0.01 level (two-tailed).
**Correlation is significant at the 0.05 level (two-tailed).

Scores on the Digital Tests Can Be Related to the SCBE Scores (Hypothesis 2)

Preschool Behavior Teacher Evaluations (SCBE)

Independent teacher evaluations using the SCBE scale were analyzed against the independent teacher evaluations yielded from the *Social Competence and Behavior Evaluation Preschool Edition* measure. The overall scores from the SCBE scores were found not to correlate with either the total test scores for either the digital or analog presentations separately, or the total task performance scores. One of the original cohort of 30 pupils did not engage with either the analog or digital tasks, and she was not included in the experimental data. However, she was tested on the SCBE scale and, along with one other girl and one boy, had the lowest scores on the SCBE. The percentile rank of 90% corresponds to a T-score of 63 and the lowest 10th percentile corresponds to a score of 37T. These children's scores were below 35T. LaFreniere and Dumas (2003) recommend that these scores indicate problematic adjustment that may benefit from planned intervention measures.

The profiles of the children's basic and summary SCBE scores were investigated to assess the relationship between components of the SCBE measure and the constructs measured here. The results are presented in Table 13.3. The dependent-autonomous subscale showed a correlation with the total digital scores ($r = 0.440$, $p < 0.05$). Dependent-autonomous behavior was elicited by questions on activities, such as "needs teacher to function well"; "clingy towards teacher in novel situations" (both negatively scored), and "persistence in solving own problems"; "takes initiative with new people"; "is autonomous and able to organize what he/she is doing" (positively scored).

Results for Performance with Empathy, Perspective Taking, ToM and Emotion Recognition Tasks Show Common Factors (Hypothesis 3)

An exploratory factor analysis was conducted to assess components from the data that may have a relationship to each other and then to test the ecological validity of any components against sub-items of the SCBE scale (Table 13.3). The total scores (combined analog and digital) provided additional data for an exploratory factor analysis. A principal components analysis (PCA) was conducted on the five items of the tests (emotion recognition was split into total scores for negative and positive affect) with orthogonal rotation (varimax). Because of the sample size, a cut-off level for factor loadings of 0.40 (Stevens, 1996) was set. The Kaiser-Meyer-Olkin (KMO) measure verified

Table 13.3 Teacher assessments using the SCBE preschool edition measure: Overall emotional adjustment and interaction with peers

	Aggressive calm	Egotistic prosocial	Social competence	Internalizing	Externalizing	Total general adaptation score
1	15	18	49	71	55	175
2	29	23	39	56	86	184
3	28	20	42	62	81	185
4	19	21	56	74	60	190
5	24	21	72	56	70	192
6	28	19	62	71	69	202
7	29	25	45	66	93	204
8	28	27	74	67	65	206
9	34	26	64	57	90	211
10	21	21	54	76	64	212
11	28	17	85	69	65	219
12	26	16	100	66	56	221
13	24	19	72	88	63	223
14	31	28	66	69	89	224
15	37	22	77	59	93	229
16	34	29	69	74	95	238
17	31	27	71	86	91	248
18	40	34	111	64	77	252
19	36	33	88	83	97	268
20	30	28	101	87	86	274
21	39	38	121	85	80	286
22	30	28	107	97	83	287
23	36	32	139	79	73	291
24	34	32	111	92	94	297
25	44	41	139	68	95	302
26	37	35	149	82	83	314
27	36	39	129	93	93	315
28	41	37	150	80	87	317
29	46	45	153	77	97	325

the sampling adequacy for the analysis, KMO = 0.513, which although is just above the minimum value of 0.5, allows a preliminary investigation of the factors. Bartlett's test of sphericity, χ^2 (4) = 37.38, $p < 0.01$ indicated that correlations between the items were sufficiently large for PCA. An initial analysis was run to obtain eigenvalues for each component of the data. Two components have eigenvalues over Kaiser's criterion of 1 and explained 71.62% of the variance.

Table 13.4 Identification of factors

	Component	
	1	2
Empathy total scores	0.933	
Theory of mind total scores	0.904	
Negative emotion identification		0.869
Positive emotion identification total		0.845
Perspective taking total scores		0.547

Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization Williams, Brown and Onsman (2010).
[a]Rotation converged in three iterations.

Table 13.4 shows the factor loadings after rotation. The items that cluster on the two components are ToM and empathy (component 1) and perspective taking and negative and positive emotion recognition scores (component 2). This is consistent with the research literature with respect to ToM and empathy being cognitive factors (Lamm, Batson, & Decety, 2007) that reside in the same regions of the brain.

Emotion recognition (both positive and negative) shows a relationship with perspective taking (Table 13.4). This could be interpreted as an affective grouping and in this context, it may suggest that affective perspective taking is associated with the recognition of emotions. This can also be seen with the correlations (Tables 13.2 and 13.3) showing a relationship between the analog ToM test and digital empathy test (r_o (25) = 0.840, $p < 0.01$). The correlation between the digital empathy test and digital perspective taking tests (r_o (25) = 0.681, $p < 0.01$) show a relationship at variance to the factor analysis. The emotion face recognition analog results correlate significantly with the analog ToM test (r_o (25) = 0.529, $p < 0.01$), which suggests that the standard test for ToM has worked well but when added to digital scores it may be measuring something different. The factor analysis agrees with the link between faces and perspective taking (r_o (25) = 0.479, $p < 0.05$) but for only the digital tests.

DISCUSSION

From an interaction design perspective, the ability to easily manipulate objects and events with their fingers was a motivating factor and fun factor and led to some pupils re-entering the test room repeatedly to play with screen to make the characters do things. Children were curious to try the touch screen. This new interaction, with a touch screen computer, motivated and challenged the children and most readily engaged with the

technology confirming the motivational aspects identified by Keller (1987). A small number of children, however, did not perform well generally and in particular with regard to new experiences. No systematic, qualitative assessment of the children's interaction with the touch screen application was measured directly, but the results from the first two questions indicate that we can design games to help with emotion recognition and perspective taking. The results, from this study, indicate three children out of 30 require help developing these skills. Qualitative data in the form of observing children's reactions and asking the teacher for suggestions about some behaviors with digital presentation was valuable in putting some of the findings in context.

Hypothesis 1 was tested using the digital and analog scores for ToM, empathy, emotion recognition, and perspective taking. There was a significant effect of presentation with scores being higher overall for the digital presentations except for ToM, where the analog results were higher. Results for each construct correlated with analog and digital versions (as expected), so even though the digital results are lower for the digital version, it may still be a useful tool for screening for ToM. The children also may have been too young and may not have developed ToM characteristics yet. The results support Hypothesis 1.

Hypothesis 2 stated scores on the digital tests could be related to the SCBE teacher-assessed school readiness scores. Using data from both the tests and teacher evaluations, resulted in the teacher-assessed readiness. The teacher evaluations of the children's behavior asked questions designed to test the constructs of social competence, internalizing, and externalizing behavior. None of these correlated with the experimental data but one subfactor of dependent/autonomous behavior correlated with the total digital scores for the tasks. Children with low scores lack initiative in new situations and are perhaps not open to new experiences. These children may lag behind others in being comfortable with technology, if it has not been introduced in a fun way at an earlier age. The results support Hypothesis 2. However, these results are from a small group of children and cannot be generalized and should be treated with caution. Some of the correlations with the separate analog and digital test scores show contrasting correlations and in the case of the confirmatory relationship between the digital faces and the digital perspective taking, it may be that the children are more motivated and engaged by the digital game and it may be that this is a way of engaging and testing at the same time. Our findings are similar to Sabourin and Lester's (2014) study of affect and engagement in game-based learning environments

with 14 year-olds, which concluded that there is both learning and a promotion of positive affect and engagement in game-based learning. The limitations of the study are the small number of participants (25-29 depending on who had attended on the study days), and the nature of the data collected. Each analog and digital test had two tests so the total score ranged from 0 to 4. The aggregate digital and aggregate analog scores provide enough data and the data are probably more reliable than the individual test scores. However, the correlation between the digital and analog tests suggest that the data represent the respective constructs well.

Hypothesis 3 stated that we could cluster some factors from the measured variables of empathy, perspective taking, ToM, and emotion recognition. The factor analysis shows, although limited but significant data, that empathy and ToM can be considered together, possibly as cognitive factors, while emotion recognition and perspective taking cluster together and may be considered together as affective factors. This contrasts with the findings of Zahn-Waxler, Robinson, and Emde (1992), which show empathy as the more intuitive construct and perspective taking as the more cognitive. This research points to perspective taking being linked with emotion recognition, and there may well be an innate ability to recognize emotions at the visceral level, and this may happen at the behavioral or even metacognitive, reflective level identified in Norman's (1988) model. The limitations are that exploratory factor analysis is often conducted where $N > 50$. However, some authors (e.g., de Winter, Dodou, & Wieringa, 2009) have argued that it should not necessarily be ruled out for smaller samples as long as the data are well-conditioned (high λ, low f, high p). These field data are interesting, but from a scientific perspective, the data are probably marginal. It would however, be interesting to repeat the study with a larger group of participants.

CONCLUSION

Since there is debate in the literature on how perspective taking helps the development of other metacognitive skills, it may be that environmental factors (skills development in recognizing emotions and being able to put oneself in another child's shoes) can be manipulated at an early age. Perhaps there is a role for prosocial games as an intervention to help children whose affective skills need developing. Ploog et al. (2013) reviewed the use of computer-assisted teaching for enhancing successful recognition of emotions as part of ToM, but did not find successful uses for false belief tasks, such as the one used here. There was no correlation between the traditional

false-belief task performance and the digital task in this study, which may suggest that the digital medium (e.g., digital cartoons), offers no extra benefit for use in the early identification of performance on ToM, but the total scores for the digital suite of tests is correlated with, but may offer a fun, engaging tool for teachers to assess performance on ToM tasks. The popularity of touch screen devices led by the iPhone apps is likely to see a growing interest in how to use these technologies with very young children. We can design affective interfaces, not just for ease of use, efficiency, and to increase sales of products—ideally, designing affective interfaces could add value to society by ensuring that preschool children are helped to use computers in a way where it is fun to learn cognitive and affective skills. The use of multi-touch technology can make the learning experience not just a solitary experience. One-to-one use of an affective game together with a teacher could help build confidence and skills with the child, before the child plays with his/her peers on a collaborative affective game.

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EMOTIONS, TECHNOLOGY, AND DIGITAL GAMES

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