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Gaming Literacy: Construct Validation and Scale Construction

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by

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Abstract

This thesis is the first attempt to construct a standardized measure of literacy for the medium of video games, filling a gap in the literature by synthesizing various items of skills, behaviors, and affective components from existent studies and determining their correlations through analysis of survey data. The five categories that were derived from conceptual review and factor analysis have high measures of internal consistency: Information and Systems Management; Exploration and Enjoyment; Teamwork; Design; and Socialization. To test for external consistency and reliability, the proposed gaming literacy model was compared to the Novak and Hoffman (1997) construction of flow, using the three primary components of Challenge, Skill, and Play. Flow is the ultimate level of optimal experience possible with any activity, so it was assumed that high levels of self-reported literacy would coincide with similarly elevated scores with the flow phenomenon. The data shows that, indeed, there is a positive and statistically significant relationship between the two constructs. Nomological validity tests between males and females were conducted post-hoc, using the available data. The intended use for this scale is to establish a baseline measurement system for self-report methods of assessing literacy with video games. Future research should attempt to correlate the scale to actual gaming activity, test the importance of each component in an experimental setting, and determine the discriminate validity by comparing it to scales that have been established for other forms of digital literacy.

Chapter 1: Introduction

In most academic circles, the medium of video games has been suffering from a lack of identity. Gaming has been studied for its effects and its potential in the context of other media and disciplines. Violent video games have been studied for their influence on aggressive thoughts and behaviors (Anderson & Dill, 2000; Anderson & Bushman, 2001), and articles have been published on addiction (Fisher, 2002; Grusser, Thalemann, & Griffiths, 2007). Prensky (2001), noting more positive aspects, advocates for games to be used in education, arguing that the format and language of games teach skills that are beneficial, like trial-and-error exploration of virtual environments, persistence in problem-solving methods, and trust in a logical, solvable rule set (p. 143). However, he is still an advocate for a limited perspective. His conclusions tend to focus on the educational implementation of games, not their intrinsic teaching properties. The things he found beneficial in games are tools toward some other end, like Gee (2003), who analyzes video games for their mechanics of learning. Though these findings and implications are useful and pertinent to the fields that bend games to their respective agendas, "media should not be regarded merely as teaching aids or tools for learning. Education about the media should be seen as an indispensable prerequisite for education with or through the media" (Buckingham & Burn, 2007, p. 323).

This sentiment is an echo of similar arguments concerning previous forms of media. "If you want to use television to teach somebody, you must first teach them how to use television" (Eco, 1979). Since the advent of television, the need for this type of education *about* a medium—as opposed to education *with* or *through* the medium—has

only increased. "We live in a world where, for both better and worse, the very same digital media serve our social, working and recreational selves" (Chatfield, 2010, p. 5). Digital media are not simply tools to be used in one's daily routine, they are actively reshaping society and the ways people relate to each other. For instance, the ability to virtually "friend" people has ramifications for how people communicate interpersonally, how they evaluate each other, and even their self-perceptions (Tong, van der Heide, Langwell, & Walther, 2008; Ross et al., 2009).

Games in particular are defying expectations and "digital play is proving to be one that demands many qualities not traditionally associated with leisure: education, management and planning skills, profound effort, even self-sacrifice" (Chatfield, 2010, p. 5). Massively Multiplayer Online Role-Playing Games (MMORPGs) have complex social structures, both in and outside of the actual game; organizations such as guilds and clans spill over into forums and fan sites, and homebrew economies are built to piece together smaller, disparate in-game systems of trade (Castronova, 2005). In fact, MMORPGs are now seen as potential "Petri dishes" for social science studies (Balicer, 2007; Castronova et al., 2009). Conversely, many aspects of the "real" world are beginning to function more like the goal-oriented, bounded systems of video games (Schell [G4], 2010). Studies in behavioral economics (Hsee, Yu, Zhang, & Zhang, 2003) have shown that people are motivated by point-based systems of achievement—a common video game trope—even when the only goal is to "persuade a room full of people to work for twice as long as they need to in order to earn a reward that most of them don't like as much as the one they would have got had they worked for half that amount of time" (Chatfield, 2010, p. 151).

The relationship between life and gaming is such that making this distinction of 'which is more like which' is becoming ever more difficult. There are people who work (for fun) in virtual factories inside *Second Life*, helping to make real jeans. On the other hand, there are people in China known as 'gold farmers' that spend all day in front of a computer, mining in-game resources to sell on shady black market sites to Americans who do not have the time or desire to attain the stuff themselves. Then again, there are people—millions of people—who will happily pay the monthly subscription fee to do exactly the same set of tasks. To muddle the matter further, the same Chinese 'farmers' who spend twelve hours a night playing MMORPGs as a job (which pays less than a dollar an hour) will clock out from work and immediately sign in to their own profile to keep playing (Chatfield, 2010).

As interactive, system-based digital media become further entrenched in the psyche of our cultural consciousness, it is prudent to look at the commercial, mainstream form of this type of technology. Understanding how gaming and the properties of its medium relate and contribute to society is of intrinsic value to the field of gaming media scholarship. Additionally, studying what games do and teach as a medium will help to illuminate the role and potential of the format of games in our society. First, though, it is necessary to establish a communication-focused milieu and to situate video games in the progression of dominant media.

The literature was reviewed concerning the nature of the medium of video games with a framework grounded in medium theory. Following the logic of McLuhan (1995), it is possible to assert that gaming entails unique patterns of media creation, interpretation, and consumption. A pragmatic comparison between video games and other

less interactive digital media positions gaming as the next culturally dominant medium. If such potential exists, then it is necessary for scholars to develop standardized scales for measuring literacy in context of the medium. Instead of asking gamers questions based on the skills that video games theoretically have the potential to teach, cultivate, sharpen, and maintain, it is more appropriate to determine what digital games are achieving in their current form. This is why the majority of the items addressed in this study are derived from direct research and inquiry. Many of the questions in the resultant survey are taken verbatim from participants in those previous studies about gaming habits, skills, and experiences.

This thesis details the potential for gaming to teach particular skills, including proficiencies with concepts like information processing and resource management, as well as the emotional reasons and outcomes of playing video games. A comprehensive literature review is still an untested construct, however. For example, it was unknown if the emotions defining the relationship between people and video games would be indicators of particular behaviors or skills, or if they justifiably constitute their own discrete literacy factor. Therefore, after all of the potential self-reportable skills had been compiled, a survey was crafted to develop a quantitative self-report measure of proficiency, confidence, self-efficacy, and perceived task value for the various items. While the proposed breakdown of variables was not perfectly predictive, it proved conceptually sound and statistically significant. The positive outcomes of the study help cement this initial foray into a scale development for gaming literacy as a solid first step upon which others may build.

Chapter 2: Literature Review

Human beings have dominated the natural world through our need to enhance communication. We have conquered the globe with our older technology, eliminating the concept of space with virtual extensions of our extremities (McLuhan, 1995, p. 149): vehicles extend our feet cross-country; telescopes enhance our optical capabilities enough to gaze deeper into the heavens than ever thought possible; and even something as simple as the written word, an extension of spoken language through time and space—itself an extension of basic thoughts, feelings, and intent—lets the voices of great minds reach across time to speak to us today. After such a thorough conquering of space and a solid dominance over one aspect of time, the past, it is only natural that we should devote our energies as a species toward the next step, the present.

McLuhan (1995) said that the content of any new, current media is always the format of the medium that came before it. The content of film is that of photography and the phonograph (or sound recording in general), quite often with the narrative structure and dialogue of books and plays. The content of television is essentially film, and the content of the Internet is an amalgamation of television, photography, and text. The advent of new media, associated with innovations like "Internet 2.0" and its offspring of social networking, have brought about a burst in cool media.

McLuhan's allusion to the eventual "cooling down" of media was a spot-on prediction. His "hot-cold" metaphor, used to outline the level of audience participation with a medium, describes the hands-off media on television and in film as hot— consumers of the media cannot do much to add to the experience and are stuck simply

being a passive audience. A cooler medium is one that consumers can "touch," or influence through feedback and, potentially, even active participation (McLuhan, 1995, p. 162). In the metaphorical-yet-still-literal analogies of McLuhan, electricity is the impetus for this perpetual and instantaneous connection with and awareness of the world at large. Electricity is the extension of our central nervous system and because of this substantial alteration to our "bodies," we are able to perceive "that great pattern of being that reveals new and opposite forms just as the earlier forms reach their peak performance" (McLuhan, 1995, p. 154). In other words, it is only once a new medium usurps the previous dominant medium that we are able to examine the older medium's patterns and effects, "and it is only on those terms, standing aside from any structure or medium, that its principles and lines of force can be discerned" (McLuhan, 1995, p. 157). Extending McLuhan's reasoning, this thesis attempts to show that those who play video games, arguably one of the most complex forms of digital media, develop a mental framework that allows them to better discern those lines and principles in other forms of interactive digital media.

Video games: the old new medium

Breaking the traditional model of technological progression, the format of the video game was not instantly adopted as the dominant medium. After more than three decades, gaming is still a relatively niche market. Though the games industry is a $13 billion powerhouse (Schiesel, 2007), it is the expensive price of games that constitutes that impressive figure, not the number of individual copies sold. Only recently have game developers and publishers been disappointed when they sell around a million units

(Justice, 2011). In fact, many smaller developers are elated when their product sees sales of anything over 300,000 units (Casamassina, 2009). Despite a hardcore following and ever-increasing sales in the casual market, video games have not yet emerged as a dominant medium.

However, there should be no doubt that video games constitute a unique medium; they have distinctive elements that previous media can barely even convey, much less lay claim to or imitate. When Nintendo began promoting its latest console, the Wii, the company used very little footage of the games themselves. The input mechanic of its motion controller and the almost pure interactivity of the device demanded something more. To present this truly new medium in the format of the old, a representational compromise was made: game trailers cut between brief snippets of gameplay footage and professional actors in a living room setting, who showed audiences how their real-life actions would control the experience. The gaming experience is more interactive than any other form of entertainment, and at least as complex as any other publicly available technology. It demands constant awareness and interaction from its users. While older media held to a prescribed format with specific rules, video games are the meta-analysis of rules: they offer up some format as an initial set of guidelines so that the user may delight in their analysis and, eventually, their mastery. Cheat codes are the ultimate breakdown of rules, eschewing the programmer's dogmatic design in favor of chaotic customization. Gamers are empowered users of their media.

What a difference a generation can make

People who have grown up playing video games, so-called digital natives, did not have a jarring transition from isolated viewing to actively engaging in an interactive medium. It is only those who have not been raised from birth to appreciate this modality of perception that struggle with interactivity. McLuhan and Fiore (1968) likened this lack of vision to a literal lack of sight with a reference to biologist Otto Lowenstein and his book on *The Senses*, where Lowenstein describes the reactions of people born blind who regain their sight later in life:

> How they shrink at first from the welter of additional stimulation, longing at times to return to the relative seclusion of their former world! One of the most striking facts is that it takes a lot of time and effort before they recognize the objects around them as separate items… 'At first sight' the world looks like a flat extension of meaningless patches of light, dark, and color jumbled up into a quilt work… A meaningless jumble of shapes defies description, until the demonstrator has drawn on paper one or the other specific shapes to be searched for (McLuhan & Fiore, 1968, p. 10, 11).

Not only do these late adopters of sensory perception have difficulty catching up, but there is evidence that suggests these delayed lessons are not integrated into people's neural network in the same way. Hirsch and Kim (cited by Prensky, 2001, p. 41) found that languages learned later in life are stored in a different part of the brain than those learned in childhood (Prensky, 2001, p. 41). Even worse, the price of investment in rewiring the brain to learn and adapt to a new schema is substantial—hours a day, most days of the week, for weeks on end (Prensky, 2001, p. 42).

If learning methods of perception and analysis after the initial period of human development takes longer, can be emotionally jarring, and is proven to be physiologically different, then perhaps the late adopters are missing something greater than a basic

understanding. Certainly, it is not as though people cannot adapt and even embrace new forms of media throughout their lives. There are plenty of Americans who remember their first television and can manage to surf the internet. However, they do not apply the same terministic screens of parallel—as opposed to sequential—thought to their experience on the internet, much less their daily lives.

These digital adopters may understand and accept new media, but they do not *identify* with it in the way that digital natives do. It is not that they do not utilize or function within the same mental processes, merely that they have not internalized the awareness or analysis of those processes. Gee (2008) understands this perfectly when he starts his chapter on video games, learning, and the human mind with a brief throwback to scholars' historical conceptions of thought. Locke and Hume, he explains, used the technology of literacy to describe the mind as a blank slate which was written upon by experience. Now, as technology extends us further out into the world and comes closer to simulating the human mind, cognitive scientists see the mind as a parallel-processing, adaptive network. People define themselves and, in turn, shape their awareness and patterns of perception through the media they personally adopt, primarily those that assume the status of their dominant medium.

Media and the mind: how players simulate games

Gee (2008) asserts that people understand their world best when they use their imaginations to creatively and virtually recreate and manipulate known elements and paradigms.

> The mind works rather like a videogame. For humans, effective thinking is more like running a simulation than it is about forming

> abstract generalizations cut off from experiential realities.
> Effective thinking is about perceiving the world such that the
> human actor sees how the world, at a specific time and place (as it
> is given, but also modifiable), can afford the opportunity for
> actions that will lead to a successful accomplishment of the actor's
> goals (Gee, 2008, p. 43).

It is not that gamers are *necessarily* aware of this mental process, though that is always possible. Being a gamer does not make one more conscious of the awareness of form that gaming affords, it merely allows him or her to think and operate in a more natural environment—one that simulates the functionality of the human mind more closely. All media are extensions of us, but some are more or less limiting to our thoughts and expressions, depending on how much they constrain our natural flow of thinking.

Linear thought and expression are artificial constructions and, though they seem natural and even vital to many, they are not engrained in the same way that people have an innate capacity for language. Gazzaniga (1968), a neuroscientist at Dartmouth, agrees that "reading is an invention that is going to have a different neurology to it than the things that are built into our brain" (cited in Prensky, 2001, p. 43). Some scientists suggest, quite logically, that literate society had to institutionalize the "reprogramming" of the brain. "In fact, one of the main focuses of traditional school for the hundreds of years since reading became a mass phenomenon has been retraining our speech-oriented brains to be able to do reading… the training involves several hours a day, five days a week, and sharply focused attention" (Prensky, 2001, p. 43).

McLuhan (1995) knew that people would eschew traditional literacy for the "all-at-onceness and all-at-oneness, which are the basic needs of people translated by electric extensions of their central nervous systems out of the old rational, sequential value system" (p. 154). It was not a normative assessment. In truth, his prose-like style and

clever turns of phrase are likely evidence of his propensity with words and for reading—though his books are often complimented by starkly contrasting photos and strategic manipulations of words upon the page—but he remained cognizant of the fact that times were changing. When parents began to complain that their children could no longer pay attention in class, they gave their kids pills and told themselves their progeny simply needed to focus. When children lost a cultural center and began appropriating and adapting other cultures to suit them, the older generation lamented the loss of cultural stability and found their children to be ignorant. And, when the younger generations became reliant upon spell-checking, GPS navigation, instant messaging, and avatar-based virtual experiences, most of the old guard sighed and resigned themselves to the notion that their offspring had become permanently detached from reality. The youth, it seemed, had lost the literacy promoted by more traditional media.

Few dared to think that the "reality" these children lost was one they never had. Even fewer would realize that these young people had transcended into a world of symbolism and virtualization, adopting a literacy paradigm that involves playful manipulations of the older modes of thought. The younger generations are empowered users of media because they are empowered as a new breed of thinkers. To them, the line between a static reality and an insulated mental haven has not simply disappeared, it ceases to exist. What is real can be constructed and, now, all of what can be mentally constructed can also become real—within intellectual and technological limitations, of course. The dominant media are now closer to replicating human thought than ever before and understanding their use implies an understanding of thought in its most natural habitat, the mind.

Choosing to measure literacy

The literature about video games is not as expansive as that concerning other forms of media, even other digital media. Gaming academia is a fledgling construct, with little more than a decade as a legitimate niche of social science research. Currently, there are only a few articles that have attempted to define gaming literacy with a sole focus on the intrinsic properties and applications of video games, not as a tool toward other types of learning or literacy. Zimmerman (2009) only outlined some potential categories for gaming literacy. Buckingham & Burn (2007) were concerned more with how children who play video games could *develop* their own games, not how gaming cultivates useful skills for consuming, interpreting, and mastering the medium. Neither was concerned with actually developing a measure of their proposed literacies. No one has sought a valid model of gaming literacy as a reliable predictor of certain levels of proficiency in either gaming or other activities associated with the gaming experience.

Just as traditional science relies on empirical data conducted for use in the systematic study of a given phenomenon, so too does social science become strengthened in the same fashion. Media studies demand equivalent standards of scrutiny and the end goal is always the creation of explanative, parsimonious, and predictive models that are conceptually solid and statistically sound. There are as many ways to explore gaming as there are researchers willing to undertake such an endeavor. Skills can be tested in laboratories, experiences can be queried about in focus groups, and behavioral patterns are suitable fodder for questionnaires. Then again, any of those three areas could be studied by any of those methods, or plenty of others. With a plethora of options, choosing to study potentially definitive motivations, skills, and practices toward the development

of a working literacy model is not a haphazard decision. Literacy is not just a measure of an individual's competencies in a given context; it is a mark of respect and legitimacy that any subject, activity, or—in this case—medium receives when society has a need to predict and not simply explain a phenomenon. Qualitative inquiry can answer "why" and experimental design can at least indicate "how," but "who, to what degree, and with what implications" is a set of issues that sees the given subject as exactly that: a given, something fermented and cemented in society. Those more advanced questions are not asking "What is this?" but, instead "What does this mean?" and "To whom?" There is a glaring gap in the literature where a standardized scale of gaming literacy should sit, and this thesis is a modest attempt at amending the omission.

Defining gaming literacy

Jo Kim (2009) offers a typology of the "essential mechanisms" (cited in Chatfield, 2010, p. 164) involved in gaming: collecting, points, feedback, exchanges, and customization. Unfortunately, this list must be viewed with an air of skepticism because these same processes can be seen in different new media venues, such as YouTube. In a thesis that seeks to explain potential transference of the forms of gaming into other digital media, it is ironic—yet necessary—that Jo Kim's list be criticized. If these same elements are present in other forms of digital media and video games are still their own unique medium, then it must be assumed that the list is not fully inclusive of the essential mechanisms involved in gaming—or is overbroad and incorporates elements that are not exclusive to any one form of digital media. Either way, this renders Jo Kim (2009) an inadequate litmus test for what a video game is. McGonigal (2011) presents a shorter,

more basic, yet ultimately more precise series of components that constitute a game: goals, rules, feedback, and voluntary participation. Still, her summarization of games is also insufficient, as it encompasses *all* types of games. Again, though these qualities are seemingly integral to the gaming experience, they cannot fully encapsulate what *video games* perpetuate in terms of form, function, and their emergent paradigms.

Video games are multimodal texts (Kress & van Leewen, 2001) and require practical and interpretive knowledge of visuals, sounds, writing, and other forms of expression that are integral to the gaming experience (Buckingham & Burn, 2007). Buckingham and Burn (2007) compare game literacy to the traditional literacy of the written word to make the distinction between *functional* and *critical* literacy, arguing that the definition and scholarship of an overarching "game literacy" must encompass both. Functional game literacy includes a mastery of controls, proficient management of in-game resources, and successful navigation of menus and interfaces. Critical literacy involves analysis, evaluation, and reflection—a reflexive ability to distance oneself from the texts of the medium and focus on broader cultural implications (Buckingham & Burn, 2007). To cultivate the same respect for game literacy that other, more explored types of literacy receive, video game researchers should undoubtedly embrace both the functional and critical aspects.

However, some scholars, like Markku Eskelinen (2001), "[dismiss] stories within games as uninteresting ornaments or gift-wrapping and [argue] that paying them any attention is just a waste of time and energy" and game designers like Chris Crawford (2002) consider characterization and narrative "merely cosmetic" (Buckingham & Burn, 2007, p. 327). Considering the lukewarm (at best) treatment of critical game literacy, it

will not be of concern in this study. Furthermore, while the format of games fosters a mental framework that transcends any single title or genre, one would have to delve into more than the actual experience of gaming to possess a broad cultural understanding of video games. A film buff may know how to dissect form and technique but very little about the history of the industry, and not every avid reader could write his or her own novella. As with these other media, it cannot be assumed that every gamer has the inclination to absorb more than what the games themselves offer. Still, while functional literacy is not comprehensive, those who possess it learn more than simply how to play a given title. It can easily be assumed, for instance, that gaining skill in the controls of one game should aid in the learning of a new set for another title. More than that, though, gamers are adopting a *practical* interpretive framework, a holistic understanding of video games that transcends any mundane skill set.

This is what game designer Eric Zimmerman (2009) dubbed "gaming literacy," which is the terministic screen that is developed when a gamer turns the "magic circle" that defines all games—digital or not—inside out. "It asks, in other words, not *What does gaming look like?* but instead: *What does the world look like from the point of view of gaming?*" (Zimmerman, 2009, p. 24). Gaming literacy—as opposed to Buckingham & Burn's *game* literacy—is not about broader cultural effects. It promotes education, but only of video games and the mentality they create; it deals with culture, but from the reverse angle, placing culture in the context of games. Zimmerman outlines three major concepts of gaming literacy: systems, play, and design. These are areas that, together, "stand for a new set of cognitive, creative, and social skills" which constitute "a new

paradigm for what it will mean to become literate in the coming century" (Zimmerman, 2009, p. 25).

Though gaming literacy incorporates many individual traits and skills, this study is unique in that it attempts to consider these characteristics wholesale, not piecemeal. Based on McLuhan's logic, the theoretical framework of this piece posits that the transference is not of any one skill or heuristic. In other words, this is larger than simply developing better hand-eye coordination, visual acuity, or problem-solving skills. While gaming literacy might grow in tandem these individual traits (one cannot experience flow without mastering controls, for instance), it also consists of many more and, more importantly, is characterized by the holistic, intertwining nature of how these traits are developed, perpetuated, refined, and eventually adopted by the self for use with other activities and experiences. Still, those studies are valuable in their own right, as they provide the foundation for amalgamating a more robust model.

Constructing gaming literacy: Core and optional competencies

The actual concept under scrutiny in this study is Zimmerman's explication of "gaming literacy," which includes an understanding of systems, a tendency toward play, and an appreciation and utilization of design. However, these concepts are empirically ambiguous, and there are arguably more than just three areas of competency necessary to be fully literate in gaming. Even more importantly, others have already taken the traits Zimmerman (2009) explicates—and more—and built up both theoretical musings and pragmatic explanative models. In other words, Zimmerman (2009) should be noted more for the inspiration and spirit of this study, the notion that gaming can yield a blend of

skills and mentalities that transcends the context of moment-to-moment gameplay and becomes applicable to a host of other digital media.

In a seminal work for the field of gaming studies, *A Theory of Fun for Game Design*, Koster (2005) summarizes some basic things that digital games can teach: patterns and structures (often mathematical), prediction and the calculation of odds, combat simulation, building and creation, competition and hierarchy (p. 52); environmental examination and spatial relationships, interpreting symbols, mapping (p. 54); conceptual mapping (possible actions and consequences), learning through repetition, exploring and memorizing (p. 56); reaction times, tactical awareness, assessing weaknesses, timing a strike, teamwork (p. 58); network building (p. 62); role-playing and interpersonal communication (p. 64); and persistence and thoroughness (p. 76). He presents these only as potential lessons and areas of skill-building. Going out into the field to conduct research, Reeves and Read (2009) came up with a list of their own: a 40-skill breakdown of practical traits fostered by massively multiplayer online role-playing (MMORPG) games that is meant to be applied to the workplace. Everything on the list can be seen in Koster's theoretical analysis, but the reverse does not hold completely true; this is because of the focus on traits that are useful in venues beyond what the mainstream definition of "gaming" incorporates. The next step is to filter Koster's potentiality through Reeves' and Read's actuality.

Accounting for redundancies, Reeves' and Read's list can be summarized through the following categories. **Information** is a broad category that simultaneously encompasses and is encompassed by the other three categories, yet remains relevant in its own right. In other words, while there is a great degree of similarity between some of the

individual tasks and skills, the modality as a whole is a discrete element. This is the

foundation, the very inception point of the other three categories, which deals with the

entire spectrum of behavior concerning information: seeking, obtaining, monitoring,

recording, documenting, processing, reviewing, assessing, translating, and explaining,

while using it to solve problems—including simple problems, like maintenance of a

particular state. **Learning** involves: understanding rule-sets, consequences, and other

systems; updating and using relevant information; and iterative engagement, or the

specific type of learning that occurs when growth is found through repetition, refining,

and mastery. **Resource management** is exactly that, and it can be used for static

behavior like maintenance and dynamic behavior like planning and scheduling.

Sociability is the blanket term for a host of talents: interpersonal and mediated

communication; distanced and virtual representation; persuasion; initiating, forming,

developing, and maintaining relationships; teamwork; and group management, including

staffing, coordinating, training, coaching, consulting and advising, and administration of

teams. **Systems skills** can be considered a sum of the knowledge, ability, and

accompanying mentality involving virtual navigation and manipulation and interface

proficiency. **Design** is the skill set that teaches and compels individuals to develop new—

and possibly, though not necessarily, artistic—applications, ideas, relationships, or

products as contributions to the virtual space and/or the experiences of others. Its

discrete-yet-overlapping nature is akin to that of the element concerning information.

Unfortunately, the expansive list must be pared down. Reeves and Read focused

specifically—though not exclusively—on MMORPGs when constructing their list. This

genre is hailed for its use of social interaction as a game mechanic, but most other games

do not necessarily require it, or not in the same way. A game can focus on single-player, campaign-esque experience and have an optional multiplayer mode, or none at all. Also, even most multiplayer games do not incorporate the same methods of communication— at least, not in the same package. The group interview of the gaming club revealed these extra-gaming interactions. They organize groups and resources, but use the phone and the internet. They teach and coach, but do so in person. The concept of **sociability** should not be shelved, merely looked at as a currently optional component of the paradigm, barring the data suggesting otherwise. As the design and application of gaming evolves, it may one day be an integral component. For now, it at least merits consideration.

Also, since the current incarnation of gaming is for commercial entertainment, it is not necessary that those who engage with them do so in a proactively creative manner. It takes a degree of creativity to solve problems and navigate spaces; to build and **design** new components, it requires another degree entirely. Games with modes for the explicit purpose of user-generated content are even fewer than those with multiplayer. Therefore, it should be viewed in the same light as sociability: interesting, important and, maybe, essential someday—but still not yet integral to the paradigm.

Video games have not yet fully transcended their first cultural application as a toy and are not *all* technologically advanced enough to incorporate social- and design-related elements. With these current cultural limitations in mind, the four components that are not theoretically optional—information, learning, resource management, and system skills—should be viewed as a collection of "core" components that are integral to this study and the overall goal of defining gaming literacy.

Table 1. Gaming Literacy: Core and optional competencies

Core Competencies	Definition
Information	Information seeking, obtaining, monitoring, recording, documenting, processing, reviewing, assessing, translating, explaining and problem solving.
Learning	Understanding rule sets, consequences, and systems in general. Actively endeavoring to update information and consciously using new information. Growth through repetition and redundant systems.
System skills	Knowledge, perceived ability, and confidence.
Resource management	Cognitive, behavioral, and affective components; dynamic management (planning/scheduling, or "meta-management"—managing the management of resources)
Optional Competencies	
Sociability	Virtual representation, relationships (initiating, forming, developing, maintaining), teamwork, and social management.
Design	Desire, enjoyment, time, and level of complexity.

Affective correlates

There are also certain affective components to the gaming experience that should help to flesh out the broader "gaming paradigm." It is quite possible that some of these components can be linked to a development of the more formal components of the proposed literacy scale. The emotions and motivations that have been researched in terms of gaming might be correlates or even predictors of high scores in some of the aforementioned competencies, or they could coalesce into their own separate entity. Either way, these emotional items are still worth review and investigation. Games can be artistic, expressive experiences. They can serve as the framework for complex social

dynamics. Alternatively, a video game can be merely what was embodied in the earliest

era of the medium: competition, puzzle-solving, or some other mastery of systems.

Regardless of which one or combination of these experiences a particular title might

encompass, emotions are at play—the first and arguably most important of which is the

experiencing of "enjoyment." This is "a constellation of different feelings" that are often

thrown wantonly into the term "fun," which "is a rather horribly vague use of the term"

(Koster, 2005, p. 90).

Fun has been broken down into various taxonomies. LeBlanc developed a list of

eight sources of fun: sensation, fantasy, narrative, challenge, fellowship, discovery,

expression, and submission (Hunicke, LeBlanc, & Zubek, 2001-2004). Lazzaro (2004)

classified similar types of desires into four groups of emotions: hard fun, easy fun, altered

states, and the people factor. Koster (2005) tweaks the wording and gives Lazzaro's

breakdown a practical spin, framing each of the four clusters in more active terminology.

Fun involves "the act of mastering a problem mentally" (Koster, 2005, p. 90).

Aesthetic appreciation is about "*recognizing* patterns, not learning new ones" and is

"*only* found in settings of extreme order" (Koster, 2005, p. 94). **Visceral reactions** are

contextual achievements of proficiency and skill, like hitting a number of targets within a

set time limit or coordinating a successful raid—the latter of which segues into a whole

host of other actions and subsequent emotional responses (see next component). **Social**

status maneuvers are the playful—in the case of gaming—elevation or demotion of

oneself or others. Notable social emotions (Lazzaro, 2004; Koster, 2005) experienced

while engaged with video games include: *schadenfreude*, basking in someone else's

failure; *fiero*, a sensation of pure triumph; *naches*, satisfaction and pride from observing a

student's success; and *kvell*, the prideful warmth when bragging about a mentee. Even though these are distinct emotions related to gaming, it is enough at this early stage to simply ask about people's inclination to play with and because of others. With all of the other variables already in question, it would be impractical to inquire about sub-components of emotion. Therefore, the statements summarized by Lazzaro (2004), which reflect the socially driven motivators and perceptions of video games, will be what is actually implemented in this study. (Please see "Method" for more information about and a complete list of these social-emotional questions.)

Table 2. Affective correlates

Lazzaro (2004)	Koster (2005)
Hard fun	Fun
Easy fun	Aesthetic appreciation
Altered states	Visceral reactions
The "people factor"	Social status maneuvers

According to Koster, fun is not a random occurrence. Instead, it is a sensation willed into existence through voluntary participation in a temporary, ludic construct. The willful, interactive frame of these terms serves as a reminder that even aesthetic appreciation is, at least to the gamer, an activity requiring mental and emotional engagement. This further bolsters the notion of the gaming paradigm as a productive construct; each positive emotion is derived from some facet of work and effort on the part of the gamer.

Gaming requires participation and effort, but the transitory nature of play and its otherworldly "magic circle" qualities help downplay ferociousness and failure. This is

why even negative feedback, including game-over screens and even social put-downs can be enjoyable (McGonigal, 2011). On average, gamers fail four out of five times (Lazzaro, 2004; McGonigal, 2011) but they are ultimately made *optimistic* by these temporary set-backs (Ravaja, Saari, Laarni, Kallinen, & Salminen, 2005). In video games, it is often the case that the visual and visceral resultants of failure are as entertaining and "rewarding" (with feedback and other stimuli) as any "mission clear" screen.

Also, there is a ludic enjoyment that is derived from taking part in a gaming experience. A negative result is still a result, a direct consequence following one's actions. Gaming empowers people by cementing a sense of agency and, since "a feeling of control in a goal-oriented environment can create a powerful drive to succeed," gamers are trained to be persistent and "believe they have every chance of success" (McGonigal, 2011, p. 67). Persistence is actually a trait that belongs in the "system skills" section of the practical paradigm, but the emotions that underlie it are squarely in the realm of potential affective correlates. This emotional inclination toward play is indicative of a particular state that gamers—or, indeed, any other masters of a craft—have experienced.

Instead of taking piecemeal the results of several other studies to assert that games assist in specific tasks like spatial acuity (Subrahmanyam & Greenfield, 1994; Green & Bavelier, 2007) and hand-eye coordination (Rosenberg, Landsittel, & Averch, 2005), this thesis posits the notion that the entirety of what games teach can be transferred from the gaming experience to other activities. If the line between an individual's identity and the activity of gaming is sufficiently blurred through a phenomenological experience then, theoretically, every possible benefit (and admittedly, pitfall) associated with achievement in video games should be preserved as a holistic terministic screen. When a person's

gaming literacy is high enough, when his or her skill is no longer a question and difficulty shifts from a frustrating challenge to a catalyst for enjoyment, then there is more than proficiency being displayed. Flow, the phenomenon of optimal experience, is the next step and a potentially strong correlate for the components of literacy.

Flow: The ultimate manifestation of gaming literacy

Flow is a psychological state that is characterized by "optimal experience," where "the information that keeps coming into awareness is congruent with goals" (Csikszentmihalyi, 1990, p. 39). To attain this sensation, one must eliminate thoughts and stimuli that create "psychic entropy… information that conflicts with existing intentions, or distracts us from carrying them out" (Csikszentmihalyi, 1990, p.36). This requires "disciplined concentration" (p. 41) The search for flow demands patience and practice: "It is not enough to *know* how to do it; one must *do* it, consistently, in the same way as athletes or musicians who must keep practicing what they know in theory" (Csikszentmihalyi, 1990, p. 21).

Experiencing flow is ultimately worthwhile because "control of consciousness determines the quality of life" (Csikszentmihalyi, 1990, p. 20). Flow is characterized by a merging of action and awareness, a complete immersion into the activity at hand (Csikszentmihalyi, 1990). When a given activity is this engaging, all stimuli that are irrelevant to completing the task are disregarded—including the concept of the self (Csikszentmihalyi, 1990). This loss of self-consciousness is significant because "when not preoccupied with our selves, we actually have a chance to expand the concept of who we are" (Csikszentmihalyi, 1990, p. 64). People experience differentiation when they

overcome a challenge, the sense that what they accomplished is incongruent with who

they are (Csikszentmihalyi, 1990). But flow also often induces a clearer state of mind,

and this harmonious state of consciousness helps the individual integrate his or her

elation and accomplishment back into the traditional identity (Csikszentmihalyi, 1990). In

sum, flow creates a mindset where people can temporarily abandon their selves, achieve a

Zen-like oneness with the given activity, and return to their newly expanded shell of an

identity. They bring back the skills of the activity and the confidence of the sensation and

use them to bolster their sense of self. Flow is the experience, growth is the reward.

      Activities that have the potential for flow offer an appropriate balance between

challenge and skill, taxing an individual's psychic energy—their awareness and

concentration—and placing the person between boredom and anxiety, where "the

challenges are just balanced with the person's capacity to act" (Csikszentmihalyi, 1990,

p. 52). Immersion into the given activity is aided by the presence of clear goals and

feedback which, in turn, assist in creating "the paradox of control… not the sense of

being in control, but the sense of *exercising* control in difficult situations"

(Csikszentmihalyi, 1990, p.61). During this intense engagement with the activity, people

lose awareness of irrelevant stimuli, even their sense of individuality. This merging of

action and experience often transforms the perception of time, since the activity is

intrinsically rewarding (Csikszentmihalyi, 1990).

      Games are particularly conducive to eliciting sensations of flow, since they are

often "designed for this very purpose" (Csikszentmihalyi, 1990, p. 51). While the essence

of flow is consistent across different activities, cultures, and eras, "the knowledge of how

to control consciousness must be reformulated every time the cultural context changes"

(Csikszentmihalyi, 1990, p. 21). And, while "some might comment that Csikszentmihalyi seemed to have video games in mind when he developed the concept of flow… games were not to exist in their popular form for several years" (Sherry, 2004, p. 339). Flow has only just begun to be discussed in terms of gaming (Sherry, 2004).

As is the case with experiencing flow in *any* activity, the differentiation/ integration process provides an individual with several rewards—the first of which is transcendence, the experience of leaving behind one's sense of self. Then, as the experience ends and an awareness of the self is restored, the individual experiences a brief bout of differentiation where this person realizes her recent experience was not of her typical self. Finally, an integration of the self-less experience and the identity occurs. Part of this last stage involves transference of the mindset during flow and any of the skills inherent in accomplishing the flow-inducing task. "A musician structures her attention so as to focus on the nuances of sound that ordinary people are not aware of, a stockbroker focuses on tiny changes in the market that others do not register, a good clinical diagnostician has an uncanny eye for symptoms—because they have trained their attention to process signals that otherwise would pass unnoticed" (Csikszentmihalyi, 1990, p. 33). Gamers who experience flow while gaming may adopt a set of skills, practices, and motivations that is representative of the medium itself. If flow works the way Csikszentmihalyi suggests, an entire mental paradigm is created through the flow-inducing activity, and the post-activity identity reintegration internalizes it in the given individual.

Incorporating this gaming-inspired mental construct would require optimal experience, and flow is only likely to occur when a given individual is literate enough to

properly engage with the medium. Gaming literacy, then, can be seen as a necessary condition for attaining flow—perhaps the most important qualification. Flow has been conceptualized as a proper balance between challenge and skill; enough to prevent boredom, yet still below the threshold for frustration. To find the crevice of experience between these two less-than-optimal states requires knowledge of both the game and the gamer. For someone to be aware enough of his or her own proficiencies and those that are prescribed by different video games would mean that individual has attained more than flow. They have achieved a fundamental understanding of more than the aiming skills necessary for their favorite shooter, more than simply having memorized the preset paths through an adventure game. People with high levels of gaming literacy can assert an agency unknown to those not as literate in video games, as they can actively optimize the conditions necessary for phenomenological optimization.

Literate gamers are just like any other expert with any other activity. Once comprehension and proficiency are achieved at sufficient levels, the main goal becomes chasing that "rush," the merging of action and awareness that is flow. To reach this state consistently, a gamer must know where he ranks in terms of skill level, especially in relation to the difficulty (or difficulties, as games often offer several levels) of a particular title. The data should reflect this conceptual linkage: flow should be a strong indicator of literacy, and vice versa. Gaming literacy and flow are theoretically related and a statistically significant correlation could be used to determine the validity of both these concepts.

Conceptualizing flow

Csikszentmihalyi (1990) outlines seven distinct components of flow, but not all of them are necessary for measuring the actual attainment of flow. Determining what elements are important in the prediction of flow in computer-mediated environments has been a difficult pursuit (Novak & Hoffman, 1997; Finneran & Zhang, 2005). Research of flow in the context of human-computer interaction has resulted in a myriad of different models (Ghani & Deshpande, 1994; Novak & Hoffman, 1997; Novak, Hoffman, & Duhachek, 2003; Finneran & Zhang, 2005), but despite the efforts at clarity and explication, "flow in CME [computer-mediated environments] is still poorly defined" (Finneran and Zhang, 2005, p. 83). Some models offer a taxonomy involving up to thirteen components, but there is little evidence to support one over the other, especially since "on average each study only considers four of the thirteen constructs" (Novak, Hoffman, & Duhachek, 2003; Finneran and Zhang, 2005). However, there have been two relative constants: the necessary balance between challenge and skill; and a sense of fun, evidenced by the action and attitude of play.

The essential dynamic for experiencing ultimate levels of flow is a proper balance between challenge and skill (Csikszentmihalyi, 1990). More involved conceptual models take into account other significant variables, like involvement and telepresence (Hoffman & Novak, 1996; Finneran & Zhang, 2005) but, again, application of these additional factors is far from consistent. Other variables may show strong predictive power, but the challenge/skill relationship is the only factor that is considered both conceptually and statistically vital across the multiple studies and models. This is best visualized in the three-channel model of flow, seen below:
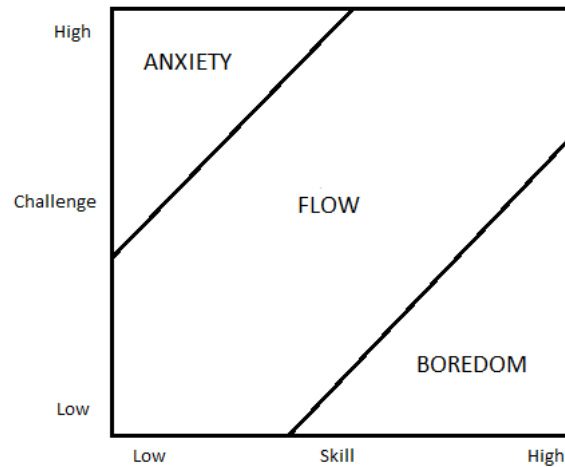
Figure 1: Three channel flow model (Novak and Hoffman, 1997)

In its most basic form, flow is the central, optimal path across a grid that is defined on axes of challenge and skill. Neither value must be high to attain flow; it is simply enough to have both in balance, at any level, for a flow state to occur. Of course, higher levels of both skill and challenge yield higher levels of flow. This metaphorical path is traveled in a ludic fashion; having fun is the evidence of flow, as well as a predictor of higher levels of flow. Fun is observed in terms of playful attitudes and actions.

Ghani and Deshpande (1994) studied flow in workplace human-computer interaction, in which exploratory use of computers was determined to be a significant correlate with higher levels of overall computer use and the attainment of flow. Novak and Hoffman (2003) showed that experiential usage was a stronger predictor of flow than goal-oriented activity. In other words, play elicits flow much better than work. Low-skill/low-challenge activity is balanced and should, according to the simpler three-channel model of flow, still be considered an opportunity to attain flow. However, there

is evidence that this is not always the case (LeFevre, 1988; Ellis, Voelkl, & Morris, 1994;

Novak & Hoffman, 1997).

	High		
Challenge		Anxiety	Flow
		Apathy	Boredom
	Low		
		Low Skill High	

Figure 2: Four Channel Flow Model (Novak and Hoffman, 1997)

According to the four-channel model of flow, low yields of both challenge and skill risk

the loss of perceived task importance, placing individuals in a state of apathy. Sherry

(2004) argues that "enjoyment of media results from a flow experience realized when

media message content balances with individual ability to interpret that message" (p.

328). Logically, then, it can be inferred that enjoyment, derived from play, makes the

difference between experiencing apathy and achieving flow.

Also, since this thesis is concerned with the application of these findings of

human-computer interaction in the context of gaming, play is an even more inextricable

part of the flow model. An interactive medium, video games do not usually play

themselves; that is essentially the sole purpose of having human involvement to begin

with. Fun and agency, play, are what keep people engaged and ready to experience flow.

Novak and Hoffman (1997) compiled the definitions of flow from sixteen different

studies and came up with their three-component definition of flow, a relationship

between challenge, skill, and play. It is this basic model that will be used in this study's

analysis of flow. Since it is being used as a check on validity and reliability, not as a

literacy component, it is only necessary to test for the existence of flow, which can be

determined by the three basic flow components used in Novak and Hoffman (1997).

Chapter 3: Methodology

This chapter explains the methodology undertaken in this study. It reviews the type of research conducted, its data collection procedure, instrumentation used to measure variables and data analysis performed.

Online Survey

An online survey via SurveyMonkey was conducted between April-May 2011. Survey research is probably the best method available to the social scientists interested in collecting original data for purposes of describing a population too large to observe directly (Babbie, 2003). Compared to other more traditional survey methods (e.g., personal interviews), online surveys not only save manpower and material resources, but are also able to gather information from a vast audience without time, space, and geographical restrictions. SurveyMonkey is a private American company that enables users to create their own online surveys.

Sample

A convenience college student sample was used in this study. The sampling frame consisted of students enrolled in the mass communications program at a major southeastern university during academic year 2010-2011. In addition to an initial invitation to all students listed in the sampling frame to participate, instructors of nine undergraduate classes were contacted and asked to email their students to invite them participate. A total of 297 people clicked on the survey link and 275 agreed to take the

survey. The age and gender distributions are shown in Table 3 and 4. Of the 275

participants, 48 who responded have never played video games and were excluded from

further analysis, resulting in an effective sample size of 227 (see Table 5).

Table 3. Age of participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	27 or older	41	14.9	15.0	15.0
	24-26	15	5.5	5.5	20.4
	21-23	65	23.6	23.7	44.2
	18-20	153	55.6	55.8	100.0
	Total	274	99.6	100.0	
Missing	System	1	.4		
Total		275	100.0		

Table 4. Gender of participants

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	168	61.1	61.3	61.3
	Male	105	38.2	38.3	99.6
	Prefer Not to Respond	1	.4	.4	100.0
	Total	274	99.6	100.0	
Missing	System	1	.4		
Total		275	100.0		

Table 5. Frequency of playing video games

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Daily	37	13.5	13.5	13.5
	Weekly	50	18.2	18.2	31.8
	A few times a month	57	20.7	20.8	52.6
	A few times a year	82	29.8	29.9	82.5
	Never	48	17.5	17.5	100.0
	Total	274	99.6	100.0	
Missing	System	1	.4		
Total		275	100.0		

Questionnaire

A standardized survey questionnaire was developed from the existent literature on
video games, concerning the habits, skills, motivations, and experiences of people who
play video games. Before being implemented in the online survey, the initial list of
questions was reviewed by a small group of peers and colleagues. Two questions were
reworded for clarity. After this preliminary screening, the final questionnaire was
constructed and distributed via SurveyMonkey. The survey link was kept active for about
a month.

The questionnaire (see Appendix) contained 89 items in six categories:

I. Demographics (age and gender, 2 questions)

II. Gaming Frequency (1 question)

The question "How often do you play video games?" was used to measure the
frequency of gaming. Response alternatives included daily, weekly, a few times a week,
a few times a year, and never. Participants who responded "never" were thanked for their
time and not asked any further questions.

III. Gaming Habits (7 questions)

To determine the gaming habits of participants, 7 questions from the Computer
Games Inventory (Greg, J., 2007) concerning the following areas were included:

1) The number of games currently played.
2) The frequency and duration of playing video games.
3) The systems/platforms are used for gaming.
4) Self-identification as an "avid gamer."

IV. Gaming paradigm/basic literacy (36 questions)

Questions in this section are, for the most part, derived from the summarized findings of Koster (2005) and Reeves and Read (2009). Some additional questions were borrowed from the Computer Games Inventory (Greg, J., 2007) to assess the "sociability" construct. These are the questions to be used in the proposed model of gaming literacy, minus the affective components. Though the emotional motivators and experiences are a worthwhile assessment of an individual's interaction with video games, those items are more useful when expanding the descriptiveness of the actual skills and practices, as opposed to helping to define that fundamental literacy in the first place. The subheading "gaming paradigm" refers to the following section of literacy, the core competencies and the other potential competencies that video games promote. The affective correlates explicate the reasons and methods for obtaining the list of factors below, which constitute the actual mentality and skill set. All literacy questions were measured on a 5-point Likert scale (1: Strongly disagree, 5: Strongly agree).

1) Core competencies (22 questions)

    a. Information

        1. Seeking: *I seek out information in or about games.*

        2. Obtaining: *It is easy for me to obtain information in or about games.*

        3. Monitoring: *I can successfully monitor inputs, meters, points, and other sources of information that video games present.*

        4. Recording/documenting: *It is easy for me to recall information about games after the gameplay experience; It*

is easy for me to look up information about games after the gameplay experience.

5. Reviewing/processing: *I am confident in my ability to analyze information and feedback presented by video games.*

6. Implementing: *I am able to appropriately implement information from or about games.*

7. Assessing: *I am able to assess the quality of the information I receive from video games.*

8. Translating/explaining: *I am good at explaining information from or about games to others.*

b. Learning

    i. Understanding

        1. Rule sets: *I pick up the rules of most games fairly quickly.*

        2. Consequences: *I am good at understanding the consequences of my in-game actions.*

        3. Systems in general: *I tend to explore how the systems (including rules) of a game work in-depth.*

    ii. Updating

        1. Actively endeavoring to update: *When the situation changes, I actively attempt to update my information.*

        2. Consciously using new information: *I build on my knowledge of games to better my understanding and/or proficiency.*

   iii. Iterative engagement

        1. Growth through repetition: *I get better at games by performing the same actions over and over.*

        2. Growth through redundant systems: *I understand the more complicated parts of games because of the simpler actions that built up to them.*

c. Resource management

   i. Static:

        1. Cognitive: *I know how to successfully manage in-game resources (like health, mana, seeds, land, vehicles, followers, or any other limited, useful and controllable element in a video game).*

        2. Behavioral: *I am good at maintaining satisfactory levels of resources.*

        3. Affective: *I enjoy balancing limited resources in video games.*

   ii. Dynamic: *I actively plan/schedule gameplay behavior based on a need or desire for certain types or levels of resources.*

d. System skills: virtual manipulation and interface proficiency

      i. Knowledge: *I know how to manipulate virtual environments; I know how to navigate virtual environments.*

     ii. Ability (perceived): *I am proficient at controlling games; I am proficient with the interfaces in games.*

    iii. Confidence: *I am confident in my technical abilities as a gamer.*

2) Optional competencies (14 questions)

   a. Sociability

      i. Representation: *I enjoy using avatars, creating profiles, customizing characters, or otherwise expressing myself in a gaming space.*

     ii. Relationships (questions from Jones (2009))

         1. Initiating: *Gaming is a way to meet people.*

         2. Forming: *Gaming is a way to build relationships.*

         3. Developing: *Gaming is a way to improve friendships.*

         4. Maintaining: *Gaming is a way to socialize with people.*

    iii. Teamwork

         1. Personal: *I work as part of a team when playing video games.*

         2. Structural: *Teamwork is an important skill in the games I play.*

    iv. Management

         1. Personal: *I have recruited, trained, advised, coordinated, or otherwise managed a team in a video game.*

         2. Structural: *Team management is important in the games I play; Leadership is important in the games I play.*

   b. Design

i. Inclination/desire: *I like to create my own game content.*

ii. Mentality**:** *I enjoy creating things that others will play with.*

iii. Time spent designing (in hours).

iv. Level of design (preset tools or ground-up modifications)

1. *I mostly use preset tools and creation modes that are included as a part of the game.*

2. *I tend to build game modifications from scratch, or use tools the developers did not create or intend.*

V. Affective components (20 questions)

Lazzaro (2004) conducted a series of interviews and focus groups and determined a set of four categories of emotions concerning gaming: hard fun, easy fun, altered states, and the people factor. Koster's tweaked list (2005) is not all too dissimilar that Lazzaro's detailed explanation cannot be used as a foundation. This study will use the bullet-point breakdowns of the four categories (Lazzaro, 2004), expanding and revising in places to better suit Koster's interpretation and the more active focus of his model. A Likert scale (1: Strongly disagree, 5: Strongly agree) was used to measure respondents' alignment with the following statements.

1) Hard fun (Lazzaro, 2004)/ fun (Koster, 2005)

a. *I play to see how good I really am.*

b. *I play to beat the game or complete a goal.*

c. *I like having multiple objectives in the same gameplay experience.*

d. *I prefer games that require strategy rather than luck.*

2) Easy fun (Lazzaro, 2004)/ aesthetic appreciation (Koster, 2005)

a. *I play games to explore new worlds.*

b. *I play games to interact with intriguing characters.*

c. *I play games to "figure out" things.*

d. *I like seeing what happens in the story, even if I have to use a walkthrough (or view the content elsewhere).*

e. *I have experienced a close bond between my character and myself.*

f. *I appreciate flashy feedback, like "mission clear" screens, sound effects for leveling up, or over-the-top death animations.* (added, see: McGonigal, 2011*)*

g. *I derive satisfaction from interacting with persistent elements in a world (raising a character or creature, growing a garden, going to a town after completing a dungeon to see how the residents react, managing a skill tree, etc.).* (added, see: McGonigal, 2011)

3) Altered states (Lazzaro, 2004)/ visceral reactions (Koster, 2005)

a. *I complete in-game goals to clear my mind.*

b. *I play games to feel better about myself.*

c. *I play games to avoid boredom.*

d. *I play games to be better at something relevant to me.*

e. *I play games for a sense of achievement.* (added, see: Koster, 2005)

4) The people factor (Lazzaro, 2004)/ social status maneuvers (Koster, 2005)

a. *It's the people that are addictive, not the game.*

b. *I play games because I want an excuse to invite my friends to join me.*

        c.   *I don't like playing games, but it's a fun way to spend time with my*

            friends.

        d.   *I don't play, but it is fun to watch.*

VI. Flow (16 questions)

Novak and Hoffman (1997) constructed a 21-question scale of flow induced by human-computer interaction, split into three distinct categories: skill, challenge, and play. A fourth category of items concerning a semantic differential measure between converse components of an eight-channel model of flow will not be used, due to the significant burden on participants; these questions would more than double this section of the survey. Additionally, their low correlative values suggest that they would not offer enough statistical usefulness to justify their incorporation.

The questions about skill, challenge, and play were reworded in the present study to accommodate the switch in media. Additionally, redundant questions were omitted for the sake of keeping the survey as short as possible. The remaining questions were given a set of Likert-scale responses as possible answer choices.

1) Skill
    a.   *I am skilled at playing video games.*
    b.   *I consider myself knowledgeable about moves, techniques, and strategies in/for the video games I play.*
    c.   *I know less about games than most gamers.*
    d.   *I find it easy to play video games.*
    e.   *I know how to do what I want when playing video games.*

2) Challenge
    a.   *Mastering a video game is easy for me to do.*
    b.   *Gaming challenges me.*
    c.   *Gaming challenges me to perform to the best of my ability.*

      d. *Gaming provides a good test of my skills.*

      e. *I find that gaming stretches my capabilities to the limits.*

3) Play

      a. *I feel mentally flexible when playing video games.*

      b. *I feel creative when playing video games.*

      c. *I feel spontaneous when playing video games.*

      d. *I feel playful when playing video games.*

Two additional measures were added, as these questions covered the gaming paradigm's aspect of "play." Novak and Hoffman (1997) were asking about play to determine the existence and level of flow, but Zimmerman's (2009) notion of play is a bit more active and "meta-gaming," in that the individual's actions and attitude involve more than the prescribed, moment-to-moment gameplay experience. Masterful gamers (those who have experienced flow and, presumably, are operating in the proposed mental paradigm) with a strong sense of play would begin to exhibit behaviors that work within the construct the developers envisioned, but that purposefully defy or surpass those bounds. Zimmerman (2009) describes three levels of play:

1) The fun of simply choosing to impose unnecessary restrictions—rules of a game—and joining the (often shared) experience of the "magic circle."

2) Play within a given system, like the "'free play' of a gear or steering wheel," or a joke, which is humorous because it plays with the rules of language—yet is dependent on the system for meaning (Zimmerman, 2009, p. 27).

3) Play *with* structures, not simply *within* them. Game mods are one extreme, while homebrew rules and personal achievements exist on the tamer side of the spectrum.

Since this survey will measure play in terms of gaming, the following questions have

been added.

1) *I like doing things in games the creators did not intend.*
2) *When I get into a game, I enjoy creating my own goals and challenges.*

Chapter 4: Results

Results pertaining to the construction of the gaming literacy scale are presented in this section. In developing multi-item scales, a number of procedures are recommended to help ensure that the measure is as valid and reliable as possible (e.g., Nunnally & Bernstein, 1994; Spector, 1992). The present study borrows heavily from this literature. As discussed in previous chapters, gaming literacy must be viewed as a multidimensional theoretical construct. The scale used to operationalize the construct should reflect the underlying dimensionality. Therefore, the first step in constructing the gaming literacy scale was to check the dimensionality of the construct through exploratory factor analysis. Using factor analysis for scale development also allows the researcher to sufficiently sharpen the constructs under study so that they can be adequately measured (Gorsuch, 1983). After the underlying dimensions (i.e., factors) were identified, a series of reliability (internal consistency) and validity (nomological and known-group validity) tests were performed to assess the psychometric quality of the gaming literacy scale.

Initial factor analysis

All items pertaining to gaming literacy (core, optional competencies and affective correlates) were subjected to factor analysis using SPSS 19.0 principal component analysis (PCA) procedure. The PCA procedure allows the researcher to examine the dimensionality of a large multivariate data set at a rudimentary level. This method allows for easy exploration into how many dimensions may exist in the data based on how much variance is accounted for by each factor and the degree to which test items or sub-scores relate to those dimensions, as expressed by the magnitudes of factor loadings. A factor

loading represents the correlation between an observed variable and the unobserved

factor (Gorsuch, 1983). After eliminating a few statistical outliers, the list of gaming

literacy questions yielded a nine-factor solution, determined by eigenvalues (Table 6).

The factor loadings after varimax rotation are presented in Table 7.

Table 6. Factor analysis: Nine-factor solution

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.304	40.217	40.217	19.304	40.217	40.217	9.761	20.336	20.336
2	4.025	8.386	48.603	4.025	8.386	48.603	5.470	11.396	31.732
3	2.850	5.938	54.541	2.850	5.938	54.541	4.286	8.930	40.662
4	2.679	5.582	60.123	2.679	5.582	60.123	3.648	7.600	48.262
5	1.590	3.312	63.435	1.590	3.312	63.435	3.503	7.299	55.561
6	1.486	3.095	66.530	1.486	3.095	66.530	2.883	6.006	61.567
7	1.320	2.751	69.281	1.320	2.751	69.281	2.030	4.228	65.795
8	1.144	2.384	71.665	1.144	2.384	71.665	1.981	4.127	69.922
9	1.026	2.137	73.802	1.026	2.137	73.802	1.862	3.880	73.802
10	.954	1.988	75.790						
11	.852	1.775	77.566						
12	.766	1.596	79.162						
13	.719	1.499	80.660						
14	.681	1.420	82.080						
15	.658	1.370	83.450						
16	.613	1.276	84.726						
17	.537	1.118	85.844						
18	.515	1.073	86.917						
19	.477	.994	87.911						
20	.457	.951	88.862						

Extraction Method: Principal Component Analysis.

Table 7. Nine-factor solution: Factor loadings after varimax rotation

Rotated Component Matrix[a]									
	Component								
	1	2	3	4	5	6	7	8	9
It is easy for me to obtain information in or about games.	**.638**	.411	.055	.168	.101	-.007	.183	-.289	-.239
I can successfully monitor inputs, meters, points, and other sources of information that video games present.	**.659**	.039	.155	.063	.094	.191	.133	.175	.032
It is easy for me to recall information about games after the gameplay experience.	**.839**	.116	.102	.095	.066	-.017	.002	.176	.131
It is easy for me to look up information about games after the gameplay experience.	**.812**	.213	.075	.120	.129	.019	-.049	.120	.027

I am confident in my ability to analyze information and feedback presented by video games.	**.746**	.075	.169	.230	.075	.204	.098	.010	.136
I am able to appropriately implement information from or about games.	**.731**	.247	.209	.101	.213	.224	.061	.015	.004
I am able to assess the quality of the information I receive from video games.	**.680**	.291	.178	.204	.104	.330	-.141	-.024	-.117
I am good at explaining information from or about games to others.	**.739**	.060	.109	.179	.060	.168	.237	-.065	-.059
I pick up the rules of most games fairly quickly.	**.695**	.069	.107	-.043	.003	.174	.255	.074	.317
I am good at understanding the consequences of my in-game actions.	**.719**	.152	.170	.070	-.137	.067	.192	.024	.168
I understand the more complicated parts of games because of the simpler actions that built up to them.	**.569**	.343	.162	.004	-.046	-.070	.425	.057	-.044

I know how to successfully manage in-game resources (like health, mana, seeds, land, vehicles, followers, or any other limited, useful and controllable element in a video game).	**.699**	.121	.188	.116	.044	.173	.199	.329	.206
I am good at maintaining satisfactory levels of resources.	**.668**	.179	.172	.050	.038	.204	.003	.354	.207
I like having multiple objectives in the same gameplay experience.	.429	**.473**	.255	.199	.016	.169	-.091	.205	.428
I play games to explore new worlds.	.219	**.758**	.019	.229	.238	.201	.069	-.037	.047
I play games to interact with intriguing characters.	.129	**.806**	.036	.241	.240	.045	.148	.001	.145
I play games to "figure out" things.	.252	**.647**	.040	.188	.189	.101	.297	-.161	.210
I like seeing what happens in the story, even if I have to use a walkthrough (or view the content elsewhere).	.246	**.779**	.144	.072	.104	.146	-.037	.048	.045

I have experienced a close bond between my character and myself.	.091	**.560**	.252	.168	.205	.146	.121	.428	.099
I appreciate flashy feedback, like "mission clear" screens, sound effects for leveling up, or over-the-top death animations.	.219	**.496**	.270	.124	-.056	.143	.114	.061	.383
I derive satisfaction from interacting with persistent elements in a world (raising a character or creature, growing a garden, going to a town after completing a dungeon to see how the residents react, managing a skill tree, etc.).	.146	**.624**	.337	.209	.029	.100	-.014	.287	.212
I complete in-game goals to clear my mind.	.182	**.567**	-.008	.287	.341	.080	.227	.293	.060
I work as part of a team when playing video games.	.253	.098	**.811**	.198	.070	.129	.072	-.004	.055

Teamwork is an important skills in the games I play.	.250	.052	**.793**	.193	.113	.076	.036	-.022	.032
I have recruited, trained, advised, coordinated, or otherwise managed a team in a video game.	.246	.094	**.703**	.127	.299	.050	.105	.232	.052
Team management is important in the games I play.	.163	.117	**.816**	.237	.147	-.034	.075	.217	.052
Leadership is important in the games I play.	.089	.145	**.797**	.084	.112	.139	.102	-.028	.087
I enjoy using avatars, creating profiles, customizing characters, or otherwise expressing myself in a gaming space.	.134	.441	.029	**.468**	.244	-.149	-.059	.059	.286
Gaming is a way to meet people.	.160	.180	.277	**.814**	.052	.034	.014	.127	.038
Gaming is a way to build relationships.	.119	.239	.269	**.821**	.031	.000	-.028	.144	.037
Gaming is a way to socialize with people.	.210	.262	.255	**.763**	-.070	.138	.045	.038	.067
Gaming is a way to improve existing friendships.	.183	.203	.089	**.737**	.028	.301	.176	-.016	.181

I like to create my own game content.	.143	.232	.072	.035	**.833**	.164	-.046	.088	.078
I enjoy creating things that others will play with.	.104	.280	.173	-.024	**.838**	.054	.004	-.009	.072
Time spent designing, on average, per week:	.125	.064	.158	.050	**.720**	.158	.009	-.189	.182
I tend to build game modifications from scratch, or use tools the developers did not create or intend.	-.043	.090	.160	.020	**.777**	-.011	.176	.103	-.081
I know how to manipulate virtual environments.	.435	.132	.189	.118	.209	**.603**	.217	.152	-.086
I know how to navigate virtual environments.	.543	.180	.172	.050	.161	**.602**	.108	.100	.134
I am proficient at controlling games.	.564	.197	.127	.151	.130	**.604**	.206	.074	.040
I am proficient with the interfaces in games.	.551	.254	.115	.164	.152	**.643**	.060	.087	.066
I am confident in my technical abilities as a gamer.	.504	.225	.050	.169	.251	**.507**	.163	.080	.098

I tend to explore how the systems (including rules) of a game work in-depth.	.409	.085	.230	.020	.298	.204	**.619**	.198	.135
When the situation changes, I actively attempt to update my information.	.424	.222	.208	.053	-.016	.231	**.618**	.049	.046
I build on my knowledge of games to better my understanding and/or proficiency.	.481	.186	.109	.129	.125	.214	**.557**	.028	.220
I enjoy balancing limited resources in games.	.441	-.004	.084	.229	-.040	-.001	.017	**.688**	.066
I actively plan/schedule gameplay behavior based on a need or desire for certain types or levels of resources.	.217	.255	.198	.075	.009	.427	.174	**.615**	-.028
I play to see how good I really am.	.069	.266	.124	.135	.203	-.066	.097	.037	**.672**
I play to beat the game or complete a goal	.352	.352	.030	.202	.062	.148	.108	.022	**.567**

Extraction Method: Principal Component Analysis.
 Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 8 iterations.

The nine-factor solution showed that information and learning, along with the basic resource management questions, seemed to be grouped together, except for three questions about learning that involved updating and building on existing knowledge—as well as the more complex resource-based questions, which asked about enjoying and actively planning opportunities for resource management. System skills, the sub-category of core competencies that deals with the physical controls, technical skills, and virtual manipulation, formed their own factor. The questions about design and teamwork also coalesced into their own discrete categories.

The questions from Jones (2009) concerning socialization through gaming were matched with a question from Lazzaro (2004) about enjoyment derived from the customization and subsequent utilization of avatars in a virtual space. This is a logical linkage, as someone who perceives the playing of video games to be a viable option for socialization and relationship-building behavior should also have an affinity for the modes of expression within that space.

Finally, the statement-based questions from Lazzaro (2004) about individualistic (non-social) motivations for gaming and the questions concerning the sources of emotional and other experiential enjoyment while gaming constituted the last factor. Originally, there was no design conceived for where these emotional correlates would find their associations. It was theorized that different motivations and sources of satisfaction might be correlated to specific activities or skills. For instance, the question "I play games to 'figure out' things"—from a conceptual basis—would have been a natural match for the categories of learning or information. Additionally, "I like having multiple objectives in the same gameplay experience" could have been paired with

questions about resource management. Instead, the questions were grouped together. While this lessens the complexity of the model in terms of its ability to determine behavioral/psychological predictors for a particular skill, it does strengthen the overall structure through its parsimony. Grouping them together still makes a great degree of sense conceptually; video games are a unique medium, one part interactive activity and the other a potentially emotionally-laden search for enjoyment through exploration and discovery.

Each of the nine factors is detailed below.

Table 8. Nine-factor solution: Factor one items and loadings

It is easy for me to obtain information in or about games.	**.638**
I can successfully monitor inputs, meters, points, and other sources of information that video games present.	**.659**
It is easy for me to recall information about games after the gameplay experience.	**.839**
It is easy for me to look up information about games after the gameplay experience.	**.812**
I am confident in my ability to analyze information and feedback presented by video games.	**.746**
I am able to appropriately implement information from or about games.	**.731**
I am able to assess the quality of the information I receive from video games.	**.680**
I am good at explaining information from or about games to others.	**.739**
I pick up the rules of most games fairly quickly.	**.695**
I am good at understanding the consequences of my in-game actions.	**.719**
I understand the more complicated parts of games because of the simpler actions that built up to them.	**.569**
I know how to successfully manage in-game resources (like health, mana, seeds, land, vehicles, followers, or any other limited, useful and controllable element in a video game).	**.699**
I am good at maintaining satisfactory levels of resources.	**.668**

The first factor is an almost complete collection of all the items that form the four core competencies: information, learning, resource management, and system skills. But,

the content validity of this factor remains suspect because it failed to include all items of the core competencies. When half of the items concerning learning and resource management have splintered off into the seventh and eighth factors, and the system skills-related items are grouped under the sixth factor, it is difficult to make sense of this polymorphous smattering of items. There is a distinct trend toward the convergence of the core competency components, but it is not fully realized without theoretical interpretation. For whatever reasons, sample size and/or question wording being likely issues, the data does not naturally yield the parsimony found in eliminating seemingly superfluous sub-factors that are only—in some instances—just two items in size. They do not represent the items with the strongest factor loadings, suggesting a lack of statistical stability. Moreover, under even the most modest application of theory, it is apparent that conceptually related components are being separated, resulting in a factor structure that lacks theoretical clarity.

Table 9. Nine-factor solution: Factor two items and loadings

I like having multiple objectives in the same gameplay experience.	**.473**
I play games to explore new worlds.	**.758**
I play games to interact with intriguing characters.	**.806**
I play games to "figure out" things.	**.647**
I like seeing what happens in the story, even if I have to use a walkthrough (or view the content elsewhere).	**.779**
I have experienced a close bond between my character and myself.	**.560**
I appreciate flashy feedback, like "mission clear" screens, sound effects for leveling up, or over-the-top death animations.	**.496**
I derive satisfaction from interacting with persistent elements in a world (raising a character or creature, growing a garden, going to a town after completing a dungeon to see how the residents react, managing a skill tree, etc.).	**.624**
I complete in-game goals to clear my mind.	**.567**

The second factor is constructed of items either derived or adapted from Lazzaro and, as with the first factor, it is incomplete. Not all of the affective correlates are in this factor. The question about avatars found a place in the fourth factor (see below) and two similar motivation-related items were exclusively relegated to the ninth factor. Otherwise, this factor is consistent with the literature and statistically sound.

Table 10. Nine-factor solution: Factor three items and loadings

I work as part of a team when playing video games.	**.811**
Teamwork is an important skill in the games I play.	**.793**
I have recruited, trained, advised, coordinated, or otherwise managed a team in a video game.	**.703**
Team management is important in the games I play.	**.816**
Leadership is important in the games I play.	**.797**

This factor is composed of the teamwork-related items from the proposed "sociability" construct. To see them divorced from the other questions concerning socialization is unsurprising; it makes sense that they would entail some different aspect of literacy. The more casual social-based items frame video games as a means toward interpersonal communication, while the items in this factor consider socialization a tool for furthering the gaming experience.

Table 11. Nine-factor solution: Factor four items and loadings

I enjoy using avatars, creating profiles, customizing characters, or otherwise expressing myself in a gaming space.	**.468**
Gaming is a way to meet people.	**.814**
Gaming is a way to build relationships.	**.821**
Gaming is a way to socialize with people.	**.763**
Gaming is a way to improve existing friendships.	**.737**

There is nothing inherently disconcerting or inexplicable about this factor. All five of the items inquired about the casual social potential of video games. The one possible issue is the substantially lower factor loading of the avatar-related item; it could belong elsewhere, though it still makes sense.

Table 12. Nine-factor solution: Factor five items and loadings

I like to create my own game content.	**.833**
I enjoy creating things that others will play with.	**.838**
Time spent designing, on average, per week:	**.720**
I tend to build game modifications from scratch, or use tools the developers did not create or intend.	**.777**

The fifth factor is that of "Design," one of the proposed components. It is constructed of exactly the same items that were outlined in previous sections. There is nothing anomalous about it.

Table 13. Nine-factor solution: Factor six items and loadings

I know how to manipulate virtual environments.	**.603**
I know how to navigate virtual environments.	**.602**
I am proficient at controlling games.	**.604**
I am proficient with the interfaces in games.	**.643**
I am confident in my technical abilities as a gamer.	**.507**

These are the "system skills" items, one of the four core competencies outlined in the literature review. It is not surprising to see them associated with each other, but there is still the aforementioned issue: with all three of the other core competencies (mostly) represented in the first factor, it is strange that this collection of items is a separate factor. As with the subsequent factors, the relatively low factor loadings of individual items ($<.70$) and the percentage of variance extracted by the factor ($<4\%$) suggest the lack of statistical stability.

Table 14. Nine-factor solution: Factor seven items and loadings

I tend to explore how the systems (including rules) of a game work in-depth.	**.619**
When the situation changes, I actively attempt to update my information.	**.618**
I build on my knowledge of games to better my understanding and/or proficiency.	**.557**

Much like the previous factor, there is nothing questionable about these three questions being grouped together, save the important fact that they are separated from the rest of the core competency-related items in the first factor. These are learning-focused questions, but not all of them. The remainder exists in the first factor, which seems to be the meeting point for all core competency items, barring any outlying factors like this one.

Table 15. Nine-factor solution: Factor eight items and loadings

I enjoy balancing limited resources in games.	**.688**
I actively plan/schedule gameplay behavior based on a need or desire for certain types or levels of resources.	**.615**

This factor might be considered a "trivial" factor because it only has two items and adds little to the information already extracted (Gorsuch, 1983). The two items in the factor are a fraction of the conceptual component it should belong to. In this case, they are items concerning resource management. It should be incorporated into the first factor for greater parsimony.

Table 16. Nine-factor solution: Factor nine items and loadings

I play to see how good I really am.	**.672**
I play to beat the game or complete a goal	**.567**

The last factor of this initial solution is comprised of just two questions. Again, like the preceding three factors, it seems to be consistent on its face; these are two questions adopted from Lazzaro (2004) about goal-related motivators for gaming. Their pairing is not in question, merely that they should exist in a logical and parsimonious model of gaming literacy as *just* a pair. Ideally, they too should be incorporated back into their category of conceptual origin—in this case, the factor of affective components.

This nine-factor model hosts some logically and conceptually sound dimensions, but the random displacement of a couple learning and resource management questions, as well as an even more random two-question factor of goal-orientated motivators, meant that the initial factor analysis was only the first step toward the identification of a conceptually clear and statistically stable factor structure.

It should also be noted that the nine-factor solution emerged from the 'eigenvalue-greater-than-one' rule which is highly influenced by the number of items in the factor analysis. As Cliff (1998) points out, the size of eigenvalue has nothing to do with the reliability of a factor, the eigenvalue greater than 1.0 should therefore be applied with caution. The limited interpretability and clarity of the sixth, seventh, eighth, and ninth factors that emerged from the initial factor analysis are indicative of the problem, despite the fact that all these factors had greater than one eigenvalues. A revision of the factor structure according some additional criteria seemed necessary.

Smith and McCarthy (1995) provided a summary of fundamental psychometric criteria that should be considered at all stages of the scale revision process. These criteria include: recognizing a scale's hierarchical structure (i.e., what facets of item content it contains); establishing internal consistency reliability when appropriate; testing of

content homogeneity of the facets and ensuring that different aspects of the construct are equally represented in a scale; ensuring that the items discriminate between respondents at the appropriate level of trait intensity; and replication of factor structure across independent samples. Guided by the criteria, the next few sections detail the reduction from nine factors to five and how an imposed five-factor structure makes sense, specifically in terms of hierarchical structure and content homogeneity.

Five-factor solution

A series of factor analyses with a fixed number of factors were performed to overcome the problems associated with the nine-factor solution. Specifically, the total number of factors to be extracted was sequentially varied from eight to five to determine (1) the improvement in conceptual and statistical clarity of the solutions, and (2) the tradeoffs between alternative solutions according to established criteria. Of the four solutions (with eight, seven, six, and five imposed or fixed factors extracted), the five-factor solution appeared to be the most stable and sound, while also being the most parsimonious. A detailed analysis of the five factors extracted is presented below.

Table 17. Factor analysis: Five-factor solution

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	19.304	40.217	40.217	19.304	40.217	40.217	12.418	25.872	25.872
2	4.025	8.386	48.603	4.025	8.386	48.603	6.605	13.760	39.631
3	2.850	5.938	54.541	2.850	5.938	54.541	4.437	9.244	48.875
4	2.679	5.582	60.123	2.679	5.582	60.123	3.608	7.516	56.391
5	1.590	3.312	63.435	1.590	3.312	63.435	3.381	7.044	63.435
6	1.486	3.095	66.530						
7	1.320	2.751	69.281						
8	1.144	2.384	71.665						
9	1.026	2.137	73.802						
10	.954	1.988	75.790						

Extraction Method: Principal Component Analysis.

Table 18. Five-factor solution: Factor loadings after varimax rotation

Rotated Component Matrix[a]					
	Component				
	1 (ISM)	2 (E&E)	3 (Teamwork)	4 (Design)_	5 (Social)
It is easy for me to obtain information in or about games.	**.595**	.153	-.122	.210	.352
I can successfully monitor inputs, meters, points, and other sources of information that video games present.	**.706**	.071	.185	.056	.049
It is easy for me to recall information about games after the gameplay experience.	**.766**	.166	.124	-.036	.097

It is easy for me to look up information about games after the gameplay experience.	**.737**	.184	.062	.066	.174
I am confident in my ability to analyze information and feedback presented by video games.	**.766**	.110	.157	.053	.248
I am able to appropriately implement information from or about games.	**.756**	.178	.150	.234	.182
I am able to assess the quality of the information I receive from video games.	**.694**	.128	.085	.172	.362
I am good at explaining information from or about games to others.	**.772**	.001	.066	.081	.227
I pick up the rules of most games fairly quickly.	**.762**	.195	.117	-.037	-.090
I am good at understanding the consequences of my in-game actions.	**.727**	.181	.133	-.151	.088
I tend to explore how the systems (including rules) of a game work in-depth.	**.604**	.239	.308	.271	-.138
When the situation changes, I actively attempt to update my information.	**.620**	.255	.192	.046	-.011
I build on my knowledge of games to better my understanding and/or proficiency.	**.645**	.308	.127	.132	.026
I understand the more complicated parts of games because of the simpler actions that built up to them.	**.604**	.291	.109	-.027	.012

I know how to successfully manage in-game resources (like health, mana, seeds, land, vehicles, followers, or any other limited, useful and controllable element in a video game).	**.767**	.271	.273	-.048	.021
I am good at maintaining satisfactory levels of resources.	**.709**	.294	.240	-.048	.000
I enjoy balancing limited resources in games.	**.449**	.218	.313	-.251	.030
I actively plan/schedule gameplay behavior based on a need or desire for certain types or levels of resources.	**.439**	.360	.340	-.023	-.058
I know how to manipulate virtual environments.	**.665**	.101	.201	.288	.120
I know how to navigate virtual environments.	**.739**	.198	.160	.225	.071
I am proficient at controlling games.	**.776**	.184	.112	.209	.170
I am proficient with the interfaces in games.	**.745**	.231	.092	.231	.209
I enjoy using avatars, creating profiles, customizing characters, or otherwise expressing myself in a gaming space.	.056	**.568**	.060	.151	.407
I play to see how good I really am.	.075	**.571**	.174	.100	-.009
I play to beat the game or complete a goal	.406	**.566**	.042	.013	.123
I like having multiple objectives in the same gameplay experience.	.455	**.613**	.259	-.031	.175
I play games to explore new worlds.	.290	**.657**	-.082	.326	.308

I play games to interact with intriguing characters.	.178	**.775**	-.039	.288	.263
I play games to "figure out" things.	.331	**.628**	-.064	.266	.217
I like seeing what happens in the story, even if I have to use a walkthrough (or view the content elsewhere).	.286	**.656**	.027	.189	.183
I have experienced a close bond between my character and myself.	.205	**.650**	.322	.169	.073
I appreciate flashy feedback, like "mission clear" screens, sound effects for leveling up, or over-the-top death animations.	.298	**.597**	.226	-.034	.105
I derive satisfaction from interacting with persistent elements in a world (raising a character or creature, growing a garden, going to a town after completing a dungeon to see how the residents react, managing a skill tree, etc.).	.201	**.690**	.337	.018	.183
I complete in-game goals to clear my mind.	.268	**.639**	.059	.294	.186
I work as part of a team when playing video games.	.298	.093	**.747**	.123	.243
Teamwork is an important skills in the games I play.	.264	.040	**.731**	.152	.244
I have recruited, trained, advised, coordinated, or otherwise managed a team in a video game.	.286	.171	**.737**	.261	.080

Team management is important in the games I play.	.175	.193	**.837**	.114	.196
Leadership is important in the games I play.	.163	.142	**.721**	.188	.125
I like to create my own game content.	.178	.275	.108	**.789**	.011
I enjoy creating things that others will play with.	.113	.288	.162	**.818**	-.019
Time spent designing, on average, per week:	.151	.108	.130	**.724**	.062
I tend to build game modifications from scratch, or use tools the developers did not create or intend.	-.002	.128	.222	**.731**	-.056
Gaming is a way to meet people.	.151	.281	.352	-.012	**.734**
Gaming is a way to build relationships.	.095	.333	.340	-.036	**.747**
Gaming is a way to socialize with people.	.239	.320	.276	-.077	**.728**
Gaming is a way to improve existing friendships.	.296	.326	.134	.032	**.653**
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 9 iterations.					

The initial nine-factor model explains 73.8% of variance, and the imposed five-factor model explains 63.4%. Though it explains a lesser amount of variance than its nine-factor predecessor, this imposed five-factor model achieves the highest degree of conceptual clarity and parsimony possible for the proposed literacy scale. At first glance, it might appear that the first factor is overloaded with a random spate of conceptual

components. However, the remainder of the table serves to explain and even vindicate this somewhat engorged list of items. Each of the components that were originally derived from the literature and placed under the "core competencies" category—information, learning, resource management, and system skills—the portion of gaming literacy that was not questioned as an optional part, were correlated enough to result in a singular factor of mental and technical proficiency and confidence.

Table 19. Five-factor solution: Factor one (ISM) and loadings

It is easy for me to obtain information in or about games.	**.595**
I can successfully monitor inputs, meters, points, and other sources of information that video games present.	**.706**
It is easy for me to recall information about games after the gameplay experience.	**.766**
It is easy for me to look up information about games after the gameplay experience.	**.737**
I am confident in my ability to analyze information and feedback presented by video games.	**.766**
I am able to appropriately implement information from or about games.	**.756**
I am able to assess the quality of the information I receive from video games.	**.694**
I am good at explaining information from or about games to others.	**.772**
I pick up the rules of most games fairly quickly.	**.762**
I am good at understanding the consequences of my in-game actions.	**.727**
I tend to explore how the systems (including rules) of a game work in-depth.	**.604**
When the situation changes, I actively attempt to update my information.	**.620**
I build on my knowledge of games to better my understanding and/or proficiency.	**.645**
I understand the more complicated parts of games because of the simpler actions that built up to them.	**.604**
I know how to successfully manage in-game resources (like health, mana, seeds, land, vehicles, followers, or any other limited, useful and controllable element in a video game).	**.767**
I am good at maintaining satisfactory levels of resources.	**.709**
I enjoy balancing limited resources in games.	**.449**
I actively plan/schedule gameplay behavior based on a need or desire for certain types or levels of resources.	**.439**
I know how to manipulate virtual environments.	**.665**
I know how to navigate virtual environments.	**.739**
I am proficient at controlling games.	**.776**
I am proficient with the interfaces in games.	**.745**

The other factors are very clearly separate. The second factor is the aforementioned factor of Lazzaro's emotional and motivation-based variable, the items that are characterized by discovery and exploration. Essentially, this is the same category that Lazzaro (2004) calls "easy fun" and Koster (2005) terms "aesthetic appreciation." Though either of these labels would be fairly acceptable for this newly derived factor, it will subsequently be referred to as "Exploration and Enjoyment," the first word of which connotes a stronger sense of involvement than Lazzaro's "easy fun" and much more interactivity than Koster's "aesthetic appreciation." The desire to interact with characters and explore virtual worlds implies a more motivated approach toward the attainment of visceral in-game rewards. The second word, enjoyment, is an accurate descriptor of the underlying motivations behind each of the questions that constitute this component.

Table 20. Five-factor solution: Factor two (E&E) and loadings

I enjoy using avatars, creating profiles, customizing characters, or otherwise expressing myself in a gaming space.	**.568**
I play to see how good I really am.	**.571**
I play to beat the game or complete a goal	**.566**
I like having multiple objectives in the same gameplay experience.	**.613**
I play games to explore new worlds.	**.657**
I play games to interact with intriguing characters.	**.775**
I play games to "figure out" things.	**.628**
I like seeing what happens in the story, even if I have to use a walkthrough (or view the content elsewhere).	**.656**
I have experienced a close bond between my character and myself.	**.650**
I appreciate flashy feedback, like "mission clear" screens, sound effects for leveling up, or over-the-top death animations.	**.597**
I derive satisfaction from interacting with persistent elements in a world (raising a character or creature, growing a garden, going to a town after completing a dungeon to see how the residents react, managing a skill tree, etc.).	**.690**
I complete in-game goals to clear my mind.	**.639**

The third factor is a measure of the importance of teamwork in the games an individual plays, as well as his or her involvement in the team management process. While this was originally bundled with other questions of sociability in the conceptual model, it makes sense that they are statistically distinct entities. Though both categories technically involve interpersonal communication, each factor requires a different set of motivations, skills, and practices. The desire/skill to coordinate a team indicates one set of mental competencies; the desire to use video games as a catalyst for relationship-building activities is another. While there may be the occasional overlap—a group of friends that happens to be proficient at a particular game and meets to both perfect their craft *and* their social group—the core focus of each social factor is rooted in a different perspective. "Teamwork" involves virtual meeting and coordination for the sake of the game; pure socialization is about the people playing the game and the use of gaming as a medium for interaction—a means, not an end. The fourth factor, then, is "Socialization," a list of questions that is about an individual's perception of the medium of video games as a venue for initiating, maintaining, and/or strengthening interpersonal bonds.

Table 21. Five-factor solution: Factor three (Teamwork) and loadings

I work as part of a team when playing video games.	**.747**
Teamwork is an important skill in the games I play.	**.731**
I have recruited, trained, advised, coordinated, or otherwise managed a team in a video game.	**.737**
Team management is important in the games I play.	**.837**
Leadership is important in the games I play.	**.721**

Table 22. Five-factor solution: Factor four (Design) and loadings

I like to create my own game content.	**.789**
I enjoy creating things that others will play with.	**.818**
Time spent designing, on average, per week:	**.724**
I tend to build game modifications from scratch, or use tools the developers did not create or intend.	**.731**

Finally, the fifth and last component of the five-factor scale for gaming literacy, which explains 3.3% of variance, is wholly devoted to the level of enjoyment, time spent, and tools used in designing and creating game content. Dubbed, fittingly enough, "Design," this factor shows great promise in terms of reliability and predictive power (see Table 23 below and the section "Reliability: Correlations between literacy and flow") but is still limited by the reality that most games are not even capable of cultivating such a skill set, much less created for that purpose.

Table 23. Five-factor solution: Factor five (Socialization) and loadings

Gaming is a way to meet people.	**.734**
Gaming is a way to build relationships.	**.747**
Gaming is a way to socialize with people.	**.728**
Gaming is a way to improve existing friendships.	**.653**

Reliability (internal consistency)

Two reliability measures commonly used are: (1) test-retest--the correlation between the same person's score on the same set of items at two points in time, and (2) internal consistency--the correlation among items or sets of items in the scale for all who answer the items (Bearden and Netemeyer, 1999; Nunnally & Bernstein, 1994). The most frequently used internal consistency reliability measure is Cronbach's (1951) coefficient alpha. The Cronbach's alphas of the five factors are presented in Table 24. The alphas

ranged from .804 to .960, suggesting that items under each of the five factors enjoy high

levels of internal consistency.

Table 24. Reliability: Coefficient alphas

Factor 1: Information and Systems Management (ISM)	
Cronbach's Alpha	.960
N of Items	24
Factor 2: Exploration and Enjoyment (E&E)	
Cronbach's Alpha	.921
N of Items	13
Factor 3: Teamwork	
Cronbach's Alpha	.914
N of Items	5
Factor 4: Design	
Cronbach's Alpha	.804
N of Items	5
Factor 5: Socialization	
Cronbach's Alpha	.908
N of Items	4

Nomological validity

Nomological validity has been defined as the extent to which predictions from a

formal theoretical network containing the concept under scrutiny are confirmed

(Campbell, 1960). It assesses the degree to which constructs that are theoretically related

are actually empirically related (i.e., their measures correlate significantly in the predicted

direction). For a scale to be useful, it must be able to explain or predict future levels and

instances in that bailiwick, and prove its reliability through a consistent relationship with

other variables. In this study, the nomological validity of the gaming literacy scale is

assessed by examining the relationships between the five identified literacy factors (ISM,

E&E, Teamwork, Design, Socialization) and the three components of flow (Play, Skill, Challenge).

Table 25 shows the Cronbach's coefficient alphas of the three flow components. The items within the components were collapsed into composite scores (i.e., mean score of the summed items).

Table 25. Reliability: Flow components

Play	
Cronbach's Alpha	.845
N of Items	6
Skill	
Cronbach's Alpha	.924
N of Items	5
Challenge	
Cronbach's Alpha	.733
N of Items	4

The correlations between the composite scores were correlated with the composite scores of the five gaming literacy factors. Table 26 shows that all correlation coefficients are positive and statistically significant, save the correlations between "Social" and "Design," with a coefficient of .157 (p=.064). As a whole, the correlation analysis indicates that the higher the literacy level, the more likely it is that a participant has experienced some aspect of flow.

Table 26. Correlations between literacy factors and flow components

		Play	Skill	Chall-enge	ISM	E&E	Team-work	Design	Social
Play	Pearson Correlation	1							
	Sig. (2-tailed)								
	N	183							
Skill	Pearson Correlation	.563**	1						
	Sig. (2-tailed)	.000							
	N	178	190						
Chall-enge	Pearson Correlation	.622**	.384**	1					
	Sig. (2-tailed)	.000	.000						
	N	175	182	187					
ISM	Pearson Correlation	.549**	.606**	.413**	1				
	Sig. (2-tailed)	.000	.000	.000					
	N	122	126	127	130				
E&E	Pearson Correlation	.663**	.571**	.507**	.657**	1			
	Sig. (2-tailed)	.000	.000	.000	.000				
	N	166	173	170	121	197			
Team-work	Pearson Correlation	.509**	.440**	.398**	.538**	.604**	1		
	Sig. (2-tailed)	.000	.000	.000	.000	.000			
	N	133	137	135	126	134	141		
Design	Pearson Correlation	.428**	.277**	.252**	.326**	.483**	.377**	1	
	Sig. (2-tailed)	.000	.001	.003	.000	.000	.000		
	N	132	139	136	126	134	137	142	
Social	Pearson Correlation	.534**	.405**	.377**	.446**	.606**	.570**	.157	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.064	
	N	175	182	181	129	194	139	140	209

To further evaluate the nomological validity of the gaming literacy scale, multiple regression analyses were performed by treating the literacy factors as the predictors of each of the three components of flow.

Table 27 shows that the five factors predicted a significant amount of variance in the first flow component: play (R square = .511, p<.001). Three of the literacy factors are significant predictors of the play component: Social, Exploration and Enjoyment, and Design. The fact that the category of technical proficiencies—the collection of core components that is Information and Systems Management (ISM)—is not linked with the experience of play associated with flow should not be surprising. Play is not about learning and understanding systems, it is about that next step where those same systems that used to pose a challenge are now toys for ludic enjoyment. It should be much more likely to see a strong correlation between ISM and the flow components of Challenge and Skill. Also, the factors "Teamwork" and "Social" are connotatively incongruent, as they imply a different tone for much the same set of actions. That only one of them would be correlated to Play makes sense.

The strongest is the literacy factor "Exploration and Enjoyment" (E&E), with a Beta value of .313. This factor is a composite of the various behaviors, motivators, and emotional experiences concerning the playing of video games with a strong sense of agency in a ludic construct—practically the definition of the word "play." The E&E construct is virtually the embodiment of the sentiments attested to by the respondents in this particular section. Again, looking at play as having a sense of agency in a ludic environment, design skills and confidence levels are another logical set of items that

should correlate to Play. Indeed, though the Beta value is the lowest of the three

statistically significant correlates (.174), this is still the strongest relationship between

Design and any of the three flow components.

Table 27. Regression analysis (Play)

Model	R		R Square	F	Sig.
1	.715[a]		**.511**	24.034	**.000[a]**
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	.862	.287		3.004	.003
ISM	.189	.101	.167	1.879	.063
E&E	.287	.100	**.313**	2.880	**.005**
Teamwork	.025	.060	.039	.426	.671
Design	.145	.064	**.174**	2.241	**.027**
Social	.151	.061	**.221**	2.466	**.015**

a. Dependent Variable: Play

Table 28 presents results of regression analysis using the skill component of flow

as the criterion variable. Only two of the literacy factors emerged as significant

predictors: Information and Systems Management (ISM), and Exploration and Enjoyment

(E&E). It is a bit surprising that Teamwork was not a significant predictor of Skill

(Beta=.048, p=.489), and even more surprising is the absence of predictive power of

Design (Beta=.000, p=.997). The results might be due to the correlations among the

literacy factors (see Table 26) which resulted in multicollinearity in the regression model.

The regression model as a whole, however, showed statistically significant predictive

power of the Skill component (R square = .423, p<.001).

Table 28. Regression analysis (Skill)

Model	R		R Square	F	Sig.
1	.651[a]		**.423**	16.892	.000[a]
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	.982	.292		3.368	.001
ISM	.413	.102	.391	4.044	**.000**
E&E	.219	.101	.255	2.166	**.032**
Teamwork	.030	.061	.048	.489	.626
Design	.000	.066	.000	.003	.997
Social	.031	.062	.048	.497	.620

a. Dependent Variable: Skill

Regression results revealed substantially reduced power of the literacy factors in predicting the Challenge component of flow (R square=.280, p<.001). Further, the only literacy factor that reached statistical significance was Exploration and Enjoyment. Aside from the multicollinearity issue mentioned above, the results might be due to the relatively low internal consistency of the challenge component (alpha=.733) as well as the varying levels of stigma associated with the notion of challenge within the gaming community. It must also be noted that while one might be more inclined to assume a negative relationship between these two constructs, there is a solid theoretical explanation for the significant and positive relationship between challenge and Exploration and Enjoyment (Beta=.326, p=.015). Though "enjoyment" is often loaded with a passive connotation in reference to most forms of entertainment media, video games are different. Part of the experience is simply based on feedback and the experiencing of visceral stimuli, but the other part of gaming—which is more necessary than the aforementioned one—is about overcoming an obstacle. Some games make challenge a non-issue, but

most designers and players relish in the respective creation and mastery of challenges. To

a gamer, Challenge and Enjoyment are often two aspects of the same thing, especially for

proficient gamers, who need to balance their high skill levels with equally high levels of

challenge to attain flow.

Table 29. Regression analysis (Challenge)

Model	R		R Square	F	Sig.
1	.529[a]		**.280**	8.928	**.000[a]**
	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.525	.333		4.586	.000
ISM	.119	.117	.110	1.021	.310
E&E	.285	.115	**.326**	2.472	**.015**
Teamwork	.060	.069	.095	.870	.386
Design	.009	.075	.012	.123	.902
Social	.049	.071	.074	.685	.495

a. Dependent Variable: Challenge

Known-group validity

Known-group validity asks the following question: "Can the measure reliably

distinguish between groups of people who should score high on the trait and low on the

trait?" (Bearden and Netemeyer, 1999). Therefore, the gaming literacy scale is more valid

if it can reliably discern between populations that are expected to score differently on the

five dimensions of the scale. Two groups that qualify for the test would be males and

females. As with many other activities, gaming is a predominantly male-oriented pastime

and the difference between the exposure to the medium and even cultural visibility in the

community is affected greatly by gender (Bryce & Rutter, 2002).

The means and standard deviations of literacy scores for male and female participants are presented in Table 30. T-tests were used to determine the statistical significance of the difference between the mean scores between the male and female groups. Table 31 shows, as expected, that male participants scored significantly higher than female participants in four of the five literacy factors. The only exception was the Design factor where the mean difference failed to achieve statistical significance. It is interesting to point out that the Design factor also received the lowest average scores from both gender groups, so there seems to be low levels of skill/confidence/action in terms of design in video games across the board.

Table 30. Means and standard deviations of literacy scores (males vs. females)

Group Statistics

	3. Gender:	N	Mean	Std. Deviation
ISM	Female	58	3.5862	.66267
	Male	71	**3.9243**	.58729
E&E	Female	107	3.0726	.78452
	Male	89	**3.6232**	.69715
Teamwork	Female	65	3.4492	1.01675
	Male	75	**4.0480**	1.09339
Design	Female	64	2.3250	.66999
	Male	77	**2.5740**	1.00386
Social	Female	117	2.8590	1.08247
	Male	91	**3.4918**	.92530

Table 31. T-test results (males vs. females)

	t-test for Equality of Means			
	t	df	Sig. (2-tailed)	Mean Difference
ISM	-3.070	127	**.003**	-.33809
E&E	-5.143	194	**.000**	-.55055
Teamwork	-3.338	138	**.001**	-.59877
Design	-1.695	139	.092	-.24903
Social	-4.452	206	**.000**	-.63278

Chapter5: Conclusions

The first step of many

      This thesis has taken the disparate studies of several different aspects of video games—skills, attitudes, competencies, behaviors, motivators, and emotions—and synthesized their findings into an early, working measure of literacy for the medium. Almost everything proved to be correlated to a statistically significant level: the internal consistency between items in each factor; the correlations between each literacy factor; and the majority of the relationship between the literacy scale and the theoretical construct of flow. Some items had to be dropped and a specified number of factors had to be imposed but—for combining so much research, adapting questions from the field of human-computer interaction to suit this new medium, and creating such a dauntingly large survey—the data yielded fruitfully interpretable results. To fully develop a literacy scale that will be viable across a spectrum of issues in gaming, something that can become an established standard for video games in social science (or, at the very least, mass communications research), there is still much work to be done. Surely, though, this first step is one of the more significant in developing research toward that end.

      The relationship to the flow experience is not necessarily clear or strong enough, especially on its own, to defend the reliability and validity of the proposed literacy scale. Future research must determine the possible relationships between the scale and other relevant measures concerning people and video games, starting with a replication study with a substantially greater sample size. The limitation of sample size did more than potentially confound some of the results; it also forced an exploratory, rather than

confirmatory, interpretation of the data. In a similar vein, the relationship between literacy and flow has been shown to be one of strong correlation but, while convergent correlation implies a causal relationship, this has yet to be definitively determined. Still, there is a statistically reliable and positive link between literacy and flow, which helped establish convergent validity for the proposed scale.

The elephant in the room: understanding one massive factor

A finding that, until this section, has been given only brief mention but perhaps deserves more than any other, is the fact that Information and Systems Management (ISM) explains more than 40.2% of the total variance and 63.4% of the variance that is actually explained by the five-factor model—40.217% out of a total 63.435% variance explained, to the nearest thousandth. The monolithic variable is statistically sound and logically explainable in terms of theory but, ideally, one component of a scale with five distinct factors should not need so many more questions in comparison. This means that either the factor is an aberration due to the sample size and that these four "core competencies" should be independent; or that the factor is at least slightly redundant and should be reduced through statistical analysis derived from inter-item correlation tables of this study and future ones like it. Then again, a cohesive main factor and smaller contributing factors suit a tentative model well enough. It makes sense, the statistics support it, and there is no argument to suggest any reason to doubt, or any evidence to support another version of the model—yet.

Still, the large main component can be further supported by the theoretical construction of the remaining factors. It was suggested that the items in the resultant

factors "Social," "Design," and" Teamwork" were relatively optional components for a literacy scale that measures the skills and experiences of the average video game on the market today. While gaming as a medium offers a chance to learn, develop, and master everything that was asked of participants, the current iteration of the medium in mainstream society rarely offers all of these opportunities with each title released. Almost every game is made with the intent of teaching/testing technical proficiency and providing an audiovisual spectacle, but games that prove to be genuinely communal experiences or those that absolutely require solidarity and communication are rarer than not.

As such, at this juncture in the history of video games, it takes only a few questions to cover these optional components. Eventually, games will be more representative of the entirety of the human experience—though at that point, they will have eschewed the moniker "games" for some time. When that occurs, or even as that transpires, literacy measures must take that into account and delve deeper than the items in this study. For now, though, it is enough to state that it is not the fault of the ISM factor for being so large; it is more a statement of how society views, develops, and consumes mass-market video games that the other components are so small. Indeed, the second most important component—and the only other non-optional one from a conceptual standpoint—is also the second largest, with twelve items. It would be prudent to prune the ISM factor for future research, but it is equally defensible that components more integral to the common gaming experience will tend to have considerably more items, regardless of any further item reduction.

Potential for the future

Establishing a measure of literacy is intrinsically a worthwhile pursuit, but it is also advantageous for gaming research that goes further. For example, experimenters could have participants play games that emphasize certain skill sets to compare reported and actual proficiency scores. This would help root the model in the context of realistic learning and better determine the accuracy of using these factors of self-reporting items. Furthermore, flow should still be used as a potential correlate, but it needs to be assessed during the research gathering process in an experimental setting, which would establish a more concrete causal relationship between high levels of reported literacy and increased likelihood of experiencing flow. Follow-up interviews and focus groups could also prove beneficial in discovering more potential measures for reliability and causal consistency. The most important use for this scale, though, would be its intended purpose: to become a standardized measure of literacy for the medium of video games.

Limitations

Unquestionably, the biggest limitation of this study is the sample of participants. Even a reserved survey with a few items should have had more respondents, and this was a survey with not-so-modest intentions. To have acceptably conclusive results, the number of items essentially dictated a sample easily ten times the size they actually received. Had this been remedied, it might have better interpreted some of the outliers and classified the group of "core competencies" into their more distinct conceptual components—though their merging is not entirely unwelcome. Still, the anomalous items might also have been fixed with better wording. In hindsight, the connotation of the

phrasing practically inspires a guarded mentality, as the competitive frame of gaming makes questions of challenge and skill sound more like a critical test, rather than the evaluative assessments they were meant to be. Nevertheless, issues of sample seem to have limited the study more than anything else.

The sample composition was derived from the convenience of utilizing the eternally popular group of study: undergraduate students in the local department. In one way, this sample was more relevant to this study than most research projects that leverage that population. Gaming literacy is theoretically best analyzed with the aid of digital natives. Unfortunately, "digital" is a category that encompasses a wide array of media, many of them far removed from the complex interaction inherent to video games. A total of 48 people reported that they "never" play video games and another 51 respondents "totally disagree" with the title of "gamer." Unlike studies of television or film, where exposure to these media is almost guaranteed, this study could have benefitted from a longer and more selective recruitment process. Approximately one-sixth of the people who followed the survey link were turned away and another sixth were reticent to adopt gaming into their identity. About a third, then, were not necessarily ideal candidates for this niche of research. In the future, if this study were replicated with a larger participant population, such a large refusal rate would best be avoided. Of course, the sample composition could have also benefitted from having more extra-departmental students and perhaps even more in-depth data from students with the knowledge, eloquence, and inclination to provide follow-up qualitative reports.

Finally, the data itself poses some problems. To reduce the cost of participation—the average time an individual needed to complete the survey—question logic was added

to key items that were meant to serve as a filter, allowing those with less of a reason to answer every question an opportunity to do just that. As a result, almost half of the participants did not answer questions pertaining to the core components of the proposed literacy scale. While it could be argued that requiring all questions to be answered by every respondent might have been equally problematic, most likely due to apathy and lack of relevance, it was a choice that definitely hindered the already meager collection of data.

Also, in terms of data, it is a matter of fact that the only things that can be analyzed are those which are observed. The theoretical background of this thesis was an effort to compile as thorough a list as possible of skills, motivations, behaviors, experiences, and competencies—but it must be noted that there could be several categories that should have been added to the list of potential factors. Not only is a measure of factors still in just fledgling form, the list of factors has yet to receive consensus in either the gaming or academic communities. This study has shown which known items are not fit for the list, but it would have been impossible, outside of an extensive qualitative pre-test phase, to cultivate new conceptual candidates.

While on the subject of generating new results, there is the obvious flaw of not having any actual experimental testing of the proficiencies and experiences in the questions. A Likert-based survey yields little more than a thin slice of self-reporting and is far removed from a lab-based measure. Yet, despite this and all the other aforementioned limitations, this was only a first step toward a greater understanding. To make an analogy with film, greater clarity is achieved with more focus and a better camera, but the initial shot is still found by pointing the lens in the right direction—or

even by the framing afforded by simply holding up two L-shaped hands toward the horizon. Future studies can expand and refine; let it be enough that this one merely formalizes the conversation within the research community.

Implications

The scale developed by this study already shows predictive promise through the psychological phenomenon of flow. When further refined, this measure of habits, skills, and emotions—even if it is eventually proven to be an incomplete scale of literacy—will at least be a decent predictor of the components of flow. Optimal experience is one of the most researched topics in this fledgling field (Sherry, 2004; Chen, 2007). It should not be overlooked that, in addition to developing an independent scale, this study found some interesting correlations between particular emotions, skills, and psychological experiences. Guessing that design skills and an attitude of play might be linked is logical; having the statistical foundation to assert this linkage is useful.

With a better understanding of the different categories of skills and how they correlate to different motivations, behaviors, and experiences, these individual factors should be explored more thoroughly. More empirical experiments and even more in-depth qualitative data are needed for every one of the factors identified by the data. This study was devoid of any measures of actual skill or behavior, which is required for a complete understanding of any literacy scale. More importantly, this technical and nuanced research would no longer occur in isolation. Simply introducing the concept of a unifying scale should motivate researchers in the video game community to analyze the individual factors as part of an interrelated whole. Separately, but perhaps

simultaneously, video game researchers need to begin comparing models of gaming literacy to other forms of media literacy to make sure it is a distinct measure of gaming skills and mentalities, not a generic list of traits cultivated by numerous digital media.

Additionally, test-retest validity is an important step that was not taken in this particular study, due to time and resource constraints. Future studies should follow up with respondents when possible and retests should be given to aid in the revision of the items. This will be especially important when those same future research efforts attempt to reduce the size of the scale. Redundancy reduction should be used to further distill the essential elements from this model. Though its current incarnation achieves an almost ideal balance between explanatory power and parsimony of *factors*, the number of overall *items* is still moderately inconvenient for the average survey. If a researcher uses this scale in a study that is not focused on literacy—to explain, explore, or defend another concept—the current length of the survey could become overly burdensome when coupled with other series of questions.

Finally, a linking of all these components: finalize this literacy, test the actual proficiencies, make sure the measures are discrete in relation to other digital media, and then use experiments to test proficiency and flow across media. The last step of that list, the culmination of everything before it, will be a cross-medium analysis of literacy. If it can be shown that those who have experienced flow while gaming tend to have higher scores on a scale of literacy specific to video games *and* that higher gaming literacy scores are correlated to higher scores on other scales of digital media literacy, then it would imply that video games instill a more complete and overarching understanding of digital media as a whole. That way, as suggested in the theoretical framework,

McLuhan's logic can be put to the test and used to cement the video game as the prime candidate for the next dominant medium.

Even such a small-scale exploratory study should help build a brighter future in video game academia. Undoubtedly, further study—with a lot more participants—will be necessary to take case studies, qualitative self-reporting, and theoretical constructs and formulate a solid measure of literacy. Still, this thesis should prove to be the first step toward setting the agenda: gaming studies needs an accurate, comprehensive, and uniform scale of gaming literacy. If not for any other reason, the establishment of such a scale would contribute to an increased level of much-needed legitimacy in both the field of research and society at large. There was a time when the serious study of film was a laughable pursuit. Now, entire schools are built to teach not just the underpinnings of the craft, but a proficiency in its analyzation and deconstruction. So, too, should video games have a niche in scholarship where appreciating games and learning from them is considered worthwhile—in their own right. While video games are appreciated for *what* they teach about *other* things, it is time to respect gaming in terms of *how* it teaches its own format. Game designers and private-sector researchers already spend their mental and financial energies looking to unravel the psychological secrets of how games shape our perception, motivation, and behavior. This proves it is possible and prudent for academic researchers to devote their efforts, as well. If the only discoveries come from companies that are motivated to increase the "addictiveness" of a game to guarantee the bottom line, then we will be limited by that scope and games will deliver nothing more than a self-perpetuating stream of enthralling stimuli. The burden of discovering more culturally important uses for the medium belongs to the video game scholar.

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