

# LEARNING-IN-USE WITH INTERACTIVE ARTIFACTS

William N. Ryan

Submitted to the faculty of the University Graduate School  
in partial fulfillment of the requirements  
for the degree  
Doctor of Philosophy  
in the School of Informatics,  
Indiana University  
August 2011

Accepted by the Graduate Faculty, Indiana University, in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

Doctoral Committee

---

Martin A. Siegel

---

Erik Stolterman

---

Elizabeth Boling

---

David Hakken

---

Yvonne Rogers

Date of Dissertation Defense: March 9, 2011

Copyright © 2011  
William N. Ryan

To my wife, for always helping me see light when all I see is darkness.

To my family, for always believing in me and supporting me every step of the way.

To my advisors, for setting me on a path of discovery.

## **Acknowledgement:**

I would like to thank everyone who has helped me to accomplish this. Many of the ideas have evolved over the course of my entire time at Indiana University. I would like to thank students past and present of the school, many of whom with which I have had conversations about this. I would specifically like to thank three graduate students who have reviewed versions of this dissertation including William R. Hazlewood, Samantha Merritt, and Tyler Pace. I would also like to thank my wife, Heather Ryan, my mother, Mary Ryan, and Amanda Goings for their help in proofreading my dissertation. Their reviews helped me to express my dissertation with greater clarity. I would like to thank my committee members Elizabeth Boling, David Hakken, and Yvonne Rogers for the time they have invested in me and this dissertation, but especially Martin A. Siegel and Erik Stolterman who have spent countless hours advising and instructing me to make this dissertation possible.



William N. Ryan

## LEARNING-IN-USE WITH INTERACTIVE ARTIFACTS

Traditionally, learning in interaction design has focused either on how information is represented for users or on how users perform using a novel interface. The approach argued for in this dissertation differs by analyzing learning in terms of the experience users have instead of the output of their learning. *Learning-in-use* conceptualizes this learning experience by focusing on the meaningful relationship between user and artifact. Four aspects distinguish *learning-in-use* from other conceptions of learning including the formation of personally meaningful relationships between user and artifact, the evolution of that relationship over time, the formation of these relationships through negotiations with artifacts, and the requirement for active, engaged interaction in use of that artifact.

This concept was examined through an exploratory study to understand what is entailed by the learning experience. Using an *experiential*, phenomenological, and longitudinal approach that utilized several standard ethnographic techniques, twelve participants were recruited and monitored for five months. Participants were asked to learn two different artifacts among Photoshop, World of Warcraft, and an iPod Touch. Participants learned the artifacts on their own, recording their own experiences in a virtual diary. They were invited to participate in six periodic interview and observation sessions.

Participants demonstrated both successful and unsuccessful *learning-in-use*. Fifteen codes recorded their behaviors and perceptions about the artifacts most relevant to learning. Participants demonstrated that the formation of

personally meaningful relationships occurred when participants were engaged in the artifacts and when the artifacts satisfied some need. These needs changed throughout the study, and, so, users would constantly re-evaluate their use of the artifact. Artifacts were rarely useful *as is* requiring that users change their work patterns, perceptions, and expectations based on what the artifacts could offer. In addition to these findings, four phenomena emerged in this study describing *learning-in-use*: *grasping*, *situating*, *perceiving-in-use*, and *making meaning*. All four of these phenomena describe situations in which participants were forced to modify some aspect of their relationship with the artifact. This study has contributed to understandings about learning in interaction design, to the *experiential* perspective in learning and interaction design research, and about the nature of *learning-in-use*.

---

---

---

---

---



## Table of Contents

Abstract .....	vii
Chapter 1. Introduction .....	1
Research questions .....	4
Key terms for this dissertation .....	6
Interactive artifacts .....	6
Artifact lifecycle .....	9
Outline of an approach to studying learning-in-use .....	11
Summary .....	13
Chapter 2. Theoretical Perspectives of Learning in Interaction Design ....	15
Cognitive perspective .....	19
Representational perspective .....	21
Constructivist perspective .....	25
Situated perspective .....	30
Experiential perspective .....	35
Summary .....	41
Chapter 3. Learning-in-use: Organizing the Concept .....	43
Describing learning-in-use and its use in this dissertation .....	43
Comparing and contrasting learning-in-use and learning in use .....	52
Summary .....	56
Chapter 4. Longitudinal Study of Learning-in-Use .....	57
Empirical Design .....	58
Methodology .....	58

Research questions .....	60
Procedure.....	62
Data collection methods .....	66
Pilot study .....	67
Participants .....	68
Recruitment .....	68
Selection and study participation.....	68
Characteristics .....	70
Participant view of the study .....	71
Analysis methods .....	72
Research question #1 .....	75
Research question #2.....	76
Research question #3 .....	76
Shortcomings of the study .....	77
Summary .....	78
Chapter 5. Study Findings.....	81
Research Questions #1 .....	81
Anticipating use .....	82
Social situation of using an artifact .....	83
Uniqueness of an artifact and alternatives to an artifact.....	85
Sharing experiences.....	87
The depth of experience .....	88
Summary.....	90

Research question #2.....	90
Improved articulation about an artifact .....	91
Changes in an artifact or how it is perceived.....	92
Surpassed and unmet expectations .....	94
Changes in learning ability over time.....	97
Summary.....	101
Research question #3.....	101
Leveraging familiarity .....	102
Identification with a particular brand or platforms.....	103
Usage management.....	104
Opportunism in use.....	106
Fit of an artifact .....	108
Perspective taking.....	109
Control over an artifact.....	113
Summary.....	114
Addressing potential counter-evidence .....	115
Summary .....	117
Chapter 6. Discussion on Learning-in-Use .....	119
Research questions .....	120
Research question #1 .....	120
Research question #2 .....	122
Research question #3 .....	124
Four Phenomena of Learning-in-use.....	126

Grasping.....	127
Situating.....	129
Perceiving-in-use.....	132
Making meaning.....	134
Summary .....	136
Chapter 7. Learning-in-Use: Lessons and Looking Forward.....	139
Contribution .....	141
Defining learning-in-use .....	142
Evaluating the experiential perspective.....	143
Future directions.....	145
Summary .....	146
References.....	148
Appendix A. Scripts.....	155
Appendix B. Experience Diary .....	160
Appendix C. Transcriptions .....	162
Appendix D. Interview Narratives.....	274
Appendix E. Interview Question Analysis.....	318
Appendix F. Photoshop Task Analysis.....	321
Appendix G. Curriculum Vita.....	323



## Chapter 1. Introduction

Learning to use interactive artifacts is a complex and important aspect of the study of interaction design. When considering the meaning of *learning* in situations when users learn how to use interactive artifacts, the focus is typically on the knowledge gained or the errors made during use. Research in interaction design has described ways to intervene in this learning. Researchers use affordances and metaphors to communicate uses of an artifact, use external resources to supplement active learning with artifacts, and explore social and contextual resources that support learning. For example, Carroll, Mack, Lewis, Grischkowsky, and Robertson (1985) have shown how computer systems that provide assistance in the forms of training manuals, help commands, and so forth directly influence how effectively a user can learn a computer system.

At the same time, such resources are only one factor that influences how users learn to use an artifact and only one of the factors designers need to address when evaluating an interactive artifact from the standpoint of learning. There are still many issues that are unclear in interaction design research on how users learn to use artifacts. For example, the relation between learning to use an artifact and becoming a virtuoso with an artifact, the consequence of different levels of prior experiences, and the differences in how a user perceives an artifact over time are not addressed adequately by current research. While not all of these questions were addressed in this dissertation, these questions demonstrate a broader conception of learning that is equally important to understanding the use situation.

A gap exists in the current research on learning in interaction design as demonstrated by such unanswered questions. Researchers are beginning to understand how users learn to use artifacts on their own (Carroll, 1990) and in their own time (Bødker & Petersen, 2000; Petersen, 2002; Pohlmeier, Hecht, & Blessing, 2009), but there is still much opportunity for further research.

Users face myriad situations when learning to use artifacts in their everyday lives. There are users that need to learn how to use an interactive artifact, such as an iPhone or PC, without having much experience. There are also users that are familiar with these artifacts and are interested in learning more. There are users with strong social support networks on which they can rely if they make a mistake using the artifact. But, there are also users who do not have such a support network and need to rely entirely on their own capabilities. There are users who can leisurely explore the artifact at their own pace and users who are under an imminent deadline to understand the artifact to keep up with changing demands on their time. Each of the users in these situations may experience the same artifact differently due to these different situations. Users not only have different starting points in learning an artifact but also dramatically different conditions in which the learning takes place.

Learning to use a new interactive artifact or an old interactive artifact in a new way is a highly dynamic and intricate process, which involves the development of a relationship that forms over the long-term course of use of an artifact. This relationship must be responsive to constantly changing situations and needs. Changes that occur outside the coupling of user and artifact will be reflected in the relationship the user has with that artifact. Likewise, a particular relationship can also change the way that a user looks at the environment. For example, when users buy new cameras, they instinctively draw on prior experiences and try to integrate how the features available in these new cameras can be used in their environment in a meaningful way.

My own experience with my iPod illustrates the role this experience plays in learning to use interactive artifacts. I bought an iPod Nano in the summer of 2009. Before this, I did not have much motivation to own an iPod. However, once I was presented with the opportunity to buy it at a discounted price, it became clear that there were other potential contexts in which I could use this iPod that I could not use my CD player. I did have prior experience using both Apple products and iPods before, but I was most familiar with Windows-based interactions. Initially, this prior experience clearly defined my relationship with the iPod. I needed to negotiate between what I expected in terms of how I wanted to interact with the artifact and the way the iPod was designed to interact with me. For instance, there were well-defined procedures for ejecting the iPod before unplugging it, using the iPod only through iTunes to add new music, and altering default settings. These situations forced me to change how I interacted with the artifact and *initially* led to a rather contentious relationship. However, I was able to work through these problems and gradually realized how such an artifact might come to fulfill the expectations I had for it. Learning to use this iPod required a reorientation of my own understanding and use of the artifact. Eventually, I began to appreciate the centrality of music that iTunes afforded me without having to rely on tracking down CDs. Within my currently stable way of using the iPod, my patterns of learning crystallized into a habituated style of interaction with the artifact. Now, I do not have many problems I need to resolve with the artifact on a daily basis. But, even a slight change in the situation may motivate me enough to learn new functionalities of the artifact or new contexts in which to use it, perhaps, without even a conscious thought about why I am learning or even *that* I am learning something new.

In this example, while I gained knowledge about the operation of the iPod, there were still greater barriers in terms of my expectations. These expectations were influenced by a lifetime of Windows use and finding a way to take advantage of the possibilities afforded by the iPod. There is not a way that I, as a user, can dominate this relationship. The artifact has been designed with its own



constraints (Norman, 2002) or intentionalities (Verbeek, 2005) that force a certain pattern of interaction with an artifact in a certain inscribed way by the designer. At the same time, the interactive artifact is not defined solely by its prescriptive role, but also by its use. This relationship can be described as a process of negotiation. Once a user's needs have stabilized, they develop a ready-to-hand relationship (Winograd & Flores, 1986) with the artifact so that attention is directed towards the activity using the artifact, not the negotiation with the artifact itself.

Such a relationship as the one I had with my iPod and the role it has on learning of an artifact is central to the inquiry of this dissertation. This means, when addressing learning in interaction design, not only is *learnability* (Preece, Rogers, & Sharpe, 2007), which describes how easy an interface is to learn, important, but it is also crucial to appreciate learning as an *experience*. This learning experience describes everything that goes into shaping the internal and external factors users encounter when using artifacts including prior experiences, emotional experiences, future anticipation, context, the use situation, and so forth. Later in this dissertation, this concept for understanding the learning experience of an artifact will be conceptualized as *learning-in-use*. This concept focuses on specific aspects of the learning experience and how it unfolds, whereas the learning experience is a much broader concept.

## **Research questions**

The following questions guided my research for this dissertation.

- 1) How does a personally meaningful relationship form between user and artifact in the learning experience?
- 2) Does the learning experience change over time or stay static in relation to one's perceived ability to use an artifact?
- 3) In what ways does a user need to negotiate with their artifact? In what ways does either the user or artifact control the learning experience?

With the first research question, the nature of the personally meaningful relationship between user and artifact is explored. This question addresses the learning experience of users as well as the relationship that users have with the artifact they are learning. Experience varies based on changing external situations and changing internal motivations, needs, and desires. Furthermore, the history users go through with an artifact should also be represented in the way they feel about and experience their artifact. For example, if users spend weeks learning how to use an artifact, the time spent learning should affect the kind of relationship that user has with that artifact. In this question, the factors that influence the relationship users have with their artifact are analyzed.

With the second question, the extent to which users' relationships change over time or stay the same is explored. This question challenges the notion of learning as an activity that begins before use and ends when the user demonstrates mastery over a particular activity. This question compares changes in participants' abilities to use an interactive artifact effectively with changes in how they feel about their relationship with the artifact. This relationship can be manifested in how they talk about the artifact, how they use the artifact, and how the artifact does or does not transform their ability to do work. Also, this question distinguishes between enhancements in the learning experiences of users and improvements in users' abilities to use the artifact. For example, when users have strong relationships with artifacts but have made little objective progress in their abilities or knowledge or have made great strides in terms of their abilities and knowledge with a weak relationship, there is a clear separation between the learning experience and learning abilities or knowledge of users.

Finally, in the third question, the influence the user and the artifact each exert on the learning experience is explored. If learning to use an interactive artifact were completely transparent, would it be conducive to forming meaningful relationships? Conversely, if an artifact is more obtuse and resistant to those who use it, does this mean the artifact is less conducive to forming meaningful relationships? A balance between the amount of control both the user

and the artifact have over the learning experience is appropriate. Some aspects of using an artifact may be in the user's control, but the purpose of this question is uncovering how the total learning experience is a product of both user and artifact and how it is not.

These three research questions guide the study at the center of this dissertation. These questions are exploratory in nature and focus the inquiry on the collected data rather than being directly testable. More description about how these questions were structured into the analysis of data and what these questions answer is provided in chapter four.

### **Key terms for this dissertation**

#### *Interactive artifacts*

The term *interactive artifact* is used throughout this dissertation. This term seems to fit within the domain of interaction design, but there are many other terms interaction design researchers use for distinguishing the objects of use and design. These terms include information technology (Croon Fors, 2006; Coyne, 1995; Löwgren & Stolterman, 2004), interactive technology (Löwgren & Stolterman, 2004; Norman, 2002), user interface technology (Carroll, 2003), interactive systems (Shneiderman & Plaisant, 2005; Preece et al., 2007), prosaic or everyday technology (McCarthy & Wright, 2004; Petersen, 2002; Norman, 2002), computer technology (Winograd & Flores, 1986), domestic technology (Bell, Blythe, & Sengers, 2005; Croon Fors, 2006) embodied technologies, artifacts, and systems (Dourish, 2001; Harper, Rodden, Rogers, & Sellen, 2008), instrument systems (Rabardel & Bourmaud, 2003) and artifacts in use (Bannon & Bødker, 1990; Nelson & Stolterman, 2003; Petersen, 2002). These terms cover a broad range of concepts, yet often these authors refer to very similar ideas. In describing learning in the context of interaction design, this concept could benefit from more clarity on what *thing* is in use, how it relates to the type of learning described above, and how it is situated inside the field of interaction design.

For the purpose of this dissertation, this *thing* is conceptualized as an *interactive artifact* in favor of focusing on informational capacities, technological capacities, or systemic capacities. There are several reasons for supporting this conceptualization. First, this concept of *artifact* shifts focus away from the technology in a vacuum and towards the notion of a technology *in use*. Artifact brings the role of the human user into perspective. Conversely, when researchers describe a technology, they focus on the physical hardware and software of the thing. When researchers describe a system, they focus on some broader conception of interworking parts. This does not mean that technological and systemic aspects of an artifact are irrelevant. However, as Bannon and Bødker (1991) point out, an artifact is

an object that is used by people to perform activities. Without analyzing it in its setting, researchers are bound to overemphasize other aspects of the artifact that may not be crucial in the use setting. Thus, ... *a tool is what it is used for*. (p. 238, italics in original)

There should be a distinction made between an artifact's intended use by the designer and its actual use in a given situation. The actual function of an object may serve many different purposes and can be evaluated based on the appropriateness of the artifact for a given purpose (Hilpinen, Fall 2008). From a learning standpoint, such an *interactive artifact* is useful for something, and through some form of sense-making, users may find a way to fit various artifacts into their lives. To summarize, learning in the context of this dissertation concerns itself with artifacts whose functionality can be fit to users' needs *in use*.

Second, a perspective of artifacts associates design with use. When researchers discuss an artifact, the concept of designer or author is implied (Hilpinen, Fall 2008). This perspective restricts artifacts from those things that are naturally occurring in favor of those that are intentionally designed (Nelson & Stolterman, 2003). This perspective, though, still allows for design intention to occur from individuals as well as design teams and systems of stakeholders. From the standpoint of learning, design and use are connected through a mutual

learning cycle under the concept of artifacts (Petersen, 2002; Croon Fors, 2006). In this perspective of artifacts, the whole span of design and use are relevant in analysis from design conception to development to use to obsolescence (Cockton, 2006) as opposed to only immediate use. Therefore, in addition to being *in use*, artifacts must also be designed through an intentional process.

Finally, interactivity has been defined as “the degree to which a communication technology can create a mediated environment in which participants can communicate (one-to-one, one-to-many, and many-to-many), both synchronously and asynchronously, and participate in reciprocal message exchanges” (Kioussis, 2002, p. 372). In this definition, Kioussis (2002) defines roles for the structure of such artifacts in their ability to create a mediated environment; in the communicative context defining the history of prior, immediate, and future use of artifacts; and in the user perception of interaction from the standpoint of its responsiveness and use as a communication medium. He arrived at this definition through an exhaustive review of the literature on the concept of interactivity. This definition conforms to the role an artifact plays in the learning experience because it implies contributions from both the artifact and the user’s perception as well as from a history of experience by that user.

Within interaction design, interaction is clearly held as a paramount feature in the field (Preece et al., 2007; Löwgren & Stolterman, 2004) and as an issue of growing importance for the future of the field of design as a whole (Krippendorff, 1997). This field, in its concern with interaction, not only explores the artifacts being created and the behavior of individuals but also the interaction between some *interactive artifact* and an individual or between some *interactive artifact* and society (Harper et al., 2008). In this sense, the concept of interaction reinforces the importance of use of an artifact in addition to its design.

Furthermore, researchers do not study all forms of interactivity but, rather, specifically computational, digital, or informational forms of interactivity. While one could say a vase has interactive capacities, the vase does not interact digitally

and, consequently, is outside of the scope of typical interaction design. This is not a universal perspective<sup>1</sup>, though it is one presupposed by the majority of the field. It is for this reason that the focus of this dissertation is entirely on *interactive artifacts* only, as opposed to non-interactive artifacts. While that vase could certainly evoke powerful emotions, experiences, and relationships, and while the concepts described in this dissertation could potentially work under such contexts, they do not fall within the domain of study of interaction design.

Therefore, the concept of *interactive artifacts* appropriately covers the domain of *things* studied in this dissertation. This concept lends itself to a study of the learning experience because of its relationship to engaged practice and the role it plays in daily use. Furthermore, within this dissertation, both *artifact* and *interactive artifact* refer to the same *thing* being studied.

### *Artifact lifecycle*

The *artifact lifecycle* is also an important topic in this dissertation because of the importance of long-term implications for artifact design, use, and decline. All of these aspects of an *artifact's lifecycle* are at least implicated in this dissertation if not central to its thesis. Other similar terms used over the course of this dissertation include the lifetime of use and longitudinal aspects of artifact design and use. These all refer to the same or similar concepts about the long term evolution of the artifact's interpretation of meaning.

This term has a history in marketing literature initially focused on the relationship between artifact diffusion and sales. Day (1981) in his introduction to a special issue on the Product Lifecycle<sup>2</sup> in the *Journal of Marketing* described five phases of the *lifecycle*. First, artifacts go through an initial trajectory stage defined as when a new artifact is first introduced until when it first becomes

---

<sup>1</sup> For instance, Bauer and Tomlinson (2007) argue that designers should not presume that a technological solution is the right answer to all design problems in interaction design.

<sup>2</sup> The term artifact is substituted for product after this point, unless specifically referring to this framework.

adopted. Second, artifacts go through a stage of rapid growth where relationships with other *substitute* artifacts are altered as the new artifact replaces the substitutes. Third, the artifact evolves to a stage of maturity where peak sales of the artifact are reached. In this stage, salespeople must look for new markets because consumers have become familiar with the artifact to the point that advertisements and promotions become less influential on buying habits of consumers. Finally, the artifacts reach a state of decline for which the author suggests little work has been done to understand this state of the *lifecycle*. There is a clear correlation with the stages of this and the sociological Diffusions of Innovations model, which shows how new technology is adopted by segments of the population. While the Diffusion of Innovation model is a predictive model to describe the adoption of an *interactive artifact* over time, the Product Lifecycle Framework aims at understanding this adoption specifically from the standpoint of sales.

Recently, the *artifact lifecycle* has started to take a more prominent role in interaction design research. Researchers have begun to look at the long term consequences of design on use. Pohlmeier et al. (2009) have introduced a model to bring longitudinal factors within the domain of interaction design research. This model included aspects of anticipated experience including pre-use attitudes and prior experience, of the experience of using the artifact, of the reflective experience immediately following use, of repeated use, and of retrospective experience that includes an evaluation on whether an artifact has fulfilled the user's expectations. Other researchers in interaction design have also analyzed other time periods within the *artifact lifecycle* spectrum including Blevis (2007) and Verbeek (2005) and their focus on sustainability and reuse during artifact decline, Cockton (2006) studying the role of value and worth in design, and several authors (Bell et al., 2005; Croon Fors, 2006; Pantzar, 1997) focusing on the role of domestication of *interactive artifacts*.

This concept of *artifact lifecycle* emphasizes a need to understand not just one point in time of artifact design or use, but to understand the longitudinal

impact of a design. Traditionally, the use of the term has been to understand the evolution of a particular artifact designed for a mass consumer audience at a macro level. However, in this dissertation, this term is used at a micro level to analyze specific artifacts used by specific individuals and how these artifacts are used changes over time. Understanding any particular moment in time of the learning experience can only make sense in the context of longer term changes in the experience of an artifact and, so, these temporal aspects are crucial to the dissertation.

### **Outline of an approach to studying learning-in-use**

This dissertation is divided into seven chapters. In this first chapter, the importance of the learning experience and the relationships participants have with artifacts was introduced. Three research questions and two important terms of *interactive artifacts* and *artifact lifecycle* were introduced that guided the research undertaken in this dissertation.

In chapter two, the focus is placed on understanding learning in interaction design, specifically how it has evolved conceptually over interaction design's history. Four perspectives on learning in interaction design are reviewed. From gaps in these perspectives and from work in experiential learning, a new *experiential* perspective is described. In this chapter, the phenomenological, experience-based approach utilized in this dissertation is explained.

In chapter three, the conceptual foundation for *learning-in-use* is presented. This concept is based on educational theory, philosophy, and interaction design. The purpose of this chapter is to orient later observations of *learning-in-use* as well as to discuss how the findings of this dissertation contribute to the notion of learning in interaction design research. This chapter builds on the *experiential* perspective described in chapter two. It also distinguishes *experiential learning-in-use* from *activity-theoretic learning in use* (Bødker and Petersen, 2000), which provides some inspiration for the concept of *learning-in-use* used in this dissertation.



In chapter four, the empirical, longitudinal study design to inquire into *learning-in-use* is presented. In this study, a small group of participants were provided with artifacts including Photoshop, World of Warcraft, and an iPod Touch. These participants had at least some interest in learning to use these artifacts. Over the course of five months, participants interacted with the artifacts and were interviewed and observed based on their learning experience. The techniques used to record the user experience, the means used to address the research questions guiding the study, and the means by which the collected data were analyzed are all described in this chapter.

In chapter five, findings from the five-month study are presented. The chapter is organized based on the three research questions. Codes that were recorded from participant interviews and episodes of participant use of the three artifacts are described in detail, and at least one example of each is provided from the interview data.

In chapter six, collected data were analyzed according to two groupings of the codes. First, the codes were arranged to directly address the research questions. Each code is summarized in terms of what it was and how it contributed towards the research question. For each question, implications these codes have on *learning-in-use* were described. Second, the codes were arranged according to *four phenomena of learning-in-use* including *grasping*, *situating*, *perceiving-in-use*, and *making meaning*. These phenomena result from codes that overlap with each other in the way that they affect the personally meaningful relationship of *learning-in-use*.

In chapter seven, the argument presented throughout this dissertation that the notion of learning in interaction design must be more broadly defined is summarized. A definition of *learning-in-use* based on the theoretical and empirical work in this dissertation is presented. The two main contributions and significance of this dissertation are explained. Finally, the most important concepts for continuing this work in future studies are explored.

## Summary

This chapter introduced the need for research on the relationship that users develop and learn with *interactive artifacts* as part of their experience of using that artifact. Folk conceptions of learning conceptualize learning as the knowledge acquired or skills gained as part of learning to use an *interactive artifact*. Too often, however, these conceptions lead to snapshots of what has been learned where users either achieved a skill or not. Once a user can maintain a target error rate, then the user has achieved what they needed to achieve in this conception. As described in this chapter, this perspective misses important aspects that are just as relevant to the user's learning, such as underlying meanings of learning and use, the experience of the artifact, and the role that artifact plays in the user's life. This chapter introduced three research questions focused on understanding the development of a learning experience as it relates to aspects of learned abilities, as it evolves over time, and as it relates to the motivation a user has for using an *interactive artifact*. Two important terms, *interactive artifacts* and *artifact lifecycle*, were introduced as key terms used in this dissertation. This chapter has highlighted an opportunity to understand learning in a new way. The rest of this dissertation is meant to address this topic and expand on older conceptions of learning in interaction design.



## Chapter 2. Theoretical Perspectives of Learning in Interaction Design

Looking at learning from a new perspective first requires uncovering previous ways of understanding learning within interaction design. Four perspectives have been used to understand how users learn to use *interactive artifacts* including the *cognitivist*, *representational*, *constructivist*, and *situated* perspectives. Research on learning in other disciplines offers a fifth, the *experiential* perspective. This perspective offers another valid way to analyze learning in interaction design and has been an important approach to research in education theory and interaction design, but has yet to be used to study learning to use *interactive artifacts*. The *experiential* perspective was the perspective used in this dissertation. In addition to clarifying the research performed from each of these perspectives, this chapter expands the description of the learning experience alluded to in chapter one.

Learning to use *interactive artifacts* has been studied in interaction design from the very beginning. This focus on learning has not been unified under any single, common perspective, but has been loosely organized around different methodological and philosophical orientations. These different research perspectives focus on different aspects of learning and reveal different factors that may be important to address in design.

Each perspective puts forward at least one preferred methodology for addressing problems that emerge in research. The *cognitivist* perspective utilizes

an experimental approach built upon the Information-Processing Model where learning is based upon inputs for the user about a situation and the output performed by that user. The *representational* perspective describes a collection of different, but related methodologies including experimental, semiotic, and heuristic evaluation with a focus on the system and how it presents and represents itself to users in tasks. The *constructivist* perspective relies on experimental, research through design, and in situ methods focusing on how users make sense of artifacts to accomplish various tasks. The methodology most commonly employed within the *situated* perspective has utilized in situ studies, often from an activity-theoretic perspective, to analyze the way users adapt artifacts to fit their needs in a changing situation. The proposed methodology for an *experiential* perspective is in situ and uses phenomenological methods. These methods identify how artifacts are personally meaningful in their use, how such artifacts alter use, and how users of those artifacts are transformed by a changing environment over the *lifecycle* of an artifact. In Table 2.1, these different perspectives are compared and contrasted.

Table 2.1

Differences of Major Learning Perspectives in Interaction Design Based on Questions Asked, Methods Used, and Main Goals

Perspectives	Examples	Questions	Methods	Short Description
Cognitivist	<ul style="list-style-type: none"> <li>• GOMS</li> <li>• Information Processing</li> </ul>	<p>How is new knowledge formed about an artifact?</p> <p>How much new information can a learner store at one time?</p>	<p>Mostly quantitative experimentation</p>	<p>Researchers focus on how knowledge is created from information in the environment; and how it is encoded, stored, and retrieved.</p>
Representational	<ul style="list-style-type: none"> <li>• Metaphors and Semiotics</li> <li>• Affordance Theory</li> </ul>	<p>How does an artifact communicate its use?</p> <p>How well can an</p>	<p>Mostly quantitative experimentation, but also research through</p>	<p>Researchers consider how a representation exerts itself in the meaning making process.</p>

	<ul style="list-style-type: none"> <li>• External Cognition</li> </ul>	interface relieve the burden of learning?	design	
Constructivist	<ul style="list-style-type: none"> <li>• Active Learning</li> </ul>	How do learners learn an artifact when freed from the constraints of a controlled experiment? What aspects of an interface interfere with how learners try to learn?	Mixed qualitative and quantitative methods using experimentation, research through design, and in situ field studies	Researchers analyze the process of meaning making beyond knowledge gained from learning, but includes analysis of <i>how</i> that knowledge and meaning are gained.
Situated	<ul style="list-style-type: none"> <li>• Learning in use</li> <li>• Design in use</li> <li>• Appropriation</li> </ul>	How do cultural, political, spatial, and temporal aspects of a situation affect learning? In what ways do learners try to change the learning situation?	Mostly qualitative methods using field studies	Researchers look at how the situation and context act as resources in the learning process. This perspective builds on <i>constructivist</i> perspective.
Experiential	<ul style="list-style-type: none"> <li>• Learning-in-Use</li> </ul>	How do different systems of meaning interact to reveal an experience to a learner of an artifact? How do users' systems of meanings evolve over time?	Mostly qualitative fields studies with phenomenological aspects; can also include quantitative aspects	Researchers focus on learning experience and formation of intentional relationships through learning. This perspective builds on both the <i>constructivist</i> and <i>situated</i> perspectives.

As Harrison, Tater, and Sengers (2007) argue, these perspectives can coexist based on the type of problems they identify and the approach each perspective takes towards addressing these problems. For these perspectives to coexist, researchers from different paradigms must respect the methodological differences between different perspectives. These categories are not meant to show a linear progression of ideas where a new perspective replaces a previous one, but rather to demonstrate how these different perspectives can build a more complete understanding of learning to use *interactive artifacts* together. In this sense, the five perspectives each provide a meaningful domain in which to research learning in interaction design and still provide room for research into other, equally valid questions.

Finally, even though various authors may be listed in one subsection, this does not preclude that author from participating in multiple perspectives. Even within one text, an author may be participating in multiple perspectives simultaneously. For instance, Norman's (2002) work can be perceived as participating in many of these different perspectives as his argument is supported by empirical research, personal experience, and design critique. These categories are a way of organizing and analyzing contributions made to study learning to use *interactive artifacts*.

Great strides have been made so far to understand how users learn to *use interactive artifacts* for work, play, or everyday life. Still, much room remains to conceptualize and study this process. Starting with a view of learning as the flow of information into a system, conceptualizations of this process evolved to incorporate new problems and ways of looking at such learning. It incorporated the *representational* approach into what artifacts meant, the *constructivist* approach into how users made meaning of the artifacts they used, and the *situated* approach that described how that use was situated into various contexts of use. The next step should be to incorporate the notion of experience into the view of learning to use *interactive artifacts*. This allows researchers to analyze how the user's perception of an artifact, the designed features of that artifact, and the

environment in which that artifact is used all co-shape the meaning of using that artifact for a particular user. The *experiential* approach opens a variety of new perspectives into the problem of learning to use *interactive artifacts* and also reconfigures how designers might design for such use situations.

### **Cognitive perspective in learning to use interactive artifacts**

The first perspective of interest for learning to use *interactive artifacts* is the *cognitivist* perspective. The *cognitivist* perspective describes a body of research that focuses on aspects of learning to use artifacts with regards to the relationship between external stimuli and internal knowledge construction. Learning from a cognitivist perspective is described as being intrinsically tied to memory and knowledge structures (Johnson-Laird, 1988). While there may be some argument for linking this cognitivist perspective strictly to the Information-Processing Model of cognition, this does not necessarily need to be the case. Russell (1996) describes a categorization of different phases of learning based on how students cognitively process an email package as part of a class. Overall, though, this perspective can be described through its focus on how the mind encodes, stores, and performs the knowledge that it accumulates across many contexts. Information-Processing Models that have been used to study the learning required to use *interactive artifacts* include GOMS (Card, Moran, & Newell, 1983; John, 2003) and cognitive load theory (Chandler & Sweller, 1999). Several models attempt to isolate processes of learning within the brain including transfer between domains of *interactive artifacts* (Choi & Sato, 2008; Benyon, Turner, & Turner, 2005; Shneiderman, 1983) and stages of cognitive development towards learning *interactive artifacts* in attitude and literacy (Russell, 1996).

Given the focus on knowledge storage and use from the *cognitivist* perspective, the research in this perspective for learning to use *interactive artifacts* privileges issues of knowledge storage and use, memory, attention, cognitive capacity, information structure and information flow. From a learning standpoint, questions of how learning occurs (Shneiderman, 1983), how new



knowledge is formed and how it relates to information that has been presented (Choi & Sato, 2008; Kintsch, 1992), how much new information a learner can process in a given timeframe (Chandler & Sweller, 1999), how a system model relates to a user's model (Norman, 2002; Kay & Thomas, 1995) and so forth represent the domain of answerable questions. Such questions presuppose the user as the agent of learning. They presuppose that the focus of studying learning is through the user's response to stimuli in the world.

The methodology of such a *cognitivist* perspective generally relies on a quantitative approach to measuring a metric of some aspect of a user's mental constitution. This metric may be information (Chandler & Sweller, 1999); goals, operators, methods, and selection rules (Card et al., 1983; John, 1995; John, 2003); knowledge and misunderstandings (Choi & Sato, 2008); and so forth. Using these metrics, authors have relied on experimental methods including user modeling (Card et al., 1983; John, 1995; John, 2003; Choi & Sato, 2008; Shneiderman, 1983), secondary task response time (Chandler & Sweller, 1999), survey methods (Choi & Sato, 2008), and long term use logging (Kay & Thomas, 1995). In addition to these quantitative studies, Russell (1996) has contributed a qualitative analysis of student's learning in using email services through textual analysis of emails sent to other nonparticipants of the study and metacognitive emails sent directly to the researcher by students reflecting on the experience. These diverse methods demonstrate the standards by which questions within a *cognitivist* perspective are to be answered. Although strictly quantitative results are not required for a *cognitivist* perspective, questions asked within such a perspective generally require understanding problems through a series of well-defined metrics. Such metrics usually are understood most effectively in this perspective within a quantitative context. Answers to such questions require an ordering of questions on how processes unfold over time; how mental structures relate to and rely upon each other; and how stimuli from the world are encoded, processed, and are transformed into user action.

These cognitive theories provide a perspective on the mind in a learning process, but at the expense of fully exploring exogenous factors that deeply influence the learning experience. Such exogenous factors include the task and interface to be learned, the use situation, and the cultural meanings underlying such learning experiences.

### **Representational perspective in learning to use interactive artifacts**

A *representational* perspective focuses on the communicative capacity of an artifact and how that communication relates to learning. This perspective removes some of the workload of learning from the user onto the object being learned. This perspective focuses on the analogical capacities of an *interactive artifact*, and how such capacities relieve the burden of learning something novel (Carroll & Mack, 1999; Cooper, Reimann, & Cronin, 2007; Preece et al., 1994). The focus, then, for a *representational* perspective is in resolving what an *interactive artifact* or some aspect of an artifact represents and relating that representation in some way to its use and functionality. Several examples of this *representational* perspective include the use of metaphor (Carroll & Mack, 1999; Cooper et al., 2007; Coyne, 1995; de Sousa, 2005) or semiotics in general (de Sousa, 2005), external cognition (Scaife & Rogers, 1996), and affordances (Norman, 2002).

One of the most prominent examples of this perspective in interaction design is the use of metaphor. Metaphors make reference to familiar material for a learner to make less familiar material more clearly understandable. Coyne (1995) describes the notion of metaphors as a reaction to the information processing paradigm. In evaluating the metaphor of a pencil cursor on a computer screen, he states, “When we use a physical pencil [for example], we do not so much control the pencil as make use of a tacit understanding, or familiarity, with the tool with a context of skilled practices” (Coyne, 1995, pp. 285-286). Here the metaphor of the pencil in a cursor does not sufficiently tap into the tacit knowledge present when an individual uses a real pencil to aid in the process of understanding how to

operate the cursor. This metaphor, though, promotes other understandings and uses through the system. One power of design, then, is in shaping such metaphors to promote the kinds of relationships and perspectives designers intend to promote. Carroll and Mack (1999) also review the notion of metaphor in interaction design categorizing them in terms of operational, structural, and active learning theories of metaphor. Operational theories of metaphor work to provide a model for the learner as they first approach a new system, but do not provide any explanation as to why the metaphors succeed or fail. Structural theories of metaphor attempt to explain specific successful metaphors on the basis of their mapping between a well-known domain to the learner and a novel domain. While such mappings explain metaphors that have worked in the past, they do not always explain other successful metaphors that do *not* follow this model. An active learning theory of metaphor would be discovered in use by a learner through abduction and adduction, where, in abduction, learners generate hypotheses on limited information about a metaphor and, in adduction, users test those hypotheses within that limited context. These various descriptions of metaphor show an emphasis on the capacity of an artifact to convey some meaning. However, with Carroll and Mack's (1999) critique of metaphor, researchers are beginning to transition toward new realms of meaning making—specifically, active learning, which is described in the next subsection.

With this perspective's focus on representation, problems that deal with the appropriateness of a given task and the relation between a representation and some functional use are favored. de Sousa (2005) studies artifacts from a semiotic approach and raises questions, such as how communication from a designer occurs through design, how that communication becomes meaningful for users, and how the signification system in the design influences how users either learn or fail to learn an artifact through communication breakdowns. Within an affordance-based perspective, authors such as Norman (2002) focus on the dual relationship of affordances and constraints towards learning how to grasp and apply an artifact and the extent to which such an artifact can be applied to a task.

Such a focus on affordances and constraints influences the generation of problems, such as what types of situations actually requires formal learning. In his book, Norman (2002, p.79) provides a chart distinguishing situations that require formal learning from ones that do not require formal learning. These situations are distinguished by situations where users can rely on affordances and constraints in the environment with no formal learning and by formal situations where the user must learn some symbol or sequence. Scaife and Rogers (1996) describe learning through the notion of external cognition. They describe three processes including computational offloading, re-representation, and graphical constraining. These are three outcomes of the process of use, and each of these rely on artifacts to transform cognitive processing by using the physical environment as a malleable resource to change how a user sees a problem or task in learning to use an *interactive artifact*. Problems addressed by this perspective could include how users can make perceptual inferences through the structure of a graphical representation that can aid understanding of a diagram, how human memory and graphical representations are related<sup>3</sup>, and how can such a representation can be used for easing the burden for completion of a task. Finally, researchers of metaphor theory also contribute their own questions. These include what kind of perspectives an artifact implies through its use (Coyne, 1995), what types of learning goals might designers communicate through metaphor in an *interactive artifact* (de Sousa, 2005), and how might designers leverage what is intuitive about a metaphor rather than relying on something that must be memorized (Cooper et al., 2007). Researchers within the *representational* perspective share a focus on the artifact, the representation, and the environment and, then, think how such *things* are meaningful for those who use them. The perspective implies that if designers can improve the artifact, they can improve the learning that can be performed through such artifacts.

---

<sup>3</sup> Scaife and Rogers (1996) make the statement that graphical representation and memory are not isomorphic. This means that the structures of both graphical representation and memory are different, and researchers cannot assume that the picture that an individual sees appears the same way in our brains.

A *representational* perspective replaces experimental results that focus on user behavior and perception with a focus on the artifact itself. First, the analytical methods seeking to understand the artifact include semiotic methods, which attempts to understand what and how meanings are communicated through an artifact; design-based methods (Norman, 2002), which attempts to understand how designed artifacts fit certain niches and functions or how a certain design could lend itself towards a certain task or communication; and structural methods—described in Carroll and Mack, 1999, though they do not espouse this particular method, which attempts to relate how the structure of representations within artifacts constitute their possible meanings. These approaches can begin to express not just mental processes, but the relationship between user and artifact, such as how such artifacts communicate with users. More progressive researchers have tried to incorporate perspectives of users and how the meanings represented within these artifacts interact with user's systems of meaning. Such approaches include traditional experimental methods (Carroll & Mack, 1999; Scaife & Rogers, 1996) as well as longer term field studies to realize how users make meaning. Such studies, though, start to transition into the next perspective of *constructivism*.

This perspective orients researchers to attend to designed aspects of an artifact, what it communicates, and the relation between what it communicates and what it does. This perspective allows researchers to focus on designers' intention for an object and how best to convey that intent to users, but falls short of understanding exactly how such an artifact has meaning to a user. As is demonstrated by the work of Carroll and Mack (1999), the problem of learning includes both the artifact itself as well as how the user makes meaning of what they use. This meaning making process is not an instantaneous or even linear process, but unfolds through a user's active engagement. These perspectives focus on the dynamics of use rather than static properties of the mind (e.g., *cognitivist* perspective) or the artifact (e.g., *representational* perspective).

## **Constructivist perspective in learning to use interactive artifacts**

The *constructivist* perspective addresses the process of meaning making in learning. This meaning is in part both composed of a user's response to a given situation and the properties of an artifact, but it is also more than either of these two components in composition. While meaning evolves from learning while using the artifact, it can be used to associate functionality with how one uses a particular artifact, to establish causal relations between expectations and the use of a system, and to enact an understanding about an artifact. Dewey, who provided a foundation for the *constructivist* perspective within education theory, argued for this perspective in reaction to both the logical positivist and the progressive movement within education (Dewey, 1938).

Two early pioneers in this constructivist perspective in the field of information technology were Seymour Papert and Alan Kay. Papert (1980) attempted to actualize this perspective in the learning theory known as constructionism. Papert (1980) put learners in situations where they were not only responsible for constructing an understanding about an artifact, but were actually active agents within that artifact's construction. Papert (1980) argues that children using such *interactive artifacts* are, "held back... [by] a model of learning in which you have either 'got it' or 'got it wrong'" (p. 23). He sees the computer as an artifact that fills this role in transitioning adolescent thinkers into adult thinkers by how it forces users to be active inquirers. Kay and Goldberg (1977) describe much the same phenomenon with the introduction of the Dynabook that is meant to guide users into creative and imaginative potentials by providing a library of primary elements with which to make meaning and not simply to aid knowledge retention about the artifact. The artifact was a vessel for learning, not an end in itself.

Carroll (1990), along with other researchers, began to label this general idea as active learning embodying this *constructivist* perspective. Users engaged in active learning, "typically created and responded to their own agenda of goals

and concerns, not to the careful ordering of steps in a training program” (Carroll, 1990, p. 26). They intended active learning to pair with the concept of minimalist instruction, which supported active learning by starting new users on meaningful tasks, reducing reading and maximizing activity, and making errors and error recovery as straightforward and productive as possible. This notion of active learning has been adopted by other researchers who have studied the process of learning to use *interactive artifacts* as well (Preece et al., 1994; Soloway, Guzdial, & Hay, 1994; Weidenbeck & Zila, 1997). “Learning by doing” characterized this *constructivist* perspective (Carroll, 1990; Kay, 1990; Rogers et al., 2002; Soloway et al., 1994).

The key problems within a *constructivist* perspective relate to how users make their own meanings for the artifacts they learn, rather than starting with what meanings the designers envisioned. Whereas the *cognitivist* and *representational* perspectives are both usually static notions with no sense of change over time, the *constructivist* perspective of the meaning making process constantly changes. Soloway et al. (1994) identify the important aspects of the *constructivist* perspective through the concept of learner-centered design. This concept supported learners’ continual development of understanding about an artifact, the evolution of learners’ motivations, the adaptation of an artifact to a user’s perspectives, and the adaptation of a user to changing artifacts. For Carroll (1990), the core of understanding learning to use artifacts is to understand the user sense-making process. This includes questioning what types of expectations users have as they use an artifact; how well users follow directions, and how such directions match users’ expectations; and what errors, manuals, and the use situation mean to a user. In this sense, Carroll (1990) argues that a user’s “whole experience begins to matter” (p. 90) and not just a set of predefined objectives that users do or do not follow as they learn an *interactive artifact*. Carroll and Carrithers (1984) analyze seven common factors in computer applications to which it is difficult for new users to associate meaning. Through these factors, they come up with the notion of a training wheels support system by which to

guide users in learning a new interface. They ask questions about how much time participants actually spend on a task, how much of the task they can accomplish, how long it takes to accomplish a task, and how many errors users make through misunderstanding what an artifact means, in addition to questions of a more *cognitivist* and *representational* perspective. Finally, Mack et al. (1983) raise questions in their work around what knowledge and prior experience people have and need as they use an artifact, how users interpret a use situation, how well users rely on and interpret resources within an interface (e.g., training directions, help system, and the interface itself), and what sorts of expectations users have about what an interface will be like. Researchers within a *constructivist* perspective shift the focus of learning towards a much broader notion of either user or artifact by focusing on issues of how the properties of an artifact are interpreted. These new types of questions necessarily lend themselves to less strictly controlled studies that allow learning to be observed in a more holistic way.

Two main approaches have been used to understand learning to use *interactive artifacts* from a *constructivist perspective*: research through design approaches and empirical studies. From a design perspective, several researchers have built installations that analyze users' exploration through a ubiquitous environment through active learning. These environments include a game where children discovered the nature of a fictional creature called the Snark (Rogers et al., 2002), an augmented forest meant to support students in learning scientific methods through exploration called Ambient Wood<sup>4</sup> as part of a classroom project setting (Rogers et al., 2004), and the home health horoscope setup within participant's homes (Gaver, Sengers, Kerridge, Kaye, & Bowers, 2007). The goal of the Snark game was to create "new experiences for children that move beyond the existing genres" (Rogers et al., 2002, p. 374). This means that such a project explores how users make meaning of something they have never seen before.

---

<sup>4</sup> This matches the Piagetian argument that education should be a resource that guides students in their progress of becoming "little scientists" (Piaget, 1952).



Other questions asked by this study included how users explored the environment as well as how users explained what was happening. The Ambient Wood explored how different modes of interaction (e.g., student initiated, environment initiated, and a hybrid between the two modes) led to different findings about the environment. Finally, Gaver et al. (2007) purposefully designed a ubiquitous home system that displayed ambiguous outputs to encourage unique interpretation of these outputs by users. In designing the health horoscope, Gaver et al. (2007) explicitly ask questions, such as “[h]ow is it possible... to build systems that *sense and interact with people in a meaningful way* in the home” and “[h]ow can technology support *reflection, address emotions, and promote wellbeing* in the home” (p. 537, italics in original)? These questions focus on how personal meaning is made, how users organize their interaction with novel artifacts, and how users organize their knowledge and available resources to make sense of a given artifact.

From an empirical point of view, understanding learning within this perspective requires observing the meaning making process as it happens. This includes understanding what users do in the process of learning, and more importantly learning why users act the way they do, what they expect to happen, and what goals they are working toward as they develop an understanding about the artifact they are learning. Methodologically, this means researchers must make concessions towards the natural situation of learning as it unfolds in learning to use an *interactive artifact* by loosening some of the requirements from a purely experimental setting. Both quantitative and qualitative methods have been used to understand how this learning unfolds. The work summarized by Carroll (1990); Mack, Lewis, and Carroll (1983); Carroll (1985); and Carroll and Carrithers (1984) all used an experimental setting to elicit this learning situation, but also ensured that users had adequate time to learn the system. For example, Carroll et al. (1985) observed participants learning to use a word processing system by hiring temps for up to four half-day sessions. These tests would often separate users into experimental and control groups recording metrics, such as time on

task, percentage of task completion, time spent typing, time spent training, and time spent recovering from errors (Carroll & Carrithers, 1984). They also recorded time spent in transferring learned skills to other novel situations; whether participants successfully completed, unsuccessfully completed, or omitted tasks; and, finally, the time focused on task as opposed to on manuals or other help materials (Carroll et al., 1985). In addition, they also observed individual differences within the ways participants approached tasks on the word processor (Carroll & Carrithers, 1984) and characteristics of the learning process (Mack et al., 1983). Wiedenbeck and Zila (1997) used an experimental method to explore whether learners “can effectively direct their own practice, and [whether] learners need to have some minimal background to ... take advantage of a minimalist training approach” (p. 171)? Their quantitative study looked at average training time for an exercise task provided by the researcher, an exploration task by the participant, and a combined task where participants did both. This study also looked at a near-transfer task and far-transfer task based on their training, which tests a familiar task and an unfamiliar task from the training respectively. Wiedenbeck and Zila (1997) tested participants on these tasks who had either low levels of background experience with computers or high levels of experience, which was measured through a questionnaire given before the study. While the studies by Carroll (1990) and others focused on a longer term study of learning, this was a much shorter term study.

While these studies focus on users and their meanings through expectations, background experiences, motivations, and goals, it became clear at the end of the twentieth century that the learning that goes on is not just a process of meaning making that occurs isolated in time and space, but is one that is situated within a lived context of an individual. Experimental studies, such as Carroll et al. (1985) and Wiedenbeck and Zila (1997), may show how learning can unfold when a user has consciously decided to train on an unfamiliar artifact, but it does not say much about how such training is situated within the lives of these users at large nor does it describe how or why users would choose to engage

in learning such an artifact in the first place. Many of these studies start with the assumption that users are learning the software as part of a work context, and these users need to learn these artifacts to effectively perform their jobs. Grudin (2005) described this assumption as a non-discretionary task that defined research agendas in the 1980s and early 1990s. Lately, though, there has been a movement within the field of interaction design to study non-discretionary tasks, such as entertainment and personal productivity, where motivation revolves around an individual's needs and desires and not necessarily those provided by an employer. This requires looking beyond the immediate situation for other contextual clues.

### **Situated perspective in learning to use interactive artifacts**

The *situated* perspective does not stand in opposition to a *constructivist* perspective, but instead enhances the *constructivist* perspective of learning to use *interactive artifacts* by looking at the context in which learning and use takes place. This means that while the *situated* perspective is *constructivist*, the *constructivist* perspective is not necessarily *situated*. As the *constructivist* perspective focuses on the act of exploration and active learning, a *situated* perspective also argues that such knowledge and learning can only develop through activity rather than “abstract, self-contained entities” (Brown, Collins, & Duguid, 1989). Furthermore, this perspective entails that the situation and context inherently matter for affecting this process. Researchers should understand the use situation as part of any observations of learning they make. In describing learning tools, Brown et al. (1989) describe this role of situation stating, “[tools] can only be fully understood through use, and using them entails both changing the user's view of the world and adopting the belief system of the culture in which they are used” (p. 33). Later, in describing authentic activities that are learned, they describe how

[the] activities of a domain are framed by its culture. Their meaning and purpose are socially constructed among members present and past... These coherent, meaningful, and purposeful activities are authentic, according to the term we use here... In the creation of classroom tasks, apparently peripheral features of

authentic tasks—like the extralinguistic supports involved in the interpretation of communication—are often dismissed as ‘noise’ from which salient features can be abstracted for the purpose of teaching. But the context of activity is an extraordinarily complex network from which practitioners draw essential support. (Brown et al., 1989, p. 34, italics in original)

These statements imply two things. First, *interactive artifacts* that are in use, sharing many features with the tools described above, are imbued with much of their meaning from the culture in which they are used; within these cultures, such *interactive artifacts* make sense in a certain way. Second, these *interactive artifacts* are used and make sense only within authentic tasks and activities circumscribed by that culture. Such activities exist within a culture and context at large. When the culture, the context, the use situation changes in any way, the meanings users derive from the *interactive artifact* will necessarily change.

Within interaction design, Bannon and Bødker (1991) argue that the problems of understanding, learning, or knowledge and cognition with respect to an artifact begin with describing and observing the use situation. While an active learning perspective does take such a use situation into account, it does not consider the developmental aspects of a particular user, nor does it take into account social, physical, or cultural contexts that affect the way users learn to use an *interactive artifact*. Bannon and Bødker (1991) criticize ecological gaps<sup>5</sup> that occur as a result of studying users only within a laboratory setting. They claim this setting omits certain important factors, which can affect both the outcome and the process of learning. They seek to reorient learning to use *interactive artifacts* around the notion of praxis. To do this, they seek to rely on a model of praxis known as activity theory.

Building from this activity-theoretic framework, Bødker and Petersen (2000) have developed the concept of learning in use. This concept contrasts with the notion of active learning because while active learning focused solely on

---

<sup>5</sup> Ecological gaps are just one of the types of gaps that Bannon and Bødker (1991) identify including user task, problem formulation, and work-context gaps.

putting the user in charge of determining what actions to take, *learning in use* situates an artifact within a user's actual life situation. *Learning in use* is not refusing the efficacy of active learning, but it takes a step back in analyzing the learning process, focusing on how learning is situated within a life situation that structures the use of an artifact. The *learning in use* perspective holds that learning is dynamic and is in a constant state of transformation. Bødker and Petersen (2000) state that designing for *learning in use*, "is a matter of understanding and developing use, also when a computer-based artifact has been taken over by users" (p. 61). Petersen (2002) extends this work and the activity theoretic work of Engström's (1987) "where to, why, how, and what artifacts" and Bardram's and Bertelsen's (1995) study of the learnable artifact<sup>6</sup>. She focuses on understanding how users establish an initial familiarity with an artifact in terms of previous uses, how learning helps develop new possibilities of use, and finally how users' operationalize actions through the learning process based on their individual goals. *Learning in use* comprehensively analyzes learning situations by embracing the complexity of the situation surrounding the user, and how such learning is fit into users' daily activities and not as a separate entity (Bardram and Bertelsen, 1995).

Within the *situated* perspective, certain key problems take precedence over others. These problem areas emphasize the situation within which users use *interactive artifacts* and draw resources to solve everyday problems. Brodersen and Kristensen (2004) describe the problem of interaction through *negotiation*. They describe *negotiation* as a way, "to identify and focus on the dynamic development of needs and understandings represented at different stages of a use situation" (p. 259). The contribution of this concept to the *situated* perspective centers on the role context plays in relation to individual interactions especially during times of breakdown. Rabardel and Bourmaud (2003) describe how

---

<sup>6</sup> Bardram's and Bertelsen's (1995) own study of the learnable artifact is based on another figure influential in activity theory, Lev Vygotsky (1978), and his study of the zone of proximal development.

situations of use can share similarities based on activity family resemblances, which in turn are based on domains of professional activity. Such resemblances and relationships help influence a user's choice among a variety of different utilization schemes for *interactive artifacts*. Notice the difference in both questions and findings of the *cognitivist* model describing the transfer of knowledge between different domains by Choi and Sato (2008) and the use of family resemblances to activate different utilization schemes by Rabardel and Bourmaud (2003). Both deal with very similar topics, but use very different approaches. Each of these approaches provides unique insights on the idea of using different, but similar artifacts and leveraging prior knowledge gained for that use.

Masino and Zamarian (2003), Folcher (2003), and Wakkary and Maestri (2007) have all investigated the relationship of artifact use, the use situation, and appropriation. Folcher (2003) describes the distinction between design-for-use and design-in-use. Design-for-use is the design created by the designer for an artifact that is useful *as is*, whereas design-in-use is the appropriation users make to fit such designs to their own needs. Masino and Zamarian (2003) compare the various decisions individuals make on whether to adopt and use artifacts based on changing needs and availabilities as well as decisions made during the design process.

Finally, researchers in *learning on use* (Bødker & Petersen, 2000; Kjær, Madsen, & Petersen, 2000; Petersen, 2002; Petersen, Madsen, & Kjær, 2002) look at the process of learning not just described by the final product of an experienced user's use, but rather as dynamic and formed over a lifetime of use. They describe learning as affected by the motivation that drives the learning; by play, innovation, and creativity; and as something that is engaged with everyday (Petersen, 2002).

Methodologically, the *situated* perspective generally relies more on observation and qualitative analysis. Researchers within a *situated* perspective

rely on qualitative methods because of the largely indescribable nature of context and learning situations. Researchers in the situated perspective can observe countless cases and examples of how a variety of different users learn to use an *interactive artifact* in different situations, and they could never account for all possible situations. Situations, by their very nature, are constantly changing. Even when researchers use descriptors for certain common situations (e.g., Rabardel & Bourmaud 2003), these descriptors are only approximations that aid analysis and observation. Real situations are always subtly different from each other. As described above, much of the scholarly work from a *situated* perspective on learning to use *interactive artifacts* relies on activity theory to structure analysis of their qualitative observations, though not all. Researchers in these studies used many methods for data collection even among those who shared an activity-theoretic approach. Folcher (2003) used dialog analysis of a call center hotline using a knowledge database system to help answer customer's questions. The main analytical feature of this observation was to highlight the co-construction (e.g., the design-for-use and design-in-use of the knowledge database) of the system by both developer and call center expert. Rabardel and Bourmaud (2003) and Petersen (2002) both use observation of work and home environments respectively, though there is a key difference in the time frame of their approaches. Each article focused on separate aspects along the same spectrum of activity-theoretic perspectives where Rabardel and Bourmaud (2003) analyzed when, where, and how artifacts acted as mediators between users and instruments systems and Petersen (2002) focused on learnable artifacts. Outside of this activity-theoretic perspective, Broadersen and Kristensen (2004) used design prototyping and usability to explore the way users negotiate interaction across different types of novel interfaces, while Masino and Zamarian (2003) and Wakkary and Maestri (2007) used observation to understand the situation in which users use artifacts and to understand the ways in which these use situations influence design appropriations. While these approaches cannot capture all aspects of a particular learning situation with artifacts, they do act as lenses within

the problem of learning under a *situated* perspective. Each of these perspectives contributes towards a deeper understanding of the illusive notion of situated learning to use *interactive artifacts*.

The *situated* perspective sacrifices the reliability of controlled experiments in understanding the process of learning to gain access to understanding and observing the complexity of the situation and context. This complexity gives the *situated* perspective a richer understanding of how people learn, why people choose to learn, and what factors influence that learning, even though it requires more interpretation. While changing methods could help one observe other aspects of learning from a *cognitivist*, *representational*, or *constructivist*, there is yet another way to understand the act of meaning making from an *experiential* perspective.

### **Experiential perspective in learning to use interactive artifacts**

The *experiential* perspective addresses many similar problems toward meaning making also addressed by these previous two perspectives, but focuses on aspects that pertain specifically to the learning experience. This perspective gives priority to the relationship developed over an artifact's lifecycle when analyzing this learning. For example, whereas researchers within a *constructivist* perspective focus on problems of errors in meaning making (Preece et al., 1994; Carroll, 1990), researchers under an *experiential* perspective seek to understand how the user's inappropriate understanding reinforces itself through use over time, how an error is revealed to a user through use, and how such erroneous beliefs interact with other beliefs held by the user. An *experiential* perspective acknowledges that a user may hold inconsistent beliefs about a particular artifact, and, over time, such systems of beliefs may change. Whereas a *situated* perspective focuses on the primacy of the situation and an artifact being *in use* (Bannon & Bødker, 1991; Bødker & Petersen, 2000), an *experiential* perspective focuses on how experience extends beyond immediate use to the vicarious experience through others' use, to experience with previous versions of an



artifact, to use of an artifact in a different context, and to imagining the possibilities of an artifact. Through this variation, one's own experience of an artifact immediately becomes personal, individualized, and unique. For example, if researchers seek to learn about how users make sense of a new video game, they must consider users whose individual experiences include a variety of different perspectives. Users may have played many games of various genres or only one genre before. Users may have played many games, few games, or none. Users may have played other versions of a game already or never have heard of the game before. Each of these prior experiences would probably contribute to different attitudes these users have before they play this game. Differing attitudes can fundamentally change how learning can occur just as much as the situation can. Finally, both *constructivist* and *situated* perspective mention the importance of goals, motivations, and expectations (Carroll, 1990; Petersen, 2002; Masino & Zamarian, 2003; Soloway et al., 1994). However, most treat them as exogenous factors to the learning experience as it occurs. The *experiential* perspective treats these as factors that are just as likely to change the learning experience as they are to be changed by the learning experience.

Assumptions of the *experiential* perspective are established by the notion of *intentionality*. The term *intentionality* defines the directedness that an entity has towards some other entity in the world (Dourish, 2001; Verbeek, 2005; Ihde, 1990). For instance, within the context of this dissertation, there are many intentionalities interacting in complex ways. Both readers and author of this dissertation have intentionalities based upon prior experiences and current needs toward its content. Either intentionality can be altered by changes in the situation while interacting with this dissertation, by changes in experiences both supporting and contradicting these arguments, or by changes in the media through which this content is presented. How the content resonates with the experience of the reader, the emotional experience of the content by the reader, and even how easy it is to understand can all change as a result of alterations in these intentionalities.

Intentionality defines a relationship between two entities. Dourish (2001) has interpreted this to describe the meaning between these two entities. Dourish (2001) describes this relationship by tracing the term back through its philosophical roots. He describes two types of intentionality: original and derived. For original intentionality, he draws on the philosophy of Franz Brentano describing how conscious creatures create intentional references to other things and make meaning about something. For derived intentionality, Dourish (2001) describes the intentional relationship created through an act of interpretation. Thus, for original intentionality, the meaning is created by an individual and, for derived intentionality, someone else's meaning is interpreted by that individual. These two forms of intentionality serve as latent structures that organize individuals' engagement with other entities in the world. He pulls from, among others, Daniel Dennett who describes all intentionality as derived. Dennett (1971) describes three stances of beliefs an individual might have. The first is a *design stance*, which occurs when individuals can predict exactly how a design works based on its design, a *physical stance*, which occurs when individuals can deduce from natural laws how a situation might work out, and a (derived) *intentional stance*, which occurs when individuals can ascribe certain information and goals to a system and make judgments based on this belief. He uses this construction to describe entities as having systems of intentions that are appropriate to the environment, imperfectly rational, and accessible through empirical means. Furthermore, he opens up the possibility for making mistaken beliefs, forgetfulness, and the projection of beliefs on a variety of situations by an agent (e.g., what would I believe if I were in that situation). Through interpretation, such intentional systems can influence an entities' understanding of a situation and experience of that situation.

The concept of intentionality has been extended to understand individuals having experiences and what they experience. These contributions have been termed noema—what is experienced—and noesis—how an experience is experienced—by Ihde (1986). Ihde (1986) explores how any experience can

contain myriad topographical possibilities. This means if we look at a problem from another perspective, we change the noesis and how the object is experienced. Furthermore, even while an object stays the same, the noema, which consists of the experiences of that object, can still change. A simple example of this is when we circle around a chair. As we change our angle to the chair, the noesis changes due to the changing perspective and the noema changes due to seeing a different angle, but the object remains the same. By layering these different perspectives, we arrive at a more complete understanding of the chair as an *integrated* entity. As we gain more perspectives, we can also see that there is not one privileged perspective of that chair, but all perspectives are equally valid. The example Ihde (1986) gives of this noema-noesis relationship is in Figure 2.1. This figure may be considered to be a three-dimensional section of a pyramid looked at from above, a three-dimensional section of a pyramid looked at from below or within, a three-dimensional cube facing in one of two possible directions, or even a two-dimensional line drawing. Changing how you look at the cube changes what you will see.

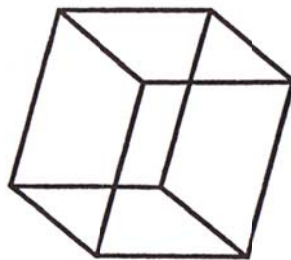


Figure 2.1 Necker cube. Multiple valid perspectives can be seen in this one image.

Verbeek (2005), building on this work, states that artifacts themselves have a sense of *technological intentionality*. By this, he claims that humans cannot have unmediated access to reality but that technology is influencing and co-shaping the way they perceive the reality of a context or situation. The experience of a technology is mediated through some artifact that is *in use*. So, the problem of intentionality within experience is always two-fold. Researchers must consider both the user's intentionality (e.g., their goals, meanings, motivations,

drives, and purposes) when they interact with some artifact and the artifact's intentionality (e.g., the intentionality put in place by the design of the artifact) as well. The relationship between user and artifact is what defines the experiential relationship from the standpoint of learning to use *interactive artifacts*, the discussion of intentionality, and the *experiential* perspective. Both user and artifact make and are made by the experience.

McCarthy and Wright (2004) describe how humans make sense and interpret a situation by making the whole permeate the parts of an experience. They observe six features of this sense-making process that help structure an individual's experience including anticipation, connections, interpreting, reflecting, appropriation, and recounting (McCarthy & Wright, 2004, pp. 124-127). Anticipation describes the way expectations, possibilities, and desires relate to an experience. Connections describes the sensual and immediate sense of a situation. Interpreting describes the unfolding narrative aspect of an experience. Reflecting describes judgments about the self and the situation. Appropriation describes making an experience one's own by relating it to a sense of self, personal history, and anticipated future. Finally, recounting describes relating one's experience to others. This list relates the experience to personal, physical, and social dimensions. For users, learning under this *experiential* perspective occurs as sequential episodes that contribute to an ever-increasing experience about a given *interactive artifact*, which then help to shape and develop users' experience of artifacts over a *lifecycle* of use by a user of an artifact.

Finally, the role of the subjective experience must be addressed in describing the *experiential* perspective. Nagel (1974) shows that subjective reality cannot be reduced to a single, objective, observable phenomenon because everyone lives in their own private realities. In "The View from Nowhere," Nagel (1989) argues that underlying the notion of objectivity is the idea of realism whereby scientists have direct access to the world. He further argues, "if we want to understand the world, we can't forget about those subjective starting points indefinitely; we and our personal perspectives belong to the world" (Nagel, 1989,

p. 6). He also describes the problem of reintegration when individuals take detached, objective descriptions of the world and try to make sense of them from the perspective of the social actors involved. Therefore, he argues that researchers must include both objective and subjective perspectives in their accounts of the world. Dennett (2007) instead tries to bridge the gap between subjectivity and consciousness and the natural sciences. In doing so, Dennett (2007) chooses to use intentional systems as a way to represent the system of beliefs underlying the experience of an individual. While a systematic organization of such experience is important, researchers should also avoid the conclusions that experience is wholly generated as a mental act. Experiences are also co-shaped by the environment, the past experience, and the current activities of the individual who is experiencing. Harrison et al. (2007) have described the way in which the field of interaction design is becoming more conducive to accounts that incorporate subjective and experiential elements to their description. This shows promise for work from *experiential* perspectives.

Studying the subjective perspective has been the focus of the methodology of phenomenology. While there are many approaches used for phenomenology, the focus is primarily on the engagement one exhibits through interaction with their environment as well as the relationship formed between an action in the environment and how that action appears to the user. Dennett (2003) describes one approach to the study of the first-person perspective through heterophenomenology, which is a *third*-person approach to human consciousness and experience. Dennett (2003) approaches this problem using the intentional system described above. This approach allows him to explore the system of beliefs of another individual in relation to some experiential phenomena. This general approach to understanding experience has been woven into the procedures and intention of this dissertation, but Nagel's (1974, 1989) contribution that subjectivity can only be truly understood by the one experiencing it should also be acknowledged. Through the topographical approaches employed by Ihde (1986), a researcher should be able to project others' experiences approximately. For this

study, this approach requires a close observation of participants as they learn artifacts as well as an analysis and a reflection by the researcher on how participants perceive the artifact they are learning and how the artifact is revealed to them through their use. Phenomenology can capture these learning experiences as they happen for comparison between users and use situations as well as for analysis as experiences within themselves.

This *experiential* perspective in the context of learning to use *interactive artifacts* does not have an organized body of researchers. Much of the theoretical description for such a perspective comes from the theoretical works of Dewey, Ihde, and Verbeek and the work in interaction design on embodied action by Dourish (2001), the experience of technology by McCarthy and Wright (2004), and the phenomenological matrix described by Harrison et al. (2007). This perspective is revealed, to a certain extent, in some of the works previously described including Petersen (2002) through her exploration of multiple meanings among agents and through her where-to artifacts, which describe the possibilities of artifact use. It includes Brodersen's and Kristensen's (2004) notion of interaction through negotiation, which describes a dynamic of interaction between users and *interactive artifacts*. It includes Gaver et al. (2007) and aspects of home health horoscope where users must find a way to make sense of the system that was designed to be intentionally ambiguous. It even includes Mack et al. (1983) and their categories in which they describe what it is like experientially for users learning a new *interactive artifact*.

## **Summary**

Several seminal works have been conducted in the study of learning to use *interactive artifacts*, which have been summarized and categorized in this chapter. There have been four perspectives on learning to use *interactive artifacts* including *cognitive*, *representational*, *constructivist*, and *situated* revealed in this categorization. An *experiential* perspective was also introduced. Each perspective can lead to new findings on learning in interaction design, but also can

fundamentally shift the problems that can be conceived within such a perspective. Furthermore, the approach to answer these problems often vastly differs between perspectives.

While the *experiential* perspective is well-equipped for problems addressing the learning experience, other perspectives provide answers to problems within their own domain. A *cognitivist* perspective can focus on the reproducibility of knowledge, but loses the ability to track skill-based knowledge that comes from the development of a repertoire of experience. A *representational* perspective allows for a thorough examination of the role of the artifact, but loses the user's role in the learning process. Finally, with *constructivist* and *situated* perspectives, researchers gain a focus on processes and behaviors involved with learning and the situations and contexts of the learning environment respectively, but lack a strong sense of the *inner life* of the individual as they learn and experience their learning. As mentioned already, *constructivist*, *situated*, and *experiential* perspectives are all akin to each other through the process of meaning making. The differences are in underlying assumptions of each perspective as well as the methods through which to observe the meaning making process.

None of these perspectives answers the question about learning fully, but by providing overlapping accounts, researchers can have access to more complete understandings of how people learn to use *interactive artifacts*. Nevertheless, the *experiential* perspective provides the theoretical orientation for this dissertation. The main purpose of this study is to understand as accurately as possible the experience that users have in their learning of *interactive artifacts*. The goal of such an *experiential* approach is to observe situations of both novelty and familiarity and understand the process by which users make sense of the situation to work for their current needs. In the next chapter, the learning experience and a concept for structuring its study, *learning-in-use*, are described in more detail.

### **Chapter 3. Learning-in-use: Organizing the Concept**

Thus far, the argument of this dissertation has been appreciating the learning experience as an equal and important part of learning to use *interactive artifacts*. The learning experience has been written about very generally in this dissertation, since it encompasses so many aspects of what happens when a user learns something new about an artifact. The focus of the dissertation is understanding intentionality in relation to the learning experience. In this chapter, *learning-in-use* is introduced as a concept for focusing the study of the learning experience on its central, though not exhaustive, aspects. *Learning-in-use* focuses on four aspects: the relationship between user and artifact, the changes over time in that relationship, the negotiations between user and artifact that support or damage that relationship, and the user's engagement with the artifact. *Learning-in-use* shares a similar name and some similar characteristics with *learning in use* described in chapter two under the *situated* perspective (Bødker & Petersen, 2000). However, these two concepts have some very important distinctions that allow researchers using them to ask and answer research questions about learning and use differently. This chapter, then, is concluded by comparing and contrasting these two concepts.

#### **Describing learning-in-use and its use in this dissertation**

Learning used in this dissertation goes beyond the common conception of learning as *knowledge gained*. In fact, learning as it is identified in this dissertation is represented by the concept of *learning-in-use*. *Learning-in-use* can



be understood as the relationship that is developed or learned by a user over an *interactive artifact's lifecycle*. The relationship can be caring, distrustful, engaging, purely functional, or even invisible to the user. These perceptions, while experienced by the user, are co-shaped by both user and artifact. The user may have certain motivations, needs, and expectations about an experience with an *interactive artifact*, but there is no guarantee that the artifact will be able to satisfy all of these. Alternatively, the artifact may surpass all of these and create a uniquely meaningful experience for the user.

First, the learning experiences as users *learn-in-use* are filled with personal meaning that develops through their use of an artifact. Such a personally meaningful relationship is an outgrowth of the user in the context of a particular artifact and in the context of a history of experience with other similar artifacts. Consider the iPod example from the beginning of the dissertation. The iPod meant one thing to my brother, it meant another thing to me when he sold it to me, and it means still another thing to me after years of use. The relationship I have with that iPod is unique to me and, so, the way I understand how it works, what I expect of it, and what I know I can do with it are all based on that relationship.

There are two important aspects of this personally meaningful relationship based on previous work on learning and experience: the peculiarity of experience and the multistability of experience. In this context, peculiarity means how each experience is tied to the individual having the experience. Aligning this peculiarity with participation in learning, Dewey writes,

displace the notion that it is the activity of a mere onlooker or spectator of the world, the notion which goes with the idea of knowledge as something complete in itself... If the living, experiencing being is an intimate participant in the activities of the world to which it belongs, then knowledge is a mode of participation, valuable in the degree to which it is effective. It cannot be the idle view of an unconcerned spectator (Dewey, 1944, p. 393).

As mentioned when describing constructivism, Dewey's reaction was in response to an explicit dualism that had arisen between knowledge that is objective and

outside of an individual and the feelings, emotions, and experiences that form an individual's subjective or inner life (Dewey, 1944). He argued that understanding the role of these internal factors was as important as understanding external factors. Kolb (1984) also describes these differences in learning processes among individuals through differences in individuality. In describing individuality, Kolb (1984) moves away from establishing general laws applying to all humans beings, and focuses instead on the individual realities of humans resulting from particular experiences.

Nagel (1974) also argued for another kind of personal meaning for experience. He argued that consciousness is predicated on a subjective character. One may be able to describe an experience through language, but that description falls short of completely articulating what it is like to have that experience. He supports this through the argument that humans can only *imagine* what it is like to be a bat; they can never know or experience it. Humans can only project their own experiences to imagine what it might be like given the unique situation and environment in which a bat lives. Likewise, each learner goes through their own process of learning that is unique and personally meaningful for them. To summarize:

Personally meaningful experiences are internal and unique to the individual experiencing the learning situation. Each experience is an outgrowth of both the external factors of the situation and how an individual feels about and perceives the situation as it happens.

The second important aspect of the personally meaningful relationship, multistability, is an extension by Ihde (1990) on his notion of the noema-noesis relationship. Multistability is the ability for an object of attention to contain multiple, often conflicting, meanings. As one's experience changes, there can be multiple stable ways in which the individual can have an experience. The key is that each of these stable states is equally valid. This means that learning to use *interactive artifact* should occur not just by seeing the artifacts through different perspectives, but also through the ability to appreciate that these different meanings emerge or recede based on different perspectives they may take.

Verbeek (2005) extends Ihde's (1986) description of multistability by describing how a particular interpretation can be stable in multiple ways. He grounds multistability through a context-dependence attached to both the individual who experiences and an object being experienced. Finally, this commitment to the importance of interpretation and multiplicity of meaning can be found in Gaver, Benford, and Beaver (2003) and Sengers and Gaver (2006) already starting to take root in interaction design. The following summarizes these points:

Personally meaningful experiences are multistable. This means that any experience that an individual has can be viewed in multiple stable ways. These ways are dependent on the context of the user and the artifact in use.

Second, the impact of time emphasizes aspects of change between user and artifact over the *lifecycle* of that artifact. This deemphasizes the perspective of an artifact as a concrete, learnable thing and highlights the perspective of an artifact as embedded within a process of development that spans an individual artifact's lifetime of use. This does not guarantee that given a longer period of time using an artifact users will learn *more*, but rather over the course of time, through shifting contexts, shifting individual needs and styles of use, and new experiences with similar artifacts, users expand the types of experiences that they have with a given artifact and develop a repertoire of experience. The time span of use then is delineated by new experiences. Referring back to the iPod again, there was a dramatic change in my use of it from my first experiences with it in which I was excited, followed by my early contentious experiences, a period where I valued and took care of the artifact, and a period of habituated use I experience with it now.

Time and temporality are very important matters for previous work on experience. Specifically, many researchers describe these aspects through the notion of the continuity of experience. In describing experience in the context of education, Dewey (1938) describes two principles for understanding the unfolding of experience. The first is interaction, which will be explained in more detail below, and the second is continuity. He states,

As an individual passes from one situation to another, his world, his environment, expands or contracts. He does not find himself living in another world but in a different part or aspect of one and the same world. What he has learned in way of knowledge and skill in one situation becomes an instrument of understanding and dealing effectively with the situations which follow. (Dewey, 1938, p. 44)

Dewey expresses that each learning moment is not separated into discrete parts, but makes up a continuous whole of active learning and use. A learner moves seamlessly from one activity to the next, learning something new at one step and applying something already learned at another in a composite whole of activity. This same continuity is an element of phenomenological research. Both Ihde (1986) and Moustakas (1994) describe how experience must be considered from the perspective of the present and not the past or future. Both describe how analyzing one's experience requires focusing on the engaged, immediate experience of the present of this individual and not on that individual's reflection. Researchers may analyze that reflection if they add the caveat that that reflection is a separate experience in itself. They describe learners as being engaged in a continuous experience. McCarthy and Wright (2004) also hold this process of experience to be a continual and ever-developing feature of living in the world, even though they have described a process of sense-making, as described above, that demarcates experience. These demarcations provide useful markers after the experience happens for those observing the experience, even though experience is neither discrete nor linear.

This continuity is also represented through descriptions of experience in interaction design. McCarthy and Wright (2004) describe experience as “the irreducible totality of people acting, sensing, thinking, feeling, and making meaning in a [technological] setting” (p.54). A similar description is found in Forlizzi and Ford (2000) where the user experience is a “constant stream that happens during moments of consciousness” (p. 419). These two descriptions demonstrate that experience, as conceptualized in interaction design, is a whole,

non-discrete, constant stream of activity and engagement. The following summarizes these points:

The *lifecycle* of use is made up by a sequence of inseparable situations that define the experience of learning. Parts of this sequence may be characterized as being anticipatory, connecting, interpretive, reflective, appropriative, or recounting though these categories do not necessarily define the experience.

Third, these personally meaningful relationships evolve through negotiations between the user and the artifact. Negotiation is not meant to mean verbal communication to reach some conclusion, but rather that each entity, both user and artifact, contributes something to the overall experience of the user. As explained above, Ihde (1986) and Verbeek (2005) both describe how scripts within an artifact influence action in a particular way. Another way this could be described is that the artifact provides feedback to a particular action by the user. An example of this is when driving a car that has a deflated tire. This car has a tendency to veer towards the side with the flat. The driver needs to compensate while driving a car to take into account this car's veering tendency. This same phenomenon occurs with *interactive artifacts* as well, which forces users to adapt to certain idiosyncrasies regardless of its user-centeredness (Norman, 2005). Referring back to my iPod example from above, problems with Apple's music storage policy and the interface of the iPod were major hurdles preventing me from having an effective relationship with the artifact. However, if I really wanted to use the iPod, there was nothing that I could do to change these factors. Therefore, I needed to change the way *I* interacted with the artifact to use it.

Brodersen and Kristensen (2004) introduced this concept of *negotiation* in interaction design, stating that negotiation is, "the dynamic development of needs and understandings represented at different stages of a use situation" (p. 259). Every time a user interacts with an *interactive artifact* there is the potential for a breakdown, which requires a new negotiation through interaction. They identify and observe three specific aspects of a negotiation through availability, interpretability, and connectivity. Availability depends on the interaction situation

to reveal interaction possibilities through the artifact, interpretability depends on the use situation to lend contextual meaning to how users interpret artifact feedback, and connectivity depends on how a user stitches multiple artifacts together as a functional unit to solve problems in their lives. This negotiation requires users not just to respond to feedback, but to be flexible to reorient in new ways to the artifact.

The research on experience reveals two ways in which this negotiation can occur: adaptive processes within individuals and coupling between users and artifacts. First, Kolb (1984) links this idea of individuality above to the “emergence of unique individual adaptive processes that tend to emphasize some adaptive orientations over others” (p. 62). He is supporting the notion not of fixed traits to describe individuality in how individuals learn, but rather a succession of stable states through which individuals pass as they learn. Second, he emphasizes the importance of the selective power that individuals have over their own learning experiences as a way that people can transform their experiences individually in a way that is meaningful to them. This idea also echoes similar commitments of Dewey’s original approach to experience in learning. Winograd and Flores (1986) describe the very same adaptive processes at work in our interaction with *interactive artifacts*. To describe these adaptive processes, they use the biological analogy of autopoiesis, which is a system’s ability to self-generate. Citing Maturana’s (1970/1980) work on cognition, “Learning is not a process of accumulation of representations of the environment; it is a continuous process of transformation of behavior through continuous change in the capacity of the nervous system to synthesize it” (p. 45). Users, then, progress to new stages when external factors force them into a new state of equilibrium broadening their repertoire of experience. The following summarizes this point:

As users negotiate the use of their artifacts, they develop a set of adaptive processes that form an equilibrium to the situations within which they use the artifact. Users’ selection of learning experiences contributes to the development of their own personally meaningful relationship with the artifact.

Also, coupling refers most clearly to the negotiation through which people learn and use their *interactive artifacts*. Drawing from the work of Martin Heidegger, Dourish (2001) describes coupling as “how an intentional reference is made *effective*” (Dourish, 2001, p. 138, italics in original). He describes users’ ability to engage in variable coupling with artifacts, which allows the user to operate the artifact seamlessly in a continuous, engaged process. As users use these artifacts, they refocus their attention from the artifact itself to the task at hand. The basis for coupling in human activity according to Dourish (2001) is that humans can reconfigure their relationships with artifacts and the surroundings based on their intentional relations to the world. Verbeek and Kockelkoren (1998), while working from notions about technological intentionality and mediated relations to reality, describe the human-artifact pairing. Based on this pairing, they assert 1) it is misleading for researchers to describe *interactive artifacts* outside the praxis in which humans use such artifacts and 2) it is misleading for researchers to describe reality without making reference to both individuals’ experiences of that reality and any artifact that is mediating that reality. This means that “technologies-in-use are no neutral objects, but... [they] co-shape the use that is being made of them” (Verbeek & Kockelkoren, 1998, p. 36). This sense of coupling with the world is significant because of the capacity of artifacts to affect change *through* use as well as change the intentional stance of the user using those artifacts (Croon Fors, 2006). Norman (2005), in support of activity-centered design, describes the way that users will adapt to the artifacts they use over time. Learning, then, in relation to coupling is not a linear process, nor is it one that a human can dominate, but it is an adaptive process. These points on coupling can be summarized as:

As users negotiate the use of their artifacts, they loosely form relationships with their artifacts oriented towards some use that can be modified through variable coupling over time.

Finally, learning of the sort being described in *learning-in-use* requires that users are engaged in an activity with an artifact. Being engaged in this way, learning becomes less of a hassle and more of an activity of concentration where

users reinforce their relationships with artifacts. Such engagement does not happen when users are distracted by other activities, lack the basic motivation to use or learn the artifact, are overwhelmed by the artifact, are bored by the artifact, or do not see any real fit that the artifact can provide. In the iPod example from above, even though I went through periods of frustration, I was still engaged in my use of the artifact as I worked through the problems and found a way to make the iPod work for me. If I lacked that engagement, there is a good chance I would not have worked at trying to get the iPod set up in the first place.

Within experience research, engagement has become a quintessential aspect of understanding how people experience the world starting from the Heideggerian tradition (Dourish, 2001; Winograd & Flores, 1986). Borgmann (1984) describes the notion of *focal things* and *focal practices* where such focal things and practices require a user's active attention and engagement to completely utilize and experience these practices. These focal practices reflect the personal learning in which users must engage in their pursuit of finding ways that artifacts fit into their lifestyles. Borgmann (1984) makes this argument in contrast with the many artifacts that automate and obfuscate the underlying practices they purport to make more efficient. What is lost in many of these artifacts is a direct engagement with the world, which is replaced by a button push<sup>7</sup>.

Engagement in an activity has also been described as an essential component of our embodied interaction with the world. Dourish (2001) argues, "*Embodiment is the property of our engagement with the world that allows us to make it meaningful*" (p. 126, italics in original). He makes an argument that the way humans are embodied in the world does "not simply mean 'physical manifestation'" (Dourish, 2001, p. 125), but, rather, that it is grounded in everyday experience and engagement. Learning and meaning making, then,

---

<sup>7</sup> Borgmann's (1984) notion of focal things and practices could be extended in the modern age to look at new technologies encompassing the use of computers, networks, and information and communication technologies, such as the Web 2.0. There is an argument here, though, that these technologies lead to *new* focal practices through the abstractions they make.



requires the learner to be engaged with whatever is being learned. McCarthy and Wright (2004) also describe the important role that engagement plays in our experience of the world. In describing engaged conversations with others, they write,

Engaged conversations are never just about the words; they are also about the sounds of words uttered, the ways in which they are intoned...And in any particular situations, it is never just the words spoken; it is also the eyes, the hands, and the body. (McCarthy & Wright, 2004, pp. 80-81)

This engagement represents the totality of the experience as it occurs over time and represents an individual's connection with people and things involved in that experience. In this sense, *learning-in-use* happens against the backdrop of an engaged experience with an *interactive artifact*. Engagement plays the following role in *learning-in-use*:

Users must be engaged with the *interactive artifact* to experience *learning-in-use*. This engagement is what makes the activities underlying artifact use meaningful.

*Learning-in-use* is an effective concept for capturing and analyzing participant's learning to use *interactive artifacts* from an *experiential* perspective. The aspects of personally meaningful relationships, evolution of these relationships over time, evolution of these relationships through negotiation with the artifact, and the backdrop of engaged use for *learning-in-use* are all essential to this concept. This concept provides the theoretical foundation for the rest of the dissertation. This conceptual structure relates to the research questions being asked in this dissertation. Each of these aspects was supported empirically through different findings in the study described in chapter five.

### **Comparing and contrasting learning-in-use and learning in use**

*Learning-in-use* has been pulled from experience research from a variety of fields. Inspiration for this concept was drawn from the concept *learning in use*, (Bødker and Petersen, 2000). Bødker and Petersen (2000) build on Activity Theory to analyze the role *learning in use* plays in everyday interaction with

artifacts. Focusing on the role of operations when using an artifact, users go through periods of breakdown where they must focus on the artifact itself as opposed to the underlying “object of work” (Bødker and Petersen, 2000, p. 64). Designs should support the user in working transparently with the artifact as it is directed towards some activity. They describe the process that novices go through as they learn an artifact in use. Novices focus on the details of the operations, whereas experts are able to move toward generalizations of the operations of an artifact and focus on higher-level aspects of an activity. They describe learning as socially mediated. They cite Lave and Wenger (1991) where learning is depicted as “legitimate peripheral participation in a community of practice, where novices gradually move from the periphery, through increasing participation, towards the center of mastering practitioners” (Bødker & Petersen, 2000, p. 66). All those that a user interacts with in the process of learning about, buying, installing, and using an artifact create a feeling of community and in some way model participation in that community with varying levels of mastery. Context can also come from past experiences with an artifact. They write that understanding learnability of artifacts consists of “how users’ previous experience can be reused and brought into play when users face new artefacts or problems” (Bødker and Petersen, 2000, p. 68).

In other related work, Petersen (2002) extends this description of *learning in use* to include how “the shape of an artefact or a tool never predetermines use” (p. 23). She contrasts the difference between the designer-imbued intended use of an artifact and the user-enacted actual use. While these two perspectives on the use of an artifact can overlap, they often will be very different from each other. She argues that meaning is found in the motive that drives the activity of the learner. She relates learning with play and innovation as analogies that demonstrate the scope of *learning in use*. Finally, Petersen (2002) focuses on the need to understand pre-use learning. Pre-use learning would encompass all the learning one goes through with an artifact before they actually begin to use the artifact. In this sense, *learning in use* expands the common scope of what learning is considered to be in interaction design.

There are several points of similarity between *learning-in-use* and *learning in use*. First, both concepts support aspects of learning beyond just knowledge acquisition. *Learning-in-use* emphasizes the learning experience and how much learning can occur even when a participant gains no objective knowledge. *Learning in use* is centered on the role context plays in the learning process within which learners are situated. Second, both concepts use prior experience as a basis by which new experiences can be had. In *learning-in-use*, prior experience becomes relevant as the learning experience evolves over time. That experience evolves against the prior experience from which each new experience is compared. In *learning in use*, prior experience becomes one of the many contextual factors that influence how a learner can learn about an artifact, but also how that learner can enter into a community of practice. Third, the element of time is deemed important according to both concepts. Both *learning-in-use* and *learning in use* recognize that how a user learns, what motivates them to learn, and the situations in which users learn will all change over time and so any study that looks at how users truly learn to use an *interactive artifact* will need to take this time dimension into account. Finally, both *learning-in-use* and *learning in use* argue that the learning that a user engages in extends beyond the immediate stage of learning in which users spend time reading manuals or completing tutorials. Learning starts from the time users become aware of the artifacts to the last time they use them.

There are also several points on which the concepts of *learning-in-use* and *learning in use* diverge. First, while *learning in use* is focused primarily on the usability and the learnability of the artifact, *learning-in-use* is focused on the experience surrounding the use of the artifact. This means that despite an interface being very difficult to use, a user might still have a profound learning experience with that artifact in the case of *learning-in-use*. Second, Petersen (2002) described that the meaning that is being learned is found in the motive in *learning in use*. In *learning-in-use*, meaning is found in intentionality. This means the meaning associated with an artifact is formed prior to the motivation that drives user

activity within *learning-in-use*. Third, *learning in use* makes reference to the progression of novices to experts where novices focus on the low-level operations and actions of their use, while experts do not need to focus on those operations and actions. From the standpoint of *learning in use*, this describes a goal state of learning. *Learning-in-use* instead describes learning as an ongoing process that occurs even as users have mastered many aspects of the artifact. While learning at this point of mastery will appear differently than at the starting point, the underlying structure of learning should remain the same because the meaning making process will remain the same.

On several points, there are also aspects where one concept emphasizes certain aspects more than the other does. The first example of this is that while both concepts would support the assertion that use is not predetermined by the artifact, *learning-in-use* seems to take a stronger role for the artifact in co-shaping the user's experience. The second example is that while both *learning in use* and *learning-in-use* support use that is immediate and transparent, *learning in use* asserts that designers should strive to support the transparency of an artifact in favor of completion of an activity, while *learning-in-use* asserts that designers should support the meaningful relationship between user and artifact even if it means the transparency of the artifact suffers so new learning may occur. Third, while an artifact is socially situated within *learning in use*, that artifact also becomes ego-centered in the *experiential* perspective of *learning-in-use*. This means that while the socially-situated aspect of the artifact is relevant and important to *learning-in-use*, it is not highlighted in the way that it is in *learning in use*. The individual is the primary unit of inquiry.

While *learning-in-use* and *learning in use* share many common features, both are focused on different aspects of learning to use *interactive artifacts*. As mentioned before, each concept provides a valid way of looking at the problem of learning in interaction design and both can offer very important insights for both researchers and designers.

## Summary

The focus of this dissertation is on identifying and studying *learning-in-use* as users learn new artifacts or learn a familiar artifact in a new way. There are four aspects of this concept that describe how users have learning experiences: the personally meaningful relationship users create with their artifacts, the evolution of this relationship over time, the negotiations between user and artifact that define this relationship, and the engagement a user experiences when using and learning this artifact. *Learning-in-use* is an approach to understanding learning that diverges from the idea of knowledge as being the output of learning as well as learning being relevant only during the initial stages of use. Through *learning-in-use*, the learning experience becomes an equally important outcome of learning as the user develops a meaningful relationship with an artifact. Also, *learning-in-use* demonstrates that learning is an ongoing process that is just as relevant to those who have mastered an artifact's interface as it is for those who have never used the artifact before.

## Chapter 4. Longitudinal Study of Learning-in-Use

An empirical, long-term study was conducted to study *learning-in-use*. This long-term study gave participants the opportunity to experience periods of novelty, habituation, and, in some cases, relearning when the artifact's role changed. It captured participants' learning experiences and organized them according to their similarities and dissimilarities. This exploratory study addressed the research questions described in chapter one, but also revealed new questions about the learning experience. The goal of the study was to identify key patterns and concepts within participants' learning; preserve and record the natural settings in which learning occurred; and focus on the whole experience rather than separating learning into its components parts. By focusing on the whole experience as opposed to its components, this study addressed questions that are only visible when all components work together. Furthermore, the goal of this study was to look at how users formed personally meaningful relationships with their *interactive artifacts* based on how they negotiate their use and how these relationships grow or wane over time.

In this chapter, the entire design of this longitudinal study is described and explained. First, how the research questions were implemented in the methods and procedures of this study and how this study fits into the *experiential* perspective is described by referring to the study's conceptual design. Next, the details of how the study was implemented are revealed. The procedures and artifacts used in the study are described. The study participants, how they were

recruited, how they were selected for participation, and what participants were responsible for doing in the study is also described. Finally, the methods used for analyzing the collected data are reviewed and explained.

## **Empirical design**

### *Methodology*

The study required access to the natural settings in which participants learn, an extended period of time for participants to learn the artifact, and access to real artifacts participants were motivated to learn. Each of these factors was accounted for in the study. First, the natural settings encouraged authentic learning experiences for participants in ways similar to what they may experience on their own. While the study does place participants in a constructed learning environment, it was crucial their experiences were as close to these natural settings as possible. Ways in which these natural settings were preserved included encouraging participants to learn the artifact on their own time between encounters and allowing participants to choose the location of encounters with the researcher. Furthermore, certain ethnographic methods were employed in the study to understand these natural settings. These included direct observation of their use of the artifact and focused interviews on the learning being observed. Through these means, significant opportunity was given to the participant to experience the artifacts in their own personally meaningful way to counterbalance aspects of the study that were imposed by the researcher on the participant.

Second, an extended period of time over which an artifact was learned was accommodated in this study by using a longitudinal approach to data collection. The researcher scheduled multiple sessions to interview and observe participants' progress as they learned the given artifacts to incorporate this approach. This contrasted with single observation points and even the week-long data points collected by Carroll (1990) of a user learning an artifact. While this approach did not capture the entire *lifecycle* of all participants, it allowed the novelty of the artifact to dissipate and, for some participants, provided an opportunity for new

experiences with the artifact that they did not have in the first session. This longitudinal approach allowed the researcher to track the progression across the length of the study for changes in between individual sessions.

Third, the artifacts used in the study needed to be real artifacts participants were motivated to use. These artifacts were used because there was incentive to learn them beyond participating in the study. In the case where participants stopped using the artifacts, it would be recorded that participants were at least *initially* interested in learning the artifacts and that interest waned over time. The realness of the artifacts also ties into making the situation in which they were learning these artifacts similar to the natural settings they encounter when learning outside of the study. These real artifacts represent examples of artifacts participants may have learned on their own if given an opportunity.

This methodology fits well into the *experiential* perspective, the foundation to this study. At its heart, the *experiential* perspective focuses on understanding how users make meaning through their experiences about the world around them. The *experiential* perspective builds its analysis by looking at the intentional relationship between user and artifact. By putting participants in real learning situations, they should have had a nearly authentic experience in which motivations, expectations, beliefs, and resultant behavior should be similar to when they learn on their own. Even though these experiences were not completely authentic, the experiences are nonetheless real and open to investigation by the researcher.

While researchers will never have direct access to the user's experience, they can begin to create a sense of what their experience is like through intersubjective investigation. Intersubjective investigation means the experience is observed and reflected upon by more than one person. As the participant went through the learning experience during the observation sessions, the researcher could ask questions relating to their experience. The researcher could note patterns in behaviors or points of confusion in addition to points of realization,



where the participant had breakthrough moments about how to accomplish some goal. The researcher can refer to episodes in learning for feedback on the participant's thought process during the situation and implications about their relationships with the artifacts. While none of these evaluate the direct experience the participant had, these experiences must be reflected upon by the participant or observed by the researcher indirectly to be recorded. Nonetheless, this study captures the heart of *learning-in-use* by participants by allowing the study to take place over an extended period of time and by simulating the natural settings in which these participants normally learn.

### *Research questions*

This dissertation was aimed at understanding the learning experience through *learning-in-use*. This study allowed for a simulation of the learning experience of several different artifacts for a variety of people. This dissertation has already been broken down into three research questions. The way each of these research questions was addressed by the study is described in Table 4.1.

Table 4.1

Relation of Collected Data to the Three Research Questions

Research Question	Relevant Data
How does a personally meaningful relationship form between user and artifact in the learning experience?	<ul style="list-style-type: none"> <li>• Responses to questions about uniqueness of the artifact, overlapping functionality, enjoyment of the artifact, and expectations and motivations</li> <li>• Episodes related to how participants do and do not care for their artifact, how an artifact fits a well-defined use, how participants cannot find a role for the artifact, and when a user stops using an artifact</li> </ul>

Does the learning experience change over time or stay static in relation to one's perceived ability to use an artifact?	<ul style="list-style-type: none"> <li>• Responses to questions about changes in use, perception, or ability as well as relationships with the artifact</li> <li>• Episodes related to breakthrough learning</li> <li>• Demonstrated observable changes in ability to use artifacts</li> </ul>
In what ways does a user need to negotiate with their artifact? In what ways do either the user or artifact control the learning experience?	<ul style="list-style-type: none"> <li>• Responses to questions about problems with artifacts and circumventing those problems, level of control over the artifact, and confidence in using the artifact</li> <li>• Episodes related to struggling with misconceptions, barriers erected by artifact use, and accomplishment in using the artifact</li> </ul>

---

The first research question was addressed by observations and questions centered on how the user develops a meaningful relationship with the artifact. This meaningful relationship can be demonstrated in how they treat an artifact, how they perceive an artifact, and how the artifact fits a role or need for the user. This research question was also addressed by looking at those who had stopped using the artifact before the end of the study. The second research question was addressed by observations and questions as well as quantified data collected centered on how the user's experience changes over time and how this change is distinct to whether their knowledge or skills change over time. These changes can be demonstrated directly through asking about changes in perception between sessions as well as through produced work and writings of the participant. The third research question was addressed by observations and questions related to the user's perception of the artifact's role and instances where the artifact directly affected the user's behavior in some unexpected way.

## Procedure

The study was conducted over a period of five months broken into two phases of two and a half months each. These two phases gave participants opportunities to experience two different artifacts over the course of the study. The two-and-a-half-month length of time for each session was long enough for the novelty of the artifact to dissipate, but still short enough to be manageable to study. If participants were really learning these artifacts on their own, the period of *learning-in-use* would probably last much longer<sup>8</sup>, but this depends on factors including individual situations and motivations. Within each session, participants spent their own time learning to use this artifact to explore what is possible using the artifact and how the artifact fits into their lives. The participants also met with the researcher to describe how their *learning-in-use* progressed during the study and to demonstrate how they have used the artifact.

There were three *interactive artifacts* used in this study: Photoshop, World of Warcraft (WoW), and an iPod Touch. Photoshop represents both productivity and creativity software in the study. Photoshop is an interesting example because participants had external resources, such as other students or Lynda.com, to reference. WoW represents video games and entertainment software. This artifact was interesting due to the social support built into the game and how this support facilitates or detracts from the participants' learning. Finally, the iPod represents productivity, entertainment, and communication software as well as physical and mobile artifacts. This artifact was interesting from the standpoint of the depth of customization in which the participant occasionally engaged with the artifact.

The participants were asked to use two of these artifacts. They were grouped based on which artifacts they learned as described in Table 4.2. The groupings of participants was based on *motivations* participants had to learn these respective artifacts as well as how much *prior experience* participants had with

---

<sup>8</sup> Alternatively, the study revealed that participants might need less time than two and a half months to realize they do not want to use it.

these or similar artifacts. The questions asked to group these participants included:

- What is your level of interest on a scale of 1 to 7, with 1 being the lowest and 7 being the highest, of using Photoshop, WoW and an iPod?
- What is your level of prior experience on a scale of 1 to 7, with 1 being the lowest and 7 being the highest, of using Photoshop, WoW, and an iPod?

Table 4.2

Study Groups for Participants Showing Phase Ordering and Artifact Usage<sup>9</sup>

Participant Group	Phase One Artifact	Phase Two Artifact
Group 1a	Photoshop	iPod
Group 1b	iPod	Photoshop
Group 2a	Photoshop	WoW
Group 2b	WoW	Photoshop
Group 3a	iPod	WoW
Group 3b	WoW	iPod

The participants met with the researcher three times per phase to discuss their learning experiences. With only a few exceptions, the first interview session of each phase was the participant's first experiences with their given artifact. This interview oriented participants to the study and the artifact. Each session was divided into four parts. First, the researcher asked questions about participants' previous learning experiences with the *interactive artifact* and related artifacts. Some questions asked included:

- Have you used Photoshop or other software like this before?
- What goals do you have for using the device?
- What aspects of the device do you expect to find most enjoyable?
- What motivates you to use and learn this device?
- What kind of tasks or activities do you foresee using this software/device for?
- Do you feel that you will be in control of the technology? How so?

<sup>9</sup> The designation of a or b in the group means half of the group started the study with one artifact, while half of the group started with the other. For example, Group 1 used both Photoshop and the iPod Touch but half started with Photoshop (Group 1a) and half started with the iPod Touch (Group 1b).

The rest of these questions can be found in Appendix A. The interview portion of the session usually took 30 to 45 minutes to complete. Second, the participant explored and learned the software on their own for approximately 45 minutes. Third, the user performed a task of proficiency respective to each artifact for twenty minutes. Finally, the participants were asked debriefing questions about the session's activities. These questions inquired what the participants' goals were during the session and why they did what they did. Sample questions include:

- Is there anything that you feel you didn't make any progress on?
- How confident do you feel you will be able to learn this?
- What are you going to do as a next step to learning this software/device?

In this debriefing part of the interview, participants discussed difficulties, motivations, and both met and unmet expectations that arose during the session. Table 4.3 describes how both the initial and subsequent interview sessions took place.

Table 4.3

Interview Session Activities

Interview	Activities
First Interview (Week One)	<ul style="list-style-type: none"> <li>• Interview about previous experience with artifact (35 min)</li> <li>• Free learning and exploration session (45 min-1 hr)</li> <li>• Task (20 min)</li> <li>• Debriefing questions (15 min)</li> </ul>
Subsequent Interviews (After Weeks Four and Ten)	<ul style="list-style-type: none"> <li>• Interview about previous weeks experiences and changes in use and perspective (35 min)</li> <li>• Free learning and exploration session (30 min)</li> <li>• Task (20 min)</li> <li>• Debriefing questions (15 min)</li> </ul>

The proficiency task in the third part of each session allowed for the comparison of differences in participants' abilities over the three sessions of each phase. For Photoshop participants, the task consisted of recreating a provided image, which required a fairly thorough understanding of the interface basics

through features a competent Photoshop user would need to know. For WoW participants, the task was to collect a certain amount of money in the game and, with that money, buy the best piece of armor they could find. Finally, for iPod participants, the task was to describe a question or need that the iPod could accommodate for them and then find an app that best addressed that question or need.

These proficiency tasks gave a measure of changes in participants' abilities. Participants were asked to save any work they created during these tasks with their name and the date. Only in Photoshop was anything created worthy of being saved. The tasks are listed in Table 4.4.

Table 4.4

Session Tasks Performed for Each Artifact

Artifact	Tasks
Photoshop	Recreate image in Photoshop from printout.
WoW	Collect as much money as possible and buy the best armor
iPod	Ask question and download app to address a need or question

For each phase, interviews were held three times: during the first week, after three to four weeks, and after two and a half months. The second and third interviews of each phase had a similar structure but different questions asked at the beginning of the session. Participants were asked about the learning that took place between sessions in addition to questions about expectations and motivations. Some sample questions include:

- Have your expectations about the software/device changed at all?
- What goals do you have for using the device? Have they changed at all during the course of the study?
- Please describe how you relate to the software/device so far. Tell me the overall story of what it has been like learning (Photoshop, World of Warcraft, or an iPod Touch).

Between sessions, participants were asked to learn the artifact on their own for at least one hour per week and to update a virtual diary of what they were doing as they *learned-in-use* with these artifacts. The participants each devoted between one and ten or more hours per week during the five months of the study, though some admitted in later sessions they were not able to contribute even one hour per week.

### **Data collection methods**

Three methods that are fairly common to interaction design were used to collect data. The three methods include observation and think aloud protocol, interview and demonstration by participants, and unobserved interaction with the artifacts and experience (incident) diaries. Observations in this study were used to learn about both goal-guided and self-guided approach to learning to do a task. The goal-guided approach describes tasks that were provided in the third part of each session to structure what participants were doing. The self-guided approach describes the free-learning second part of each session where participants filled in this structure on their own. Observations documented participants' actions and toward what their learning was directed. The majority of their interaction with the artifact was self-guided and oriented toward their needs and motivations, which occurred outside the interviews. Think aloud protocol was used so that participants "verbalize questions and concerns that were raised in the course of interacting with a computer system and its documentation, plans, and strategies" (Carroll, 1990, p. 18). Think aloud was useful for revealing the rationale behind participant behaviors as well as for understanding the participants' accounts of their *learning-in-use* after the experience had happened. Data were collected in observation through audio recordings as well as in field notes captured describing participants' actions and when possible their rationale for such actions.

Interviews were used, also, to understand participants' perspectives on their learning process and experience. The interview was semi-structured with a list of questions asked in each session but also allowed other pertinent questions

during the interview. Questions can be found in Appendix A. Participants were encouraged whenever possible to give examples of their experiences. Often participants would offer to demonstrate aspects of their experience. These demonstrations were spontaneous and aided in how participants would recount their *learning-in-use*. These data were collected through audio recordings also. Select portions of the audio recordings were then transcribed for analysis.

Finally, participant data outside of the interview sessions were recorded using a virtual diary system. Participants completed a web form for each diary entry asking about their experiences and relationship with the *interactive artifacts*, *contexts of use*, *functionalities* used, *resources* used, and any problems they had. The diary question list appears in Appendix B. Participants could also review old entries in the diary if they desired. Kjær et al. (2000) also used an incident diary in a similar study on *learning in use* to capture learning incidents and interesting events by providing participants with a form to fill out any time they used a new functionality. They did not find this method to be particularly useful, however, as participants had difficulty knowing how to complete the forms and rarely remembered to fill them out when such learning did occur. From Larson's and Csikszentmihalyi's (1983) experience sampling method, periodic updates were used to fight this problem of participants remembering to fill out the virtual diary entries. In the virtual diary system, such updates were also used. These reminders likely helped to keep participation in the virtual diary consistent through the entire study.

### *Pilot study*

A pilot study was conducted on one individual for three weeks with Photoshop to evaluate the study procedures and refine any questions asked. The participant was able to perform all tasks in the pilot. As a result of this pilot, the protocol was revised and certain questions were removed because of their redundancy based on suggestions from the participant. These changes are represented in what is found in the protocol in Appendix A.



## Participants

### *Recruitment*

Participants were recruited by advertising the three *interactive artifacts* they would have a chance to learn. All participants were recruited from the same pool of users by using the School of Informatics at Indiana University undergraduate and graduate email listservs. Initially, the recruitment focused on participants who had minimal experience with Photoshop, WoW, or an iPod. This would maximize the potential for learning experiences and enhance the quality of learning engaged in by these participants. Due to the random selection of recruits, two participants who had previous experience in their artifacts also participated in the study. These experienced users brought their own unique perspective to learning that led to important insights. To determine the group placement, participants were asked two questions via email about their motivation to use and level of prior experience with all three artifacts. Participants were then placed in equal-sized groups based on their responses described in Table 4.2.

Pure representativeness was not a goal of this study. In fact, looking for participants that were more representative of all *potential* users of these artifacts could have obscured findings in the study because there would have been too much variation in user learning based on the randomness of the participants. With a representative sample of users of *interactive artifacts*, it would be difficult to say whether participants are just too dissimilar to begin with or whether each one of the participants' learning styles were actually unique based on their learning experiences. This study recruited participants who had some similarity to each other in terms of their backgrounds with technology.

### *Selection and study participation*

Twelve participants were selected at random from a total of 23 participants who responded to the recruitment email sent out to the school listservs. The list of last names was randomized using the list randomizer on

Random.org. The top twelve on that list were selected for the study. Of that twelve, one participant did not respond to the email to schedule a date and time for the interview, one participant scheduled an interview but asked to be replaced, and one participant scheduled but never came to the interview and would not respond to emails trying to reschedule. Each of these three participants were replaced because the study had not yet begun. The replacements were selected randomly from the remaining people who responded to the original email.

Of the twelve that participated in at least one interview, three participants did not complete the entire study. The first participant participated in one interview session and one closeout interview one month later. Another participant completed five interview sessions, but the researcher concluded the study prematurely because the participant said that she would not use the artifact between the fifth and sixth sessions. The final participant could not be reached to complete the final study after approximately five attempts to contact them via email. Reasons for attrition included a lack of time to participate in the study for two of the participants who could not finish and a lack of interest for the last participant. However, nine participants did complete all six interview sessions and use the artifacts they had to varying extents throughout the study. Given the length of time and expectations of the participants, the retention rate of this study was moderately successful<sup>10</sup> with minimal attrition.

The data from all participants were included because, with the exception of participant one, all participants completed at least one complete phase of the study with one artifact. The conclusions would not change by removing these participants because within each code other examples could take their places. However, they do provide interesting examples of *learning-in-use* even if they did not complete the study. Removing the three participants from the pool of data

---

<sup>10</sup> Goodman and Bloom (1996) describe in a review of longitudinal, psychological studies that attrition rates of 48 studies analyzed ranged from 0% to 88% with a median of 27%. The 25% attrition from this study fits right into the median and most of the attrition came during the last session.

collected would remove slightly less than one quarter of the sessions completed in the study. Removing the data eliminates many valuable and legitimate learning experiences from analysis. For example, in the instance where participant ten told the researcher she would not use the iPod after the fifth study, another interview would likely have been a formality with little insight gained from it. Nonetheless, participant ten did have meaningful learning experiences that were documented in the sessions in which she did participate. Finally, the fact that these participants did not complete the study demonstrated that these participants did not have a relationship strong enough worth even humoring the researcher and completing the study. It was not worth the time for them, which was an interesting finding in itself.

### *Characteristics*

By focusing on a small number of participants and given the resources available for this study, fewer participants meant learning experiences could be analyzed more thoroughly and the period over which experiences occurred could be longer. The sample of participants used in this study was stratified based on the participation in the School of Informatics. This group should have had a higher level of *interactive artifact* ability and a lower threshold for engaging with new artifacts. Beyond this stratification, participants were sampled randomly.

The study included a diverse group of participants with various backgrounds although the level of experience was very similar between the participants. There were five female and seven male participants. There were seven undergraduate students, four graduate students, and one staff member participating in the study. Participants answered an average of 5.8 out of 7 in terms of their initial interest in the artifacts that they eventually used before the study began. There was one outlier who answered less than 4 to this question: participant eight using WoW. Participants answered an average of 2.89 out of 7 in terms of their level of prior experience for the artifacts they eventually used before the study began. There were several outliers who answered more than 5 to

this question: participant three using Photoshop and WoW, participant four using Photoshop, participant six using Photoshop and WoW, and participant seven using Photoshop. This means that on average the participants had little experience but a great deal of interest in using the artifacts they were given to start the study.

### *Participant view of the study*

After participants responded to the recruitment email, the researcher followed up by asking about their level of motivation to learn Photoshop, WoW, and an iPod as well as their level of experience with each of those artifacts. An initial interview was scheduled with each participant at their preferred location. Most meetings were held in a lobby, computer lab, or classroom depending on traffic in the School of Informatics building at Indiana University, although a few participants wanted to have a session at their homes.

A day before the interview, participants were sent reminders about the time of the interview the next day. In the case of participants using Photoshop, they were asked to install the University-provided version of Photoshop.

During that first interview session, participants were greeted, provided study information sheets, and thanked for participating. If there were further installations required for the session, such as for WoW or Photoshop, this installation was started during the interview so it would be ready for the observation parts of the session. Everyone asked to install the software on their own personal laptops, with the exception of participant ten who wanted to use University desktops in the computer lab. iPod participants were given the iPod at this time. Participants were asked the scripted list of questions in Appendix A, but occasionally the researcher would ask follow-up questions if certain responses needed clarification. Then, participants were instructed to start using the artifact. They were not given any more instruction than this. Participants using Photoshop opened the program and once they thought of an initial idea, they would usually download an image via a search engine and manipulate it. Participants using WoW created a new character and would try some of the initial quests to get used

to the mechanics and controls of the game. Participants using the iPod usually explored all of the different apps that came preinstalled and eventually would find their way to the app store. If participants using the iPod brought their laptop, they would also try to connect to the device via iTunes. After approximately 45 minutes to one hour, participants completed the tasks described in Table 4.4. Finally, the participant would be asked several questions about the particular experience of that day.

After the end of the session, participants were thanked again and asked if they could learn these artifacts on their own for as little as one hour per week. Participants were later sent a link to the online virtual diary system where they would record their use of the system. Over the next ten weeks, participants would typically make an entry in the diary once per week.

Around weeks four and ten, new interview sessions were scheduled with participants. During the last interview session of phase one, two things were done differently. First, the iPods were collected from those who had them. Second, two interview sessions from two different phases were conducted sequentially: the last session of the first phase and the first session of the second phase. This sequential session of two interviews in one day differed from the other four sessions that each took place on separate days. Consent from all participants was received to run this double session instead of trying to schedule two separate sessions.

### **Analysis methods**

Of all the collected data, only one audio recording session and one session's Photoshop images were lost. The total data collected include approximately 64 hours of audio recorded, 74 collected Photoshop images, 72 diary entries, and hundreds of pages of notes taken. From these data, 85 pages were transcribed selectively based on those that seemed to speak most clearly to the learning experience from the audio and 23 narratives (e.g., one narrative for each participant who participated in each phase) were constructed for the

participant's experiences with the artifacts. The transcribed data appear in Appendix C and the narratives about the participants appear in Appendix D.

The audio was selected for transcription based on relevance to learning and to avoid transcribing repeated statements<sup>11</sup>. Special attention was paid for capturing the various episodes of learning (e.g., important learning events or situations) for each participant. The transcription was taken exclusively from the interview data and not the observation because most of the observation was episodic and already captured in the field notes. The audio was reviewed and, as a relevant segment played, it was transcribed.

Two other protocols were used for analyzing the data including narratives for each participant and analyzing collected Photoshop images and WoW data (e.g., their level and the money they were able to collect during the proficiency task). Narratives for each participant were constructed describing how the relationship of each user for each artifact unfolded over time. These narratives summarized important episodes by each participant in their relationships with the artifacts. They recorded many of the episodes identified in the transcribed interview data.

Photoshop and WoW were used to compare progression between sessions in participants' abilities. This progress was charted in Photoshop by using the images collected during the controlled task in each interview. From the pictures, eight features were identified that the participant would need to modify to go from Figure 4.1 to Figure 4.2 including removing the white space around the elephant, changing the elephant color, adding text, layering the text properly on the image, curving the text, and adding the three concentric circles. If participants were close in achieving one of these changes (e.g., they were able to put the text on the image, but not add a dark outline around the text), then a separate recording for almost complete feature was kept. The progression was measured for each

---

<sup>11</sup> This made transcription more manageable, since only one researcher was involved in transcription.

session. A similar progression was maintained for WoW players. The level at which the players started the session was recorded during most sessions. This was tracked for each participant in each session. Also, the amount of money earned during the controlled task during the interviews was tracked over time. These data were found to be less reliable in terms of tracking change over time as there was less available data and the changes in earned money matched the level participants achieved. This means higher amounts of money would be much easier to obtain at higher levels.

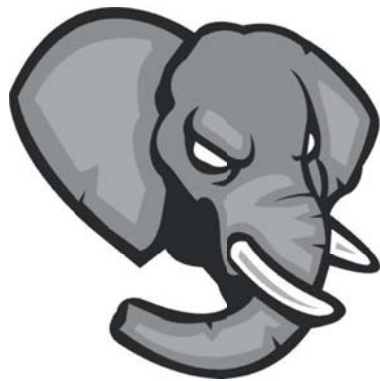


Figure 4.1. Starting image for the Photoshop task.



Figure 4.2. Goal image that participants were asked to create.

The procedure for analysis was loosely based around affinity diagramming (Beyer & Holtzblatt, 1997). Affinity diagramming is used extensively in information architecture by usability specialists to group information into meaningful categories for a specific audience (e.g., in organizing a web site). First, transcribed data, field notes, and narratives were organized by participant and session date. The diary was already being inquired about during the interview sessions and, hence, was not used in analysis. Second, evidence of the meaningful relationships of participants for their artifacts, changes over time, and examples of negotiation were marked with sticky notes as either episodes occurring over multiple sessions through transcribed data and interview data or as excerpts of text and identified as *codes* within the data. Third, these emerging codes were

then grouped into categories. These categories are the four *phenomena of learning-in-use* described in chapter six. Finally, to show the limits of these *phenomena*, two-dimensional scales were added and relevant examples were used to demonstrate the four extremes of these scales. The two axes consisted of a functional axis, describing the impact each *phenomenon* has on the *learning-in-use*, and an evaluative axis, describing the mechanism that participants use to evaluate the artifact based on each *phenomenon*. Each of the axes derived from the codes found in the sessions.

The following subsections describe the important interview questions for each research question as it pertains to analysis. These interview questions did not constrain the analysis, but were a likely place that interesting data addressing the research question could be found.

*Question #1: How does a personally meaningful relationship form between user and artifact in the learning experience?*

This research question related to learning through the uniqueness of the artifact, overlapping functionality, enjoyment of the artifact, and expectations and motivations from participants. The following questions respond to this research question:

- 1a. How do you expect (Photoshop, World of Warcraft, or this iPod Touch) to be useful for you?
- 1b. What aspects of the device do you most enjoy?
- 1c. Has learning the device been enjoyable?
- 1d. How has (Photoshop, World of Warcraft, or this iPod Touch) been useful for you?
- 1e. What does this software/device allow you to do that you cannot do any other way?
- 1f. What goals do you have for using the device?

The uniqueness of the artifact was addressed by questions 1e. The enjoyment of the artifact was addressed in questions 1b and 1c. The expectations and motivations were addressed in questions 1a and 1f. While there are no questions that address overlapping functionality, it would occasionally be addressed in 1d.



Question 1a was asked in the first interview of each phase only. Questions 1b, 1c, and 1d were asked in the second and third interviews of each phase only.

Questions 1e and 1f were asked in all interviews.

*Question #2: Does the learning experience change over time or stay static in relation to one's perceived ability to use an artifact?*

This research question related to learning through the changes in use, perception, and in ability and the user's relationship to the artifact. The following questions address this research question:

- 2a. What goals do you have for using the device? Have they changed at all during the course of the study?
- 2b. Have your expectations about the software/device changed at all?
- 2c. Please describe how you relate to the software/device so far. Tell me the overall story of what it has been like learning (Photoshop, World of Warcraft, or an iPod Touch).
- 2d. How strongly would you rate your ability to use this device before using it? On a scale of 1 (lowest) to 5 (highest).
- 2e. What is the likelihood that you will be able to use the device to accomplish all of your important goals? On a scale of 1 to 5.

Questions 2b and 2c describe changes in use and perception with the artifact by the participant. Question 2d describes changes in the participant's ability to use the artifact. Questions 2c and 2e describe changes in relationship to the artifact by the user. Questions 2a, 2b, and 2c were asked in the second and third interviews of each phase only. Questions 2d and 2e were asked in all interviews.

In addition to these questions, the collected Photoshop images as well as the progress of players in WoW were compared.

*Question #3: In what ways does a user need to negotiate with their artifact? In what ways does either the user or artifact control the learning experience?*

This research question related to learning through the problems participants had with the artifact, means to circumvent those problems, level of

control over an artifact, and confidence in using the artifact. The following questions respond to this research question:

- 3a. Do you foresee any obstacles that will hinder your use of the software/device?
- 3b. What resources have been most useful for you in circumventing problems?
- 3c. Do you feel that you will be in control of the technology? How so?
- 3d. How confident do you feel you will be able to learn this?

The problems participants had were addressed in questions 3a. The means to circumvent those problems were addressed most completely in 3b. The level of control over an artifact was addressed in question 3c. The level of confidence was addressed in 3d. Question 3a was asked in the first interview of each phase only, 3b and 3c were asked in all interviews, and 2d was asked in certain debriefing interviews.

### **Shortcomings of the study**

There were some limitations to this study, particularly with regard to the analysis. These limitations may change the interpretation of some of the findings and implications, but none of these limitations were so severe so as to invalidate the study. Some of these limitations are described in a subsection addressing possible conflicting evidence in the next chapter. There are also two important aspects of the study that need to be addressed here as well.

First, the narratives and collected data were never shared or confirmed with the participants. There were two reasons for this. Most importantly, IRB approval was never granted to allow these data or this analysis to be shared with participants after the study was over. The interview sessions and virtual diary were the only approved aspects of this study. Secondly, it was becoming increasingly difficult to reach participants as the last session occurred during finals week before summer. Participation in the study may have been very difficult once the semester was over.

Second, while all efforts were made to preserve the relevant data for analysis, there may be room for disagreement over certain aspects of the analysis. Steps taken to preserve data throughout analysis include collecting all data from participants and saving it for future analysis, providing an organizational scheme that makes it easy to track what participant said which statement in which interview, and attempting to view this problem of *learning-in-use* from as many different perspectives as possible (e.g., using interview, observation, and diary entries for data collection and transcription, field notes, and narrative development for analysis). The researcher made every effort to ensure all important patterns that were present in the data were reported. Nonetheless, there is still an interpretive element to this analysis, and there is still room for other interpretations on these data. Furthermore, some may argue that there should be more codes recorded from the collected data. Following this analytical procedure, though, these were the most salient codes.

Finally, the data of participants who had not completed the study were used in analysis. Though this would not likely have changed the findings of the study, there is the potential that if they had completed every session, they may have had some new or different experience with the artifact.

## **Summary**

In this chapter, the longitudinal study implemented to inquire into the nature of *learning-in-use* was described. It described the study design and the major protocols used to collect data about participant's learning of three artifacts: Photoshop, WoW, and an iPod. This longitudinal study focused on long-term development over the course of two and a half months of personal meaning through use. This development was recorded through experience diary entries from, periodic interviews with, and observation of participants. Participants also had time on their own in which to learn these artifacts. Twelve participants were recruited and selected at random with a range of demographics though all had a technical background. The study was analyzed by transcribing user interview

data, writing narratives for each participant with each artifact they used, and analyzing user work in Photoshop and WoW.



## Chapter 5. Study Findings

This study produced findings that spanned all participants and artifacts. Each artifact contributed its own unique perspective to this study, yet all revealed similar results. In this chapter, the data collected were organized around the three research questions. The codes were interpreted from participants' responses and episodes that occurred during the study and used to address these questions. Each code was described in detail, illustrated through an example in the study, and linked with participants and artifacts to which it applied. Since these research questions were formed loosely around the main concept of *learning-in-use*, there was some overlap in the way in which the codes applied to each question. This means the codes may address multiple questions simultaneously. Nonetheless, codes were placed in the following subsections to correspond with the research question they most logically address.

### **How does a personally meaningful relationship form between user and artifact in the learning experience?**

There were several codes that were relevant to this first research question. The codes applied to findings under this question included anticipating use, the social situation of using an artifact, the uniqueness of an artifact and alternatives to an artifact, sharing experiences, and the depth of experience.

### *Anticipating use*

The first code was anticipating the use of an artifact. Anticipating use centered on instances where a participant mentioned their future use of an artifact. Not only were these future aspects of use mentioned, they would often be accompanied with a position taken by the participant whether positive, neutral, or negative about how that future use is experienced. Positive experiences would reinforce the motivation and interest of the participant, whereas a negative experience might prevent a participant from developing any kind of a relationship. This coding of anticipation occurred for participants one, six, seven, and ten using Photoshop; participants six and twelve using WoW; and participants eleven and twelve using the iPod.

One example of this code in a positive way was participant six's use of WoW. In the first interview, she revealed she had already played the game once before.

- P6: Like once I start playing, I'm like, 'Hells yes, let's play.'  
Like I will take this very. I don't know how many hours I'm supposed to work on this per week, but I will make sure I don't go over those hours. Because it's very easy for me to do that with WoW.
- R: Do you want structure with WoW?
- P6: Haha. I need structure with WoW. Like, like it basically ruined my last, my summer before grad school was wasted on WoW. And it was very fun, and I leveled up a lot of characters and I had a lot of fun. But it's too easy to be very enchanted with this game.

This quote showed her initial interest in the prospect of playing the game again, but also revealed the complication that she needed to learn to manage her time playing this game. She described this as one of her goals for this portion of the study.

Participant one provided a second, negative example of this code. This excerpt was taken from the very end of the first session during the debriefing questions.

- R: How confident do you feel right now that you'll be able to do this?
- P1: You mean accomplish this or be involved and learn the program?
- R: Just like end up where you want to end up with Photoshop.
- P1: I'm divided. Part of me feels like, you know millions of people can learn this, so I ought to be able to. Right now, I don't feel like I have the wherewithal. All the places I have been trying to make it work, I meeting with frustration, so I'm not encouraged. But, I don't think I'm any, I have the ability somewhere in me to find the means into and then get going.

Initially, she was very positive about the prospect of learning to use Photoshop as something she wanted to accomplish for quite some time. However, by the end of the first session, she was already describing her discouragement after trying to learn to use Photoshop and not finding the success that she was looking for.

#### *Social situation of using an artifact*

Participants would make reference to other social groups including friends, roommates, spouses, children, or other users on the Internet. These other people, their perspectives on an artifact, and how they use an artifact all had an important role in how the participant used and learned the artifact. Participants solicited these others for help in learning, invited them to use the artifacts with them socially, and used them as inspiration for their own use when participants observed these others using the artifact as well. Also, participants' use of these artifacts would affect and mediate the relationships the participants had with these others. All of these might then influence the kind of meaning and value a participant has with the artifact. This code of the social situation was recorded for participants two and ten using Photoshop; participants two, eight, nine, and twelve using WoW; and participants five, eight, eleven, and twelve using the iPod.

One example where the social relationship had a positive impact on the participant was for participant eight and her use of WoW. This excerpt was taken from the third interview with the participant.



- R: Oh you made two [characters]?
- P8: Oh actually so, this is my friends account. That's his, that's his player, not mine. Like it's a joint account and I guess you can triple, or yeah, triple the experience if you play together.
- R: Really?
- P8: Yeah. It's pretty cool. I told him it's ridiculous. So, basically when I got to level 60, everything like, He played with me until level 60, so everything was triple experience, so it was really easy. And then from 60 to 69, it just killing me.
- R: Yeah, it gets worse and worse.
- P8: And it's a mage. So I get that.
- R: Yeah you gotta be in a group.
- P8: I'm not really good at playing on, getting hit, getting away from players, so player against player. So every time someone hits me, I give up.
- R: Haha. Yeah.

Her friend played with her through level 60 and then she needed to finish the rest of the levels on her own. The high level progress was especially interesting because early on she rated her interest in playing WoW low<sup>12</sup> because she was not very confident in her ability to play the game to begin the study. So, the social relationship with her friend who knew how to play the game was enough to help her get started to being a competent player in her own right.

An example of a social situation that needed to be handled more delicately was from participant twelve and his use of WoW. This excerpt was taken from his second interview.

- P12: If I spend any less than two hours I don't really feel like I accomplished anything. To do one of the dungeon quests, haha, I started one and my wife was sitting there for quite a while waiting for us to eat dinner, because I wasn't done, and. I mean she was patient and understanding and everything, but it's like, I can't stop, because I'm in this group with four other people, and they're depending upon me. She doesn't understand it. But it's like I felt this

---

<sup>12</sup> She was the lone outlier in terms of her initial interest in playing WoW in the study.

obligation to this group to finish the whole dungeon with them. And it took a lot longer than I had estimated that it would take. It ended up taking another 45 minutes after I thought I would be done with it. So, and you're not aware of the passage of real time when you're in the game. Especially when you're really engrossed in some of those things.

This participant described the balance between his real life obligation to his wife and his in-game obligation to those with whom he was questing. Here was a case of the artifact potentially asserting itself between the participant and his wife.

### *Uniqueness of an artifact and alternatives to an artifact*

The uniqueness of a particular artifact had to do with the unique role a particular artifact played in the life of a participant. The uniqueness of an artifact was recorded based on an experience being unique between that particular artifact only and the user. This was coded for participant three and his use of Photoshop and participant nine and his use of the iPod. The code of alternative to an artifact was closely related to this code, since the presence of alternatives could mean the artifact would be less unique. Alternatives to an artifact were how a participant would describe the other artifacts they have in their lives that already do what a new artifact can do. It reveals overlapping functionality. Most often, the iPod was described in this situation in that it did not offer enough functionality that was not already being offered in other artifacts they used, such as their laptop, other MP3 players, cell phones, and cameras. For WoW participants also, they described other games and other gaming systems they played. The alternatives code was recorded for participants four and nine using WoW as well as participants eight, ten, and twelve using the iPod.

One example of a unique relationship between user and artifact was participant three when he decided to configure Photoshop to effectively support the work he needed to do. This excerpt was taken from the second session with the participant.

R: Are there any new functionalities or features that you've used since we last met?

- P3: No. It's really just different ways that I've used them. Like I'd say the Lens Flare, I've messed around with that a few times. I used that before.
- R: Yeah, you used that last time we met.
- P3: And I've kind of been trying to set up the menu, like the interface in the same way each time that I do it. So I can get accustomed to knowing where everything is at. Kind of like you would set up your desk the same way each place that you go.
- R: That's new? You haven't done that before?
- P3: Well, it's just a different way, I'm going about using the program. I guess, rather than, I like to have everything out and open to begin with, rather than searching for it as I'm doing everything. I guess it's a new attack plan.
- R: Ok. Yeah. So that's very interesting. If I can ask, like what sort of brought that on? Like why did you start doing that now?
- P3: It's kind of an influence of a lot of things outside of Photoshop and this research project of just like being more efficient, I guess, with what I do. And that, it really comes down to seconds whenever you'd be searching for your tool, but it's just a comfort thing, too. More of like an ease of mind thing, I guess.

This participant described the personalization he did, but also described the act of personalization as an action of comfort in addition to efficiency. This participant organized the interfaces in a manner recognizable to him so he could become accustomed to where everything was and fit Photoshop's interface into his workflow.

An example of the alternatives recorded in the study was for participant four and his use of WoW. This was taken from the second interview session with the participant.

- R: Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod I found that my workout routines had changed as a result of bring the iPod with me. So has there been anything like that so far for this?

P4: It hasn't changed. In fact, what it's done is make me more aware of the fact that I wouldn't have chosen to play this game over other games that are more accessible to me. In fact, for example, I think it was a few days ago, knowing that I could play the game and in some ways I should. Actually, the allure of playing PS3 was more attractive to me, and I actually chose to play PS3 than WoW because it felt like I wasn't really going anywhere at that point in time. And I wanted to something quick and I wanted something that I didn't have to immerse myself into as much. So, that really affected the decision and after the fact I reflected on that and maybe that's one of the big issues or barriers that made me not invest as much time as I should have into the game. And I wouldn't say it's a natural, it's an expected outcome of what this game was designed to be, but it was an interesting observation for myself.

R: So it's like a time-management thing?

P3: Yeah.

R: Gave you a different way to look at it?

P3: It was awareness.

Not only were other alternatives attractive to the participant, but his lack of interest in the game was largely because he did not feel he was "going anywhere" in his WoW gameplay. These other alternatives with which he was more familiar and more comfortable became much more attractive sources of entertainment for this participant.

### *Sharing experiences*

On a few occasions, participants who had an experience with their artifact would share the knowledge they gained with others. This experience could be based on specific aspects of an artifact (e.g., how to use its functionality, how to make the best use of artifact for some goal, and so forth). This sharing was tied greatly to the social connectedness above. Those who could integrate the artifact into some social use would be able to share their experience with others, but those who did not, such as in the case of participant twelve and his wife above, could not share the experience in a meaningful way because they did not have any core,

shared experience with that artifact. This code of sharing experience was attached to participant two and his use of Photoshop and participant twelve and his use of WoW.

An example of this code was for participant twelve in relation to the other players with whom he was playing WoW. This was drawn from third interview with this participant.

P9: I kind of found out about it just through interaction. And realizing that something else was going on in the game. That I hadn't, really had the need to know about it. So, now I'm teaching other people about it all the time. I've taught three people in our guild. They didn't know. They were pricing green items too low and they were pricing white items too high and they weren't selling. You know, they just had no idea. That one guy that was using the bank vault. He basically was using the guild vault as a bank tab, because he had so much stuff. And he didn't know. And I looked at him and I'm like, 'Dude you could sell all this stuff, and you could probably just from everything sitting in this one tab, you could probably get 1000 gold from it.' But he didn't.

Soon after learning about the auction house in WoW, where players could sell the items they made or collected, he realized members of the guild with whom he was playing could sell a lot of the unused items the guild collected by selling it on the auction house. He was trying to convey his experience to others, which includes a new-found perspective that items are actually a tradable resource as opposed to just something you collect, new knowledge that the items could be sold for money, transformed values that items *should* be sold as opposed to unused but available, and so forth.

### *The depth of experience*

Participants would frequently refer to deeper, unanswered questions and a more profound appreciation for the artifact they were using. This would occur in use as participants would learn of still more avenues to explore in the artifact. The depth of experience would reveal only more questions about the artifact through exploration. The key for this code was that this depth was not overwhelming. It

was simply a depth that, through further learning, a participant could one day explore. Another reason this depth was coded was when people would either become increasingly interested in how an artifact works or realize the functionality of an artifact can do more than they once thought. In this code, there was some overlap with the next research question as realizing this depth implies a change in time, but also works to make the relationship between user and artifact more meaningful. This code was recorded for participants four and six using Photoshop as well as participants three and eight using WoW. It was also recorded for participant eight using WoW, participant eleven using Photoshop, and participant twelve using the iPod from the sense of understanding or wanting to understand the functionality more deeply.

Participant four described how this depth required him to continue to learn and to engage with Photoshop such that his ability to use the artifact was the same as the previous week even though he had learned more about it since then. There was just much more for him to learn and to master. This excerpt was recorded in the second session with this participant.

- R: How strongly would you rate your ability to use the software having used it for four weeks on a scale of one being the lowest and five being the highest?
- P4: I still want to say three. Because, the more I delve deeper into Photoshop, the more I'm not really I'm feeling I'm knowing the stuff, the power that's under the hood. You know. I probably I will feel like I'm staying at three for a while until I actually get through a whole bunch of different tools.

Participant three, an experienced user of WoW who had played the game since it came out in 2004, described that this particular study of WoW was not engaging for him because he had lost the anticipation, which was described in the code of anticipation above. This excerpt was recorded in the second session with this participant.

- P3: Because I know what's going on, I know what to expect, I know what I have to do. It's kind of like going somewhere for the first time, traveling, you don't know what to expect,

there is an anticipation there. But if you have been there before, you know what to expect, you know the whole drive or flight, you know it's going to be boring.

This participant knew exactly what to anticipate as he played the game, which made the game boring. He had lost some of the surprise that came with playing a game for the first time. The depth of the world in WoW was missing. Later, in the third interview session, the participant revealed there really was not much left to accomplish.

R: How does that make you feel as a learner of the game?

P3: It makes me feel like I accomplished it, like there's not much else I can learn about it. I don't really know as a learner. I feel like anything else they put about I already know, it's just learning the story behind it.

### *Summary*

The question about the formation of personally meaningful relationships has been addressed through coded observations and excerpts from interviews with participants. The codes include anticipating use, the social situation of use, the uniqueness of an artifact or the alternatives that can be used, sharing experiences, and the depth of experience. In the cases of these codes, participants revealed a deeper engagement and articulation of that engagement and experience with the artifact. These artifacts, though, were not used in a vacuum; time was an important factor in how these personally meaningful relationships were formed. This aspect of *learning-in-use* was addressed in the next research question.

### **Does the learning experience change over time or stay static in relation to one's perceived ability to use an artifact?**

In terms of the influence of time in the study, several participants went through positive and negative phases of growth in their relationship with the artifact over time. Several participants experienced the artifact both positively and negatively. The codes recorded to address this research question were an improved articulation about an artifact, changes in an artifact or how it is

perceived, and surpassed and unmet expectations. Also, this question looked at participants' perceived ability to use an artifact. These changes in learning ability over time were also described.

### *Improved articulation about an artifact*

One difference between sessions was an improved ability to talk about the artifact. The way a participant described an artifact would occasionally become more detailed and nuanced. There is a connection with this code and finding depth in an artifact described above as well as realizing something different about an artifact described later. There was a transition when genuinely trying to learn or explore a new artifact from less clarity and more vagueness to more clarity and less vagueness.

The one clear example of this code was recorded with participant two using Photoshop. The following excerpt was taken from the first interview session.

- R: What goals do you have for using the device? What immediate goals do you have?
- P2: Probably learn how to add pictures and make them look nicer. My girlfriend, for example, knows how to use Photoshop. I want to learn how to touch things up and make things look nicer.
- R: Have you ever like done that with her? Or has she mostly just done that by herself?
- P2: She has always done things by herself. I don't think I have ever really been there when she's done that stuff.

Participant two's description of goals for using the artifact was vague about why exactly he wanted to use this artifact even when asked very directly what those goals were. He described wanting to make pictures "look nicer" and "touching things up." His work until that point was at the University Library center helping people format images in Photoshop to print on the plotter. So, even though he did have some experience with Photoshop, he did not yet know exactly what he wanted to do. By the time of the second interview session, the participant was



able to articulate more completely making references to actions he took in Photoshop, using more descriptive terms.

R: What can you do that you can't do in any other way?

P2: Well, it does allow me to modify certain parts of a picture or something like that. For example, like last night, one of the pictures I made was essentially, I took well something sappy and sentimental a picture of myself and my girlfriend. Kept that part colored, but essentially I guess drew around it. and separated the rest of the picture from it. Turned the rest black and white. And you know made that sort of hazy effect on it also. Just to you know do something like and make it little things like that, make things pop out or make things blend in more.

While there is still room for some more clarity, he referenced actual things he did using Photoshop, used emotional terms “sappy” and “sentimental,” described detailed steps he can take, and described his goal in terms that are a little bit more specific.

#### *Changes in an artifact or how it is perceived*

Another code that tracked changes over time was recording changes happening either in the artifact itself, which indirectly altered the participant's perception about an artifact, or in the way the user perceived an artifact. The first instance happened when WoW sent out a patch to update the software midway through the first phase of the study—one of two updates at different times in the phase. The other instance happened when participants were switching between two related interfaces. As these changes occurred, they forced the user to look at the artifact in a new way, though not always positively. This was coded for participants three and six using Photoshop as well as participants four and nine using WoW.

These two WoW players mentioned the aid given to them in completing the game because of the patch to make more progress in the game. Participant nine, in particular, described the way the patch helped him in the third interview session.

- R: What goals do you have for using World of Warcraft and have they changed at all during the course of the study?
- P9: Well, about halfway through when I was having trouble with like the missions and stuff, my goal was just to get it over with. But now, that they have made it easier, it's more enjoyable since they basically tell you where to go for the missions. So my goal.
- R: So, the latest update has made it easier?
- P9: Yeah. A heck of a lot easier. So, yeah, it's more enjoyable and easier to play now.

The patch provided several utilities to make completing quests, which are the main function of the game, much easier. Participant nine described how the new patch transformed the study from a task to be completed into something more enjoyable. Notably, this was not the first patch that the players needed to apply during the study, but this patch specifically changed some of the early tutorials and also provided references in terms of where players needed to go to complete objectives of a quest. It was not until these changes affected their use of the artifact directly that the changes had an impact on their perception.

The next example applied to how participant three would consistency bring up the difference between Photoshop and Illustrator. This excerpt was recorded in the third session.

- R: What would you ideally change about Photoshop?
- P3: I think that it should include its own tutorial.
- R: Ok. How do you think that would be?
- P3: Help option. Like
- R: Like what would the tutorial do?
- P3: Basically, run through what the tools do and what your menu options are...What's the pen tool do. Because it's not just like a click and draw, it's like a click, point and drag, Kind of like Illustrator. A lot of the tools the names of them, you'd think they'd do something different and they don't. Or they don't do what you'd expect them to be. Like from their names...

In other parts of the interviews, participant three described the difficulty he had with transitioning between Illustrator and Photoshop. Here, certain aspects of Photoshop became more meaningful because of the work he did using Illustrator.

### *Surpassed and unmet expectations*

Participants began each phase with certain expectations about an artifact. This was a part of their motivation to use the artifacts. There was some minimal thing the artifact needed to accomplish to be considered useful and worth the effort to learn. The user did not necessarily know how to articulate these expectations at all times, but, despite this lack of articulation, participants could appraise whether an artifact was meeting, surpassing, or falling short of their expectations. This code was also interesting in that there was frequently a period of novelty that needed to subside before participants could make a decision as to whether an artifact would work for them in the way they wanted. So, this code could only be accounted for when looking at changes over the time of use. This code records similar aspects of the learning experience between the codes of anticipation and deepness described in the previous research question, except this code requires the passage of time to be appropriately recorded. The code was recorded for surpassing expectations in the interviews for participants four and eleven using Photoshop, participants nine and twelve using WoW, and participant five using the iPod. The code was recorded for failing to meet expectations for participant eleven using Photoshop, participant nine using WoW as well as participants eight, ten, eleven, and twelve using the iPod.

Participant five provided an interesting example of this code when his expectations about the iPod were surpassed. This excerpt was from the second interview session with this participant.

- R: So please describe how you relate to this device so far. Tell me the overall story of what it has been like learning the iPod Touch.
- P5: It's been pretty easy. I was surprised because I have always been one of those people who has been PC versus, over Mac.

And then, I have been using this, and you know that's one of the things Mac boasts is the whole easy to use stuff. ...So, I feel like it's been very easy to learn how to do most things.

R: So think, can you tell me a story, so you're telling me that, Mac boasts itself as the easy to use, so tell me a story somewhere during the last month where all of sudden that just makes sense to you, or maybe something that sticks out in your mind where suddenly, it just, that impression just became really solid to you.

P5: It's probably when we were doing, when I was putting music on you know this for the first time, CDs. He burned me some CDs and I stuck them on my computer. And there was like. I went to iTunes, and up on one of the toolbars, there was like important CD icon. And I mean you click it and I mean it might have been some menu that I went through I hit ok or something. And it just went through, listed off all the names of the songs as they came through, put 'em all on there, and for like two of them it found artwork online for the songs, and put album artwork with them, and it just started importing all of them. And I'm like, wow, that is really cool.

R: Haha.

P5: That I don't have to deal with you know if a song doesn't with album artwork, it puts it on there, and I don't have to worry about any of it. And it gave me some album artwork. That was probably when I was like this is really easy to use.

Despite associating himself with the PC brand, he realized the iPod was as easy to use as he claimed Apple boasted it to be. His story showed even some small function like automatically updating album artwork for song can have an important impact on the participant's learning experience of an artifact.

A story where expectations went unmet was coded in the third interview with participant eleven using the iPod.

R: What does this device allow you to do that you cannot do in any other way?

P11: Honestly, right now, nothing. I, the usage on it has dwindled for me over the timeframe.

R: I kind of noticed that.

P11: Haha. The [inaudible].

R: It seemed like it went like learning, a little frustrated, excited, happy, and then it's like indifferent.

P11: Haha.

R: Stopping.

P11: I couldn't find things to do with it after a while. that were new. So it just felt like more of a tedious task than anything. So, I didn't it wasn't making anything easy for me, so. You know I just really never used. Well, I tried to use it, but I.

R: Fair enough. Also, notice how I tried phrased that question

P11: Yeah.

R: Just in case, things changed...What goals if you have any still, would you say that you have for the device and have they changed during the course of the study?

P11: Well, they definitely changed during the course of the study. I really towards the end was seeing if this was something that I liked to have. Really, if there was something new that popped up that I would like on it. It's a great device and it did everything I expected it to. It's just for some reason my old habits kinda came into effect and I didn't utilize it. It was really more of a pain to carry around and use than a convenience. If that makes sense.

R: Sure.

P11: I was going to use it to you know track dieting, but it just never got utilized like that.

This participant was trying to see whether this artifact was something he would like to purchase at some point. Describing the iPod as a pain to carry around demonstrated how it had not proven itself to be a worthwhile artifact to keep handy. Furthermore, this participant demonstrated how such appraisal of an artifact can be a very complicated procedure where the participant may, at first, be very interested in it, but ultimately decides not to use it. For example, while the iPod started out by exceeding participant eleven's expectations, it became evident that it failed to fulfill what he was looking for in the artifact. Also, participant nine was becoming disillusioned with WoW because it did not meet his expectations, until the new patch made the game more enjoyable and fulfilling.

This demonstrates that perceptions about an artifact can drastically change over time.

### *Changes in learning ability over time*

Finally, the changes in learning experience were compared with participants' perceived ability to use the artifact as well as the actual progress they made using the artifacts, specifically WoW and Photoshop. While there were no quantitative questions to measure the learning experience, there was a Likert scale question included on the interview protocol that recorded the changes in learning ability. According to the recorded differences in responses to this question, participants rarely changed how they viewed their own abilities on a scale of one to five over the course of the study. Participants reported an average change in the rating they gave their abilities by only 22.8% from the first interview session to the second interview session, and only 9.3% from the second interview session to the final interview session<sup>13</sup>.

The Photoshop images participants created in the interview sessions are demonstrated in Figures 5.1 through 5.7. While there were some improvements in the images, participants largely ended up created the same image each time they performed this task. In Appendix F, the breakdown for the analysis of these images is shown. This analysis shows the change between sessions one and two was only a 16.7% improvement and between sessions two and three was only a 9.4% improvement, though the improvement between sessions one and three (ignoring session two) was 31.7%. By including instances where participants almost completed a feature within the image, the change between sessions one and two was only a 14.8% improvement, and between sessions two and three was only a 13.9% improvement, though the improvement between sessions one and three was 31.2%.

---

<sup>13</sup> The full data from the interview sessions on the ability to use the artifact and the related question of the accomplishment of important goals for the study are found in Appendix E.



Figure 5.1a. Participant two's first attempt during week one. The self-described level of experience prior to the study was 4 out of 7.



Figure 5.1b. Participant two's second attempt during week five.



Figure 5.1c. Participant two's third attempt during week eleven.



Figure 5.2a. Participant three's first attempt during week one. The self-described level of experience prior to the study was 5 out of 7.



Figure 5.2b. Participant three's second attempt during week four.



Figure 5.3a. Participant four's first attempt during week one. He admitted later at the end of the third session he did realize the goal was to make the elephant red. The self-described level of experience prior to the study was 5 out of 7.



Figure 5.4a. Participant six's first attempt during week one. The self-described level of experience prior to the study was 5.5 out of 7.



Figure 5.5a. Participant seven's first attempt during week one. The self-described level of experience prior to the study was 5 out of 7.

Figure 5.3b. Participant four's second attempt during week five.



Figure 5.4b. Participant six's second attempt during week five.

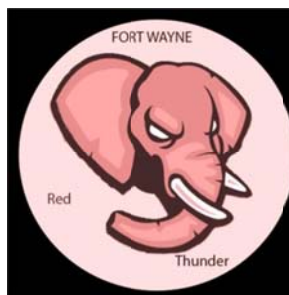


Figure 5.5b. Participant seven's second attempt during week five.

Figure 5.3c. Participant four's third attempt during week eight.



Figure 5.4c. Participant six's third attempt during week ten. She said she purposefully tried to be creative with the final image.



Figure 5.5c. Participant seven's third attempt during week ten.





Figure 5.6a. Participant ten's first attempt during week one. The self-described level of experience prior to the study was 3 out of 7.

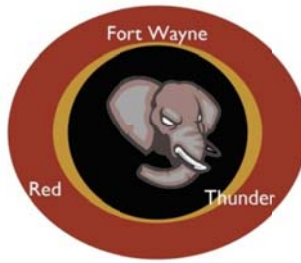


Figure 5.6b. Participant ten's second attempt during week four. Prior to this week, she realized she could use ovals instead of drawing the circle.



Figure 5.6c. Participant ten's third attempt during week eleven.



Figure 5.7a. Participant eleven's first attempt during week one. The self-described level of experience prior to the study was 3 out of 7.

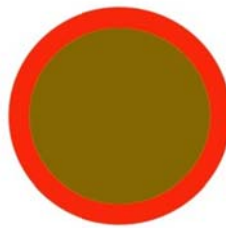


Figure 5.7b. Participant eleven's second attempt during week six.



Figure 5.7c. Participant eleven's third attempt during week ten. There was some improvement as participant mentioned practicing circles on his own.

While participants certainly made some progress and gained some knowledge about these artifacts, there is a strong argument that larger strides were made in the learning experiences of these participants. Several participants decided to stop using the artifacts; others decided that they would like to continue using the artifacts after the study was completed. Participant nine even asked to buy the specific artifact he used in the study, even though there was much still he had not figured out about the artifact due to lack of time. Participants made several comments about how they understood the artifacts, how they worked, and

how they might be used as a result of their learning experiences. So, while an argument can be made for modest improvement in ability to use the artifacts, the participants had important and impactful learning experiences.

### *Summary*

The question on changes in learning experience over time has been recorded through increased ability to articulate about an artifact, changes in perception about an artifact and changes in the artifacts used by participants, and expectations both surpassed and unmet in learning to use an artifact. These codes reveal how certain participants developed a more meaningful relationship with the artifact and how others lost interest in their artifact as a result of the time factor built into this study. Furthermore, while certain participants did have some gain in ability to use the artifact in the study, those gains were generally minimal. There were frequently very wide ranges of learning experiences of participants some of which led to a strong or strengthened relationship between participant and artifact. While this research question has focused on broader, comparative elements within the study, the next research question focuses on more granular episodes as participants negotiated with their artifacts to develop a meaningful relationship with them.

### **In what ways does a user need to negotiate with their artifact? In what ways does either the user or artifact control the learning experience?**

This research question focused on episodes and questions revealing the interactions participants had with their artifacts. These instances include when and how a participant interacted, aspects of the situation influencing an interaction, and managing and maintaining use. The codes recorded that address this research question include leveraging familiarity, identification with a particular brand or platform, usage management, opportunism in use, the fit of an artifact, perspective taking, and control over an artifact.

### *Leveraging familiarity*

Familiarity was the comfort participants had with aspects of an artifact they already knew and with which they had experience. When participants leveraged prior experience, they relied on experience they had with a particular task, other similar artifacts, or just a certain way of thinking about a process. Participants would occasionally look for ways their prior experience could help make sense of a learning situation. This familiarity was a basis from which new learning could take place. This code was recorded for participants one, four, and six using Photoshop; participant twelve using WoW; and participant seven using the iPod.

One example where this code was recorded was for participant four and his use of Photoshop. This excerpt was taken from the debriefing questions at the end of the second interview session.

- R: Can you walk through, you know you tried to figure out how to put the text on a path a bunch of times. And you actually backed off and said ok well, “Here’s this option and it will make it a lot easier and a lot quicker.” How come you went first to do that sort of text on a pathway as opposed to just looking at what kind of options do I have with the text?
- P4: Right. I guess my mind just went with what whatever I remembered from the past project, which obviously I confused it with what Photoshop could do with text and I also probably forgot that I could do this when I did this same exercise in the past. And so, it’s only after maybe just fooling around a little bit with like just the text and realizing that in front of me was this little option, Oh text for a pathway, Morphing the text. Why didn’t I remember that? So I it was a realization that it wasn’t a function that I used often enough to remember. Which I should now for the next time we do this.

This participant was describing his experience of one of the Photoshop tasks. The task was to put the text on a curve around the outer circle as seen in Figure 4.2. The participant started to put the text on a path, which required him to read tutorials about how to do this on Google. Before he finished, he remembered there

was an option in the text creation window that would allow him to bend the text to closely approximate the curve. He remembered this due to his past experience working with Photoshop. Participant six also using Photoshop described a similar experience in interview session two.

R: Any new features or functions that you used today that you haven't seen or used before?

P6: You know stuff, but you forget that you know stuff. And you are constantly making distinctions of like, "Oh, yeah, Oh yeah, that is how you do that," so I don't think I really learned, nothing is new, new...

R: Sort of like rediscovering some stuff?

P6: I don't even like the term rediscovering, ...but it's like reminding.

### *Identification with a particular brand or platforms*

Closely related to the leveraging of experience was participants' identification with particular brands or platforms. This brand identification was usually stated in the first session. Participants would say they were a *PC* person, as opposed to a *Mac* person, or a *console* game player, as opposed to a *PC* game player. These identifications not only associated the participant with one type of brand—usually the opposite of the artifact they were using—but, also, shaped the kind of expectations about the experience they would have with the artifact. In the case where participant twelve identified with the brand of the artifact, he knew he could trust that product. The brand identification code was recorded for participants six and nine using WoW as well as participants five, eight, ten, and twelve using the iPod.

This code was recorded for participant ten and her use of her iPod in the first interview session.

R: Do you feel you will be in control of the technology and how so?

P10: Not really. Because I can't change the technology and I can't modify the technology. It's an out-of-box experience. I can't do anything about it. So, yeah, there's no doubt that people

aren't in control of this technology when they use it. But that's the Apple experience. They promise it works the first time through.

R: Could you just describe to me what you think, like how you would define control in this context?

P10: It's the ability to own the device, the ability to say I'll do with it what I want. And you can't do that in Apple devices.

The participant described her perspective about what she expected from any Apple product she used. She described using an artifact of this brand as not in her control. This participant would eventually stop using the artifact by the end of the second interview.

Participant six and her use of WoW was also given this code. This excerpt was from the first interview.

P6: I grew up with a little bit of PC gaming. I'm not a big PC gamer. I don't like it as much.

R: Ok. Why is that?

P6: Well I say, that in theory. I don't know. I like little mini-games. I don't, like I don't like WoW because it takes, it sucks up so much time of my life.

In this excerpt, the participant linked not liking WoW and other PC gaming with the idea of these games monopolizing all of her time. This brand identification, then, became linked with her goal of enjoying the game, but making sure she could manage the amount of time she played it.

### *Usage management*

Usage management addressed how participants dealt with monitoring and managing their usage of an artifact. Some participants (e.g., participant six), alluded to in the last example, would actively try to restrict the amount of time spent using or learning an artifact. Others would describe how they felt they had not put enough time into learning the artifact between sessions. Participants recognized that to make progress in learning the artifact, they needed to commit themselves and their time toward learning the artifact. Finally, this code was

about setting boundaries between the artifact and the individual. If these boundaries were not managed, or not even monitored, a user could spend a great deal more or less time than they intended using the artifact. This code of needing to make time to learn and use an artifact was recorded for participants one, two, and eleven using Photoshop; participants four, five, six, and eight using WoW; and participants eight and eleven using the iPod.

There were two interesting examples of this code from the interviews. The first example was from participant nine and his use of the iPod in the second interview.

P9: I don't have much music on there, compared to what I actually have stored at home. So, I'm going to try to add more music to it.

R: Why is that? Why haven't you already added the music [inaudible]?

P9: I've just kind of had a busy schedule and I haven't added set aside the time to do it. And I kind of want to go through and not just add, like I've got full CDs, and I don't want to add a full CDs. I want to go through and get songs that I like off of those and just. And just kind of focus it down and get songs that I actually really enjoy and want to listen to.

R: Ok. So, it's not just a blind dump. [inaudible]?

P9: Right. Right.

The participant described how setting up the artifact to work for him would take some investment of time on his part. The time required was not just time to passively engage with the artifact, but it was also the time he needed to spend *concentrating* on whether he wanted to include particular music on the iPod or not.

The second example was from participant eleven describing the decline of his usage of Photoshop. This was taken from the third interview.

R: What goals do you have for the software? And have they changed at all over the course of the study?

P11: They have changed. I wanted to be kind of an expert at it by the end of the study, and now, I just, I want to know some of the basic features. That's what it's kind of shown me is that, I didn't know anything about it. Which I thought I already knew the basics of it.

R: Ok. Did you really think that you could be an expert or were you just hoping you could be an expert?

P11: I was, I guess it was more towards I thought I would be. Because I thought I'd put in more time into it and I thought it would be easier to learn. But I didn't put in the time, that I should have to become an expert.

R: Ok. What prevented you from putting in the time?

P11: I guess just lack of interest. I never got interested in the program. Like I thought I would. I thought I would kind of get lost in it. Just browse the internet and tweak things.

In this example, the participant related not putting the necessary time towards learning the artifact with a lack of interest and the difficulty of using the artifact. His goal of becoming an expert was stymied in part because the program was more complex and required more time than he originally thought it would take.

### *Opportunism in use*

Complicating the situations recorded under the previous code was that the way participants would use their artifacts was very opportunistic. This opportunistic code recorded situations where learning was not well-planned. Participants would learn the artifact when they had time and were interested in furthering their understanding about it. The previous example of participant eleven underestimating what he needed to commit to this relationship with the artifact demonstrates this code well. Other participants that were recorded with this code include participant one using Photoshop as well as participant three, five, eight using WoW.

This opportunism might also extend into the way the participants would use the artifact as well. Participants would often use trial and error as opposed to well-planned strategies to use the artifact effectively in a given situation. They would rely on feedback from the artifact to guide their future actions without any

real plan as to what they were trying to achieve. This code was also recorded for participants six and ten using Photoshop in these conditions.

Participant eight demonstrated an example of this code when playing WoW in the third interview.

R: Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod Touch, excuse me when I got a new iPod, I found that my workout routines had changed as a result of bring the iPod with me. So has there been any routines that you have that have changed?

P8: I mean at the very beginning when I did this, I just like whenever I had time, or bored, I do it. Now, I feel like I play it every, I get, and sometimes even make time to play this. I guess this game is addicting. Sometimes, I even bring, like my friend asks me to spend time with her, and I bring my laptop to the library to play.

R: Ok. Ok. So that's a big change.

P8: Uh-huh.

This participant demonstrated that too little control over the opportunism with which one uses an artifact like this can lead to time management problems. She described how the game started to fill up more of her time than when she first started playing.

Another example of the opportunism of use was from the second type of opportunism where participants would opportunistically apply various actions until they found something that worked. This excerpt was from the debriefing session at the end of the second interview with participant ten using Photoshop.

R: Do you have an overarching strategy? And how do you evaluate your actions against that strategy if you have one?

P10: I really have no strategy. If I do have a strategy, it would be when I sit down at Photoshop, I don't ever get stymied. Like with the outline, I was like, well, this is hard, so I'm going to do something different. But my, I mean, if I, I guess it's more of a goal then a strategy.



R: Ok. So, it's interesting because, sorry, sorry, you were going to say something else.

P10: I was done.

R: So you were talking about the button, and when you first loaded up you're like, I'm not going to worry about the bevel basically.

P10: Yeah.

R: And then you got the basic shaped down, then you went back and you figured out the bevel. So how did you determine to stick with that problem and not stick through the outline or something like that.

P10: Well, putting the bevel on the button was something that needed to be done. And I realized that the outline on the scoreboard was not something that didn't need to be done because we have the background for our website. So the background provides a border.

This participant was trying to add bevel to an image for a website she was designing as part of a team project for one of her classes. As she was working on the bevel, she realized what she was working on was already being accomplished by another part of the image. This deviation in strategy required her to keep much less of the grand scheme of what she was trying to accomplish in her head as she was actively engaged with Photoshop freeing her to concentrate on only the most important aspects of what she was doing.

### *Fit of an artifact*

The fit of an artifact code was recorded to mark when participants mentioned the relationships between their needs and what the artifacts could do or the roles the artifacts could fill. This relationship often had a great deal to do with the goals users had set for themselves. Whether there was a good fit between participants' needs and what artifacts could offer had an impact on the meaningful relationship that could develop between participants and artifacts. Often, this fit would only be realized through a process of discovery with the artifact and trial and error. The participant would try to use the artifact to fill the needs they had, which would either fill that role successfully or unsuccessfully. This code was

recorded for participant eleven using Photoshop; participants six and eight using WoW; and participants eight, nine, and ten using the iPod.

There is one good example of this code from participant eleven describing his use of Photoshop in the second interview.

R: What does the software allow you to do that you cannot do in any other way?

P11: Ok. Like I think I said before, I was kind of interested in it as far as my wife uses it a lot to photo edit. That was my original thought was that I might be able to help her out in the business. But, as far as that goes, it might be further questions, so. She just has certain ways she wants to do things. So, I'm just backing off on that.

In this excerpt, participant eleven described that due to his evolving understanding of what Photoshop can and cannot do and the way that his wife works, he was not be able to help her in her business, which was one of his original goals. As such, this fit or role for Photoshop was not going to be possible for this participant and may have played some role in his loss of interest in this artifact.

### *Perspective taking*

Perspective taking had to do with the various point of views participants had with their artifacts. This code signified changes due to anything from making mistakes and misunderstandings to participants finding ways to work around their problems, finding a way to avoid stalling their progress in learning the artifact, or using trial and error to test different strategies. These different perspectives could be beneficial or detrimental to the progress on learning to use the artifact, but changes in these perspectives often took place in later interview sessions as people would realize there was a different way to look at problems they have been coping with in the study. These changes in perspective revealed maturing views on the artifact. Participants that were recorded under this code include participants four, six, ten, and eleven using Photoshop; participants four, six, eight, nine, and twelve using WoW; and participants five, eight, nine, eleven, and twelve using the iPod.

There were three examples of this code, which each described a different form of perspective taking needed. The first one was from participant nine's second interview using WoW.

- R: What goals do you have for using World of Warcraft and have they changed at all during the course of the study?
- P9: I don't believe they really changed. I mean I'm still trying to figure out what everything is, because for one I mean the world is quite large and I haven't gotten around too much. And Just trying to do as many missions as I can. But even that gets confusing because I don't really know where it's telling me to go. So basically just, yeah, that
- R: So around the quests really?
- P9: Yeah. That and building my character because I have seen a couple characters running around the map and I noticed one was slightly or I thought was slightly weaker than me. So, I decided to duel and got my ass kicked.
- R: Haha.
- P9: So yeah, that taught me not to mess around with other people too much, but at least I didn't have to go find my body after that.

In this example, participant nine described the kinds of limitations he had with the game. As he learned to play the game, he judged he was ready to try to fight other human-controlled characters, since most of the missions only have players fight computer-controlled characters. So, after this first encounter fighting another human, he realized that fighting other human characters was to be avoided. In realizing this, he was able to narrow his focus on tasks that he knew he was capable of achieving. Although, these limitations can change over time and later in the game, if the study was allowed to continue, he may realize that he is capable of taking on other human characters.

The second example was from participant ten using Photoshop in the second interview.

- R: That was the other thing I was going to ask you about your diary because you started talking about you found another

way to do the color changer. Could you talk a little bit about that?

P10: Both, one person, we were trying to change colors, there were three of us and each of us knew a different way to do it.

R: Oh. So you learned from other people?

P10: Yeah.

This demonstrated that through interacting with other people who use and know Photoshop and seeing their process, she was able to realize this new way of changing colors. This process was noteworthy enough to be recorded by this participant in the virtual diary system.

The last example is an episode from the second interview with participant five.

R: What goals do you have for using the device?

P5: Huh. The number one goal right now is to get software on it so that I can do, so that I can download apps.

R: And how have your goals changed during the study?

P5: Uhm. At first it was, it was just, uh, you know, I want to use it so that I cannot be bored on the way to class and stuff. And then I found out about the whole, uhm, 'it costs money to upgrade software to the new firmwares.' And, until then I can't download apps and stuff. So, I've been looking online at a bunch of different ways to get the software for free.

The participant described his goal as being connected to downloading new firmware for the iPod because he believed he could not download new apps without it, which was a major driving force for him to use this artifact.

R: Ok. For, For our activity, let's just try to do that this time. Uhm. So, let's start with the objective that you will find some application that's free and try to download it.

P5: ...There's a game on the computer called 'Bubble Spinner,' that I play on the computer. So I'll search for that. [he searches for it]. Bubble Spinner Lite. Addicting Games.com. Free...And, I hit install. Oh, this application can only be used on an iPhone. So, that's not the same problem I was having before. So, I'll go to the one that I know doesn't work, it's the one that I really want....NBA, Game, then, Lite. And I hit Free, Free, Install...then

it gives me the error that I have been coming with, 'the application requires the iPhone 3.0 software update.' Huh? I actually haven't been seeing the iPhone error, I have just been seeing this one. And, uh, it makes, you know when I started thinking about it, I was ticked off. You know it makes sense why the error is there, because before Will gave the iPod to me, he wiped the iPod. I could tell that because like there was nothing on it. So, obviously the firmware got wiped too... And there are a lot of apps that you can't use without the software updates, and if you don't have any software updates you can't use any of them. And I told Will that I was uncomfortable spending money for this if I wasn't keeping this, you know it's a personal thing. And he said, you know, it's fine...

R: Is there a circumstance where maybe it's just this game that requires the 3.0?

P5: Yeah I've seen that. Well I guess I've only tried a couple things. I'll just start trying things I guess. Who knows? This one requires 3, ah, iPhone 3.1 software update, which is the newest one. The other one just required 3.0. So, [inaudible]. 3.0. Uhm, there's one my brother has, this one app. That I remember him having for a long time. I don't remember what it's called. It's the lighter one, where you just have a lighter on the screen and that's it. And, I wonder. I mean, that's as simple as it gets, right? So, maybe. Oh!...It's going to let me download it. I haven't the slightest clue what [my account password] is. But, it's a positive thing, because I can, at least I know now that there are some apps that I can download.

The researcher asked the participant to confirm the error downloading apps was a system-wide problem, which would be necessary to attribute the problems to firmware issues, and not just for these two particular apps he was trying to download. He finally finds an app that *could* be downloaded on the artifact and realized that he was just looking at apps that could not work on this kind of artifact; this was not a problem with the artifact itself. This shift in perspective helped him realize there was more he could do with this artifact than he previously realized changing his relationship and goals, once again, for it.

### *Control over an artifact*

The last code was one in which the participant and artifact asserted their roles in the relationship. This code described participants' responses about the amount of control they had over the relationship with the artifact. Some participants felt they had total control over the artifact. Others felt they had little control over the artifact. Still others described a balanced relationship where both artifact and participant asserted their control over the relationship. Referring to chapter three, the concept of *learning-in-use* is formed by a co-shaping of experience between both user and artifact. Nonetheless, what was recorded in this code demonstrated participants' responses of their *perception* of that control. This code was recorded for participant one, three, and ten using Photoshop; participant nine using WoW; and participant seven using the iPod.

There were two examples that stood on two opposite ends of the spectrum of responses. The first excerpt was from participant three from the second interview using Photoshop.

R: Do you feel you were in control of the software and how so?

P3: I feel like in a sense it's controlling me, in what I'm able to use and my capabilities to a very far extent. In another sense, I control it as far as what I want to put on the page, it doesn't automatically put things on there, I have to choose what effects I want on the image. But I think I touched on it last time, of the potential restrictiveness of the program. That's just something I've talked about in a class before.

This participant drawing on his experience mentioned while Photoshop required his input, there was still a great deal of restrictiveness of the program that was outside of his control. The capabilities Photoshop provided for him limited him in addition to enhancing his abilities.

The second example from participant ten and her use of Photoshop demonstrated the opposite point of view on this code of control over artifacts.

R: What aspect of the software do you find the most enjoyable?

P10: Changing colors around on stuff is pretty cool

R: Like.

P10: It's a tool. I use it like a tool... Is a hammer enjoyable?  
Perhaps for some people.

Unlike participant three who looked at the restriction of the program as preventing him from controlling the artifact completely, participant ten viewed Photoshop as a tool. Not only did this shape her confidence in her ability and how she used the artifact, but it also shaped the kind of relationship she had with the artifact (e.g., using an artifact like Photoshop is not meant to be experienced as enjoyable, but rather productive).

Finally, in a very unique situation, the iPod that participant seven was using stopped working properly. She was no longer able to use the home button, which reduced the functionality of this device. This excerpt was taken from the third session with this participant demonstrating the lack of control the participant had with the artifact.

R: Did you feel that you were in control of the device? How so?

P7: I was really frustrated when I couldn't get the home button to work. So, I just really didn't feel like I'm in control of the device.

### *Summary*

These codes demonstrated the process of negotiation participants went through as they tried to learn these artifacts. The codes used to address the research question about how users negotiate with the artifact and how they control or are controlled by the artifact included leveraging familiarity, identification with a brand or platform, usage management, opportunism, the fit of an artifact, perspective taking, and control over an artifact. Each of these codes recorded how the artifact first came to be appreciated by participants, how and when participants arranged time to learn and use the artifact, and the role the artifact played in *learning-in-use*. Although these codes often captured a variety of different examples—often conflicting—of *learning-in-use*, this demonstrates

there is no one right way users go about learning these artifacts, and all these codes lead to a variety of different learning experiences.

### **Addressing potential counter-evidence**

There were twelve participants who took part in this study and not all uniformly experienced these codes nor could they all experience these codes. These codes emerged depending on factors including the user, the level of prior experience, the artifact used, the social situation, and the general context of use. Each particular code emerged as a result of these factors in interaction with each other to varying degrees. There certainly are some aspects of the findings that deserve some attention as potential counter evidence.

There were certainly other factors that became important for learning to use *interactive artifacts* that were not covered from an *experiential* perspective. For example, the knowledge gained as a result of using the artifact was not observed, recorded, or compared with the findings in this study. There were a few questions relating to ability and the progress made in addressing the second research question above. However, there is still room for a more expansive collection of information relating to the knowledge gained as compared to the experience of using these artifacts. Especially in WoW but, also, in Photoshop, participants assuredly gained knowledge as they explored the artifacts and progressed in their ability to complete more complex tasks with them. Perhaps, participants who did not achieve that payoff of some concrete learning gain did not feel as positively about their experience with the artifact than they would have been if they had gained more knowledge. This would require future research on this topic and represents a limitation of the collected data.

One example from the research demonstrated another potential type of counter evidence. This was from participant ten in third interview session using Photoshop.

P10: It's interesting that you have all these questions in your survey that keep trying to get at some kind of emotional



relationship with software. I mean, I have emotional relationships with some pieces of software that I use very often. It's just,

R: And this is not one of them?

P10: No. Were you looking at that in the study or is that an HCI thing?

R: Well. I'm honestly looking at what your responses are. And believe it or not, I'm actually learning a lot about your particular perspective about this.

P10: Cool, thanks.

R: The one thing that I will say is that everyone is different, everyone approaches it in some form. You may not say there is relationship, but you obviously there is a way that you interface with the software.

P10: Right.

R: And the way that you approach that software by you is that it's a hammer. But other people define that relationship differently.

In this excerpt, the participant tried to read into a question about having an emotional relationship with the artifact by presupposing that everyone *should* have an emotional relationship with Photoshop. To steer the direction back to the questions and assure the participant her perspective mattered, the researcher explained every participant will experience the artifact differently and this study aimed to understand that experience and relationship as it happens in participants' use of those artifacts. This excerpt summarizes the intention of the data collection: to represent participants' experiences faithfully.

Based on the findings, there is still a great deal of evidence supporting the notion of a learning experience as demonstrated through *learning-in-use*. This exploratory research has been offered as a first step towards clarifying the learning experience as it occurs in users' changing relationships with their artifacts. Despite this potential counter-evidence, the codes presented in this chapter supported through observation and interview with users of real artifacts provide a good foundation for understanding the concept of *learning-in-use*.

## Summary

This chapter presented the findings from the five-month study on *learning-in-use*. It focused on the three research questions presented in chapter one. Each question was addressed by finding relevant codes with respect to the formation of a personally meaningful relationship, changes over time, and the negotiation between user and artifact. From interview data and through the support of observation of relevant episodes of use, fifteen codes were recorded describing evidence of *learning-in-use* of participants during the study. These codes become the building blocks for four *phenomena of learning-in-use* that emerged from the study described in the next chapter.



## Chapter 6. Discussion on Learning-in-Use

The codes recorded in the last chapter describe observations and interview excerpts about the behaviors, attitudes, and relationships participants had with the artifacts. These codes described some of the nuance observed, but there is more that can be learned about the codes' relationships with each other. First, the codes were organized to address the research questions. This organization is described in terms of the individual codes addressing the research question and what these codes when analyzed as a whole reveal about the question. Second, these codes shared certain similarities with each other. Through a process of categorization across all these research questions, four new *phenomena* are described that are central to *learning-in-use*: *grasping*, *situating*, *perceiving-in-use*, and *making meaning*. These two interpretive processes of the codes shed more light on this concept and its application in interaction design.

These two interpretive processes represent the two purposes of this chapter. First, each research question was reviewed, and what can be learned about the three aspects of *learning-in-use* of the personally meaningful relationships, the time factor, and negotiation with artifacts was derived from the codes. Second, the four *phenomena* found from the study, how they were derived from the codes, and what they mean for *learning-in-use* was described. A two-dimensional scale was also presented, describing the scope of each *phenomenon*. These scales were also derived from the codes. The findings from the research

questions and the *phenomena* represent the major contribution of this dissertation. They will be reviewed in more detail in the final chapter.

### **Research questions**

Based on the data and findings, certain conclusions can be reached about the three research questions, which represent three of the four important aspects of *learning-in-use* described in chapter three. In this section, each code was reviewed in terms of the role it plays in addressing the research questions. General conclusions about each research question were discussed based on the findings from the study.

*How does a personally meaningful relationship form between user and artifact in the learning experience?*

The personally meaningful relationship was described as how users relate to the artifact based on their history with it. It is the way a particular artifact had a meaning unique to the individual who uses it. There were five codes recorded to address how this personally meaningful relationship was formed between participant and artifact including anticipating use, social situation of using an artifact, sharing experience, uniqueness of and alternatives to an artifact, and depth of experience.

The anticipating use code demonstrated a personally meaningful relationship forms by using an artifact, but also by thinking about using it. Anticipation linked present use with the possible outcomes of learning an artifact. This anticipation drove some of the initial positive motivations when an artifact was still novel. Once that anticipation diminished, participants often lost their interest in learning more about the artifact even though they may continue to use it based on functionality.

The social situation code described how having a strong social support network will reinforce the learning experience. Even users who learned to use artifacts in isolation at some point interacted with others because of this artifact.

They may go online to read a quest walk-through for WoW, they may use Photoshop in a class or project setting, or they may share music with their friends through iTunes using their iPod. Not having this social support led to situations where one cannot progress as far in their understanding about an artifact. The learning experience could not be as strong because it was not integrated into the user's life as in the case of someone who does engage in the artifact socially.

The sharing of experience code was closely tied to the social experience and to the fact that the user had an experience from which others could benefit. Sharing an experience was a way that users not only helped or provided a new perspective for other users, but also consolidated an experience for themselves.

The uniqueness of and alternative to artifacts code demonstrated the interconnectedness of other artifacts. Again, all of these artifacts were entangled in the everyday experience a user had with the world. For a user to experience an artifact strongly, an artifact needed to offer something they could not get in any other way in the other artifacts they own. This may be a functional relationship, an emotional relationship, or a relationship that allowed the user to change a perspective on some activity. In any case, the artifact needed to be able to offer something unique from the user's perspective.

Finally, the depth of experience code related to the artifact itself. As a user learned and used an artifact more, did the artifact reveal more modes of inquiry or did it reveal the limits of what one can do? This depth of an artifact revealed the underlying meaning found within an application. This depth did not have to come solely from having many features, but could come from the kind of activities one could engage in with an artifact.

These codes demonstrated that the formation of a personally meaningful relationship starts with the perspective (e.g., based on prior experience, needs, and desires) from which the user approaches learning to use the artifact, but quickly leads to an interaction between what the user wants to do and what the artifact can do, how it allows the user to do it, and how it reveals what it can do to the user.

This relationship also must fit correctly within the social and artifactual context in which users find themselves. Most importantly, this relationship is formed between artifacts that can fill a unique role to their users.

*Does the learning experience change over time or stay static in relation to one's perceived ability to use an artifact?*

This question inquired into how learning experiences, due to the various internal and external factors that constitute an experience, changed over the *lifecycle* of use of an artifact. While knowledge and skills about an artifact changed over this time period, the learning experience did not increase, but rather was *different*. This experience was responsive to the current needs of the user and the current functionalities an artifact afforded. The codes recorded to address this research question include improved articulation about an artifact, changes in an artifact or how it is perceived, and surpassed and unmet expectations. In addition to these codes, a comparison was made between the way the participants perceived their abilities to use these artifacts changed over time and the way that learning experience changed over time.

An improved articulation over time showed that, through using an artifact, users can talk about the artifact in more detail. This included being able to articulate one's own needs and goals, to articulate what an artifact can do and how, and to articulate the learning experience with more detail. When starting to use an artifact for the first time, for certain participants, their reasons for being motivated to learn the artifact were often not well specified and were very general. As these participants progressed through the study, they were able to use more detail in their descriptions of it. This increased detail showed a deeper understanding and knowledge of the artifact as well as the fact that the user is more engaged in their learning experience with the artifact.

Changes in the artifact or how it is perceived were at the core of these changes over time rather than just being a consequence of them. When either the user changed the way they perceived an artifact, or when the artifact itself

changed, this directly altered the relationship a user had with the artifact. In many cases, this change was positive; these changes led to improved learning experiences with the artifact. Often, though, these changes made the learning experience more difficult as what was already known had to be unlearned and users needed to reorient to this new way of thinking about or using the artifact. Whether the experience was positive or negative depended on the experience the user had with the artifact before the change.

Over time, users reflected on using the artifact and whether it has met, surpassed, or fallen short of the expectations they had. Even the most ardent user when the artifact is still novel may realize an artifact no longer has the value it once had. On the other hand, an artifact may surprise its user. There are often aspects of the artifact learned only through using the artifact over time. The realization of how an artifact does or does not meet one's expectations can have important consequences to the kind of relationship a user can develop with their artifact.

Finally, with regard to the comparison of changes to the perceived ability to use an artifact and changes to the learning experience, users achieved minimal gains in their perceived ability to use the artifact, while demonstrating changes in their learning experience. This study demonstrated, at the very least, these two aspects of learning are distinct from each other. One can make very little progress, but have a meaningful relationship with an artifact; one can also make a great deal of progress, but have no real improvement in their relationship with the artifact.

The influence time has on the development of a personally meaningful relationship cannot be understood through a single point in time. Furthermore, it is difficult to understand the nuances of the relationship through only two points in time. To completely understand the learning experience of a user over time, researchers must be prepared to track users' relationships through multiple points in time and through different time scales. Over time, changes will occur to the situations in which users find themselves and the time they can devote to learning



an artifact, the motivations they have to learning an artifact, and, subsequently, the way they view their relationships with the artifacts. These codes demonstrate the use of an *interactive artifact* can grow and mature for the user just as the user grows and matures.

*In what ways does a user need to negotiate with their artifact? In what ways does either the user or artifact control the learning experience?*

This final research question explored the way both users and artifacts had control over the learning experience. The question also addressed the ways in which users need to orient their perspective with the way the artifact works. The learning experience emerges for the user through negotiation with their artifact. The recorded codes that addressed this research question included leveraging familiarity with an artifact, identifying with a particular brand or platform, managing one's usage of an artifact, learning opportunistically, appraising the fit of an artifact for a user's needs, perspective taking, and controlling an artifact.

Familiarity revealed what users are comfortable with exploring. Users focused on aspects of an artifact with which they are familiar. Only gradually and for specific reasons will users explore beyond aspects with which they are familiar for risk of becoming overwhelmed. Rarely did users try out some functionality that was completely new. One participant made a huge step in the functionality used by exploring the three-dimensional tools in Photoshop after only using the two-dimensional tools; although, this behavior was a rare occurrence. Most users looked for tools that match the way they were used to solving problems or doing activities with other similar artifacts.

The brand or platform with which the user identified played into users' familiarity with artifacts. The exception is that this code described much stronger and more rapid appraisals shaping the user's experience. With such brand and platforms, users associated trustworthiness or untrustworthiness in addition to a particular pattern of use to which the user must conform. The brand or platform

can often have effects on the learning experience before the user even starts using the artifact.

Usage management described users' recognition of the amount of time needed to learn an artifact. This amount of time depended entirely on users' goals. Having a strong relationship with an artifact may not take much physical time, but may take time for the user both to adapt the technology to their circumstances and orient their way of thinking to the artifact. Finally, usage management depended on the perspective of that user about the work they did with the artifact. Work that could be attributed to training for school or career would be easier to engage with than work that is just for entertainment; this sentiment, though, depended on the individual as well.

Learning opportunistically means users rarely planned when or how they would learn or use the artifact. In terms of developing a relationship with the artifact, learning always happened *in use* as opposed to *in study*. Users may learn sequences of commands, shortcuts, or menu items in the interface by taking a class or reading a tutorial, but the participant needed to engage with the software to have a learning experience and develop a meaningful relationship with the artifact. It is only in using the artifact that one realizes what they need to learn.

The fit of an artifact described negotiations that align the functionality of the artifact with the needs of the user. While it may not always be clear to users how an artifact fitted their needs, the fit played an important role in determining whether an artifact was worth investing more of the user's resources into it.

Perspective taking when negotiating with the artifact allowed flexibility in how the user learned to use an artifact. This perspective taking was responsible for the mistakes that people made in using an artifact and for allowing users to find ways to work around or solve those problems. Perspective taking was also responsible for allowing users to use the artifact in new ways unforeseen by the designers. Perspective taking was what allows artifacts to take on a variety of

different meanings in different circumstances to different people, but still allowed these people to share their experience with each other.

Finally, the control over an artifact code described the perceived control the user had over an artifact. This perception changed the emotional experience a user had with the artifact, the confidence a user had in using the artifact, and the expected outcomes of using an artifact.

Negotiations between user and artifact required some compromise. Even in cases where users believe they had total control, they needed to play by *the rules* of the artifact. The artifacts also derive meaning only through the activities for which users used them. That meaning is formed in relation to what the user knew and was familiar with, but can also force the user to take new perspectives that may lead to new uses. This did not happen as a conscious decision by the user, but rather as a result of using the artifact within a particular context. Being *in use* gives *learning-in-use* its meaning.

#### **Four phenomena of learning-in-use**

The second grouping of codes that revealed meaningful relationships in *learning-in-use* was of four phenomenological categories that influenced the learning experience in some way for participants of this study. These *phenomena* included *grasping*, *situating*, *perceiving-in-use*, and *making meaning*. Each represented changes to the meaningful relationship a user formed through *learning-in-use* with an artifact. It had a direct connection with the *intentional* relations created by a user as a result of a learning experience.

In *grasping*, a user learning to use an artifact exhibited behaviors of someone who is proceeding through an unfamiliar environment trying to establish meaning for the artifact. As the user's knowledge of an artifact expanded, the user's use was characterized by familiarity, but opened still new unfamiliar uses to pursue through *grasping* as new needs and desires for the artifact emerged for the user. In *situating*, the user looked for a fit of the artifact into their everyday lives giving meaning to the artifact in relation to other artifacts the user used and

activities in which the user engaged. In *perceiving-in-use*, users who strengthen their relationship with their artifact progressively relied on an artifact to become a mediating tool. This mediation affected the way a user perceived and thought about their use of an artifact and co-shaped the meaning of the learning experience. Finally, in *making meaning*, users attempted to consolidate experiences as they happened to make sense of the situation. This *phenomenon* operated as a mechanism to make knowledge about an experience and to share that knowledge with others.

### *Grasping*

The *phenomenon* of *grasping* had to do with users proceeding through unfamiliar situations while using an artifact. When learning something new, unfamiliar situations can be fairly common. Learning, then, is about how these unfamiliar situations can be approached and made familiar. While this *grasping phenomenon* occurs most frequently when a novice first uses an artifact, even an experienced user can still experience this *phenomenon*. Experienced users can push themselves to learn even more about their experience with an artifact. These users, who have a meaningful relationship with the artifact, can always find more to learn about the artifact. Finally, users experiencing *grasping* do not always seek to remove all aspects of uncertainty because that may also remove aspects of surprise and enjoyment. *Grasping* acts as a means for users to map out the possibilities of use of an artifact. It provides an initial impulse towards the act of learning for participants to learn more about the artifact. *Grasping* is the catalyst of *learning-in-use* that perturbs the stable state of users who are familiar with aspects of an artifact into learning aspects with which they are unfamiliar.

*Grasping* is drawn from the codes of anticipation of use, learning opportunistically, leveraging familiarity with an artifact, identification with a particular brand or platform, and perspective taking. These codes demonstrate the user perspective when faced with a situation that is not immediately obvious. Under the circumstances leading to these codes, users were challenged to form a

coherent relationship in spite of an artifact that was not entirely known, had a vague sense about why they wanted to use the artifact, and faced a situation that was constantly changing. The user tentatively approached learning an artifact on an as needed basis, and, when needed, learning was approached on the basis of which gaps needed to be covered based on the user's needs.

The two-dimensional scale for the *phenomenon* of *grasping*, which describes the extremes of this *phenomenon*, had axes of the level of familiarity of an artifact and how enjoyable an artifact was. For this first axis of familiarity, the functional axis, participants fluctuated between the unfamiliar and the familiar. The second axis, the evaluative axis, describes two extremes between how enjoyable or how monotonous or overwhelming an artifact was. Figure 6.1 demonstrates this scale for grasping including the participants who exhibited behaviors in each of the four quadrants.

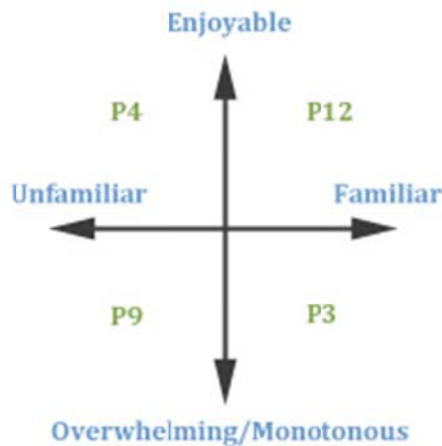


Figure 6.1. Two-dimensional scale of *grasping* with axes of familiarity and enjoyability.

Participant four exhibited characteristics of unfamiliar and enjoyable, found in the top left quadrant, after realizing how much more there is to know about Photoshop than he first thought. Participant twelve had a familiar and enjoyable experience, found in the top right quadrant, when he encountered the auction house in WoW and realized the similarities it shared with eBay, a website he used frequently. Participant three exhibited characteristics of familiar and monotonous, found in the bottom right quadrant, when describing how WoW had

lost some of the allure it once had. Finally, participant nine initially described an experience of unfamiliar and overwhelming, found in the bottom left quadrant, as he described having great difficulty before the patch was installed in terms of figuring out where to go and what to do in WoW.

*Grasping* relates to the theoretical research on *learning-in-use* as an intentional relationship that is in doubt. Given the outcome of an activity as partly defined by the user and partly defined by the artifact, the user must trust what the artifact is going to do in relation to one's own activities. The development of such trust is an inherent part of a growing relationship with the artifact. If a user trusts an artifact will reliably be available for some action, a user can focus attention towards areas of uncertainty. *Grasping* also relates closely with the Heideggerian concept of *thrownness* imported into interaction design by Winograd and Flores (1986). *Thrownness* relates to a condition where a user can only have an incomplete knowledge, but despite this lack of knowledge, the user must still take some action to address emerging needs. The sense of trust describes the relationship between internal factors and external factors (Dewey, 1938). This sense of trust is at the heart of what makes meaningful relationships possible with artifacts.

### *Situating*

The *situating phenomenon* involved how users would situate artifacts in their lives in terms of when to use the artifact, how to use the artifact in relation to other artifacts, and how the artifact functioned within users' daily routines. When learning about an artifact, participants would often acknowledge obstacles to learning the device besides potential lack of experience or lack of motivation. Frequently, other commitments might get in the way of spending time with the artifact, even when the participant was motivated to learn. *Situating* was ultimately about bringing the artifact into one's own life. This *situating* involves finding time to use and learn the artifact, finding the right fit of the artifact, and finding activities in which to use the artifact. *Learning-in-use* describes learning

as not just about acquiring knowledge, but also how a specific artifact becomes situated and used in one's life, which is crucial in identifying the underlying meaning by a user for an artifact.

The codes from which this *phenomenon* was derived were the social situation of using an artifact, uniqueness of or alternatives to an artifact, surpassed and unmet expectations, managing one's usage of an artifact, learning opportunistically, and appraising the fit of an artifact for a user's needs. These codes all refer to the situation of the user whether that situation is social, temporal, artifactual, and personal in nature. Assigning meaning is a complex process formed in some part by the relationships and meanings that a user has already formed. It is the result of the navigation and negotiation of a user, his situation, and the artifact that is being learned. This *situating* is about integrating the personally meaningful relationship a user develops with one artifact with the other commitments the user has made already.

The two-dimensional scale for this *phenomenon* had a functional axis of opportunities for use and an evaluative axis of fit of the artifact. As for the axis of opportunities of use, at one extreme, participants found it difficult to spend time using the artifact due to other circumstances, while, at the other extreme, some participants found they were spending more time than intended using the artifacts. The axis of the fit of the artifact related to the issue of situating how the artifact fit to the needs that they had, which may change over the course of use of the artifact. Figure 6.2 shows this scale and the participants that demonstrated the four extremes.



Figure 6.2. Two-dimensional scale of *situating* with axes of opportunity and fit of artifact.

Participant nine exhibited characteristics of no opportunity to use the artifact but a good fit for it, found in the top left quadrant, demonstrating that while he liked the iPod he was using enough to buy it, he was not able to devote the time needed to learn to use it more deeply. Participant eight's experience could be classified as not being able to stop using an artifact and a good fit for it, found in the top right quadrant, because of how she thought she might be addicted to WoW but still found the game useful as a way to entertain herself and learn about advanced technology among other things<sup>14</sup>. Participant six reveals an experience of cannot stop using the artifact but bad fit, found in the bottom right quadrant, in the way she discussed her struggle of situating her gameplay of WoW with her school commitments. She played a great deal initially, but, toward the end, nearly stopped playing the game due to school requirements, revealing that she had not been able to find that balance. Finally, participant eleven demonstrated an experience of cannot find time to use the artifact and bad fit, found in the bottom left quadrant. Once he realized he was not going to be able to use the artifact to help his wife's business, his time spent learning Photoshop subsided.

---

<sup>14</sup> These other things—not listed in the findings but recorded in Appendix C—included using it as a way to connect with a friend that she thought was withdrawing socially and to be more open herself socially as she described herself as being more reserved in person.



*Situating* relates to the theoretical research on *learning-in-use* by building on the idea of *Dasien* (Winograd & Flores, 1986) in experiential philosophy. *Dasien* becomes situated in the world as the user engages with the artifact in an environment. These activities are not a discrete part of experience, but are wrapped up in a continuous, on-going experience of the world as part of that engagement (Dewey, 1938; McCarthy & Wright, 2006). Part of the learning experience then is on situating the use of a new artifact within a user's larger on-going experience. This means it must fit within various technological, social, cultural, physical, and temporal constraints as defined by the user's own situation as well as within the prior experience that a user brings to an artifact.

#### *Perceiving-in-use*

*Perceiving-in-use* described how engaging with artifacts affects the way users perceive activities for which they use the artifacts, the problems users can solve, and the usefulness of certain artifacts over others. As participants used these artifacts, what they saw and how they saw the world were transformed in several cases. The transformative effects of *perceiving-in-use* affect both perception and action. The artifacts will both shape how users perceive the artifact and how they use it. WoW mediates both actions and perceptions through the fictionalized world the game developers created. Photoshop augments a visual artist's ability to create art as well as aiding in the process of deconstruction of an image through the tools provided. On the iPod, mobility and interactivity transforms the way a user interacts with the media they put on the artifact as well as other information in the world.

The codes from which *perceiving-in-use* is derived include changes in an artifact and how it is perceived, surpassed and unmet expectations, perspective taking, and controlling an artifact. All of these related to a user's engagement with an artifact and the activity for which the artifact is used. They all also dealt with the realizations that participants had about the artifact and the activity. As participants *learned-in-use*, perception and action subtly changed to account for

the way the artifact addressed, or did not address, the needs of the user in use. With *perceiving-in-use*, the relationship between user and activity is fundamentally altered because of the artifact.

The two-dimensional scale of *perceiving-in-use* had a functional axis of the perception of control over an artifact and the evaluative axis of the promise of functionality by an artifact. The axis of the perception of control over an artifact varied from those who believed they were in control of it and those who did not believe they were in control at all. The axis of the promise of functionality described how effective or ineffective the artifact was at performing what it promised in its functionality from the perspective of the user. Figure 6.3 illustrates this scale.



Figure 6.3. Two-dimensional scale of *perceiving-in-use* with axes of perceived control and promised functionality.

Participant three demonstrated a lack of control but effective relationship with the artifact, found in the top left quadrant, in his description of Photoshop as a useful artifact for his work, even though he greatly relied on what the artifact could do for him. Participant ten exhibited characteristics of total control and effective relationship with the artifact, found in the top right quadrant, arguing that Photoshop was a tool and, hence, can only be appraised on the merits of its usefulness as a tool. Participant one had an experience that can be described as total control but ineffective, found in the bottom right quadrant. She mentioned

that since millions have been able to learn it, she believed she should be able to as well, even though this study was not conducive for that. Finally, participant seven revealed an experience of lacking control and ineffective relationship with the artifact, found in the bottom left quadrant, because her iPod stopped working properly preventing her from using it the way she wanted.

With regard to the theoretical development of *learning-in-use*, the connection of *perceiving-in-use* to this literature is through the notion of *technological intentionality* (Ihde, 1990; Verbeek, 2005). The *phenomenon* of *perceiving-in-use* was not about only being able to do new things a user could not do before, but rather these new capabilities led to new orientations and new ways of seeing the problems they had and activities in which they engaged. *Perceiving-in-use* describes how artifacts mediate what users of the artifacts see and how they see it. This is not to claim it is in total control of that view. This is to claim between each artifact-user coupling the issue of intentionality and how meaning is to be ascribed through use of these artifacts is shaped by both the user and the artifact.

### *Making meaning*

The *phenomenon* of *making meaning* is about trying to rationalize through an experience, relating it to previous experiences, and making new knowledge. *Making meaning* is not a linear process, as there may be several inconsistent beliefs the user must address. Participants experiencing this *phenomenon* attempt to interpret and understand the situation of use by assigning meaning or enhancing meaning of an experience. It is about attempting to consolidate an on-going experience as it happens.

The recorded codes from which *making meaning* was derived include sharing experience, depth of experience, improved articulation about an artifact, surpassed and unmet expectations, leveraging familiarity with an artifact, and perspective taking. Each of these codes refers to the internal consolidation and rectification of new experiences in the way they relate to previous experiences.

There are also several codes (e.g., sharing experience and improved articulation) that deal with the outward expression of new knowledge. This consolidation of new knowledge often occurs in relation to mistakes as demonstrated by the code perspective taking. Those mistakes can lead to new perspectives in addition to new knowledge. This *phenomenon* is about the transformation of the individual through new learning experiences and opportunities to apply what is learned through these learning experiences.

The two-dimensional scale of *making meaning* has a functional axis of the apparent complexity of meaning and an evaluative axis of comprehensibility of the artifact. Participants experienced the apparent complexity of meaning as how simple and straightforward or how complicated an artifact is and how deep one can go in exploring the intricacies of the artifact. This complexity may not represent whether an artifact's interface is simple or complex itself, but it describes the entire experience of the user of the artifact when using that artifact. The comprehensibility of the artifact represents whether or not the artifact makes sense in relation to one's prior experience. One extreme is when a learning experience resonates with prior experience and the other extreme is when the learning experience contrasts with prior experience. Figure 6.4 shows this scale.

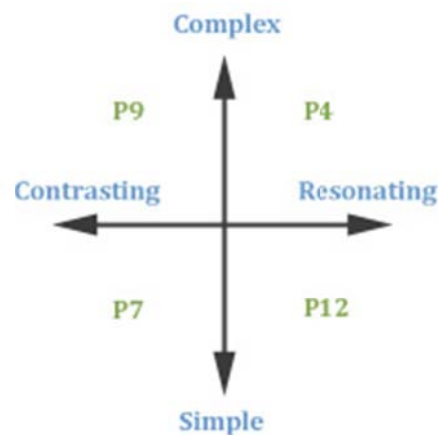


Figure 6.4. Two-dimensional scale of *making meaning* with axes of comprehensibility and apparent complexity.

Participant nine initially demonstrated an experience that was both contrasting with prior experience and complex, found in the top left quadrant. He demonstrated his confusion over the expansive world in WoW where he struggled to figure out what to do next in the game. Participant four exhibited characteristics of his experience resonating with prior experience and complex, found in the top right quadrant, when he mentioned how he gained a deeper appreciation for Photoshop because the more he learned about it the more he realized there was to know. Participant twelve described an experience that resonated with prior experience and was relatively simple, found in the bottom right quadrant of resonating and simple, by attempting to leverage the Auction House according to what he knows about eBay and markets in general. He claims that he knows the basic rules to use the auctioning system in WoW very effectively. Finally, participant seven revealed characteristics of an experience contrasting with prior experience even though the experience could be described as simple, found in the bottom left quadrant. She struggled when the home button on her iPod stopped working. She was left without any idea or prior experience about how to use it since so much of the interaction with the iPod relied on using that home button.

This *phenomenon* of *making meaning* relates to the literature on *learning-in-use* through intentional systems (Dennett, 1971). The *making meaning phenomenon* relates to the process of understanding, sense-making, and interpreting when learning to use an *interactive artifact*. This *phenomenon* relates an experience in which a user is engaged with everything a user knows and believes. In *learning-in-use*, *making meaning* is the glue that holds experience and knowledge together. It helps to consolidate knowledge about an artifact through experiences with that artifact. Finally, it plays an integral role in the establishment of personally meaningful relationships between users and artifacts.

## **Summary**

This chapter described two groupings of the discovered codes reported on in chapter five. The first grouping was used to respond to the research questions

that were driving this research. From the standpoint of the meaningful relationship with the artifact, this relationship developed from the standpoint of possibilities based on the user, their experience, and their situation. From the standpoint of time and its relationship with *learning-in-use*, learning was an ongoing activity that did not end when one *mastered* their artifact. It required consistent effort by a user to maintain one's meaningful relationship with that artifact. From the standpoint of negotiation with and control over an artifact, the *in use* aspect of *learning-in-use* was crucial for having a meaningful learning experience. Tutorials and other external artifacts did not lead to exactly the same learning. Furthermore, this negotiation required that a user must make compromises to make an artifact work for them.

The second grouping revealed four *phenomena of learning-in-use* including *grasping*, *situating*, *perceiving-in-use*, and *making meaning*. Each demonstrated how the meaningful relationship changed through the course of using an artifact for participants as revealed through the codes. *Grasping* related to the transition between unfamiliarity to familiarity with an experience and the trust users placed in the tools that lead them through such familiarity. *Situating* dealt with the appropriation of a tool such that it fitted within the lifestyle and environment that a user constructed for himself or herself. *Perceiving-in-use* occurred in situations where an artifact transformed the experience of the user to extend and enhance a user's abilities through use of the artifact. Finally, *making meaning* had to do with the consolidation of ongoing experience through interpretation and judgment toward the construction of new knowledge about an artifact. Two-dimensional scales, which further characterized the phenomena, described the extreme cases observed within each *phenomenon*. These scales are described in Figure 6.5.

		Two-Dimensional Scales	
		Functional Axis	Evaluative Axis
Phenomena	Grasping	familiarity	enjoyability
	Situating	opportunity	fit to needs
	Perceiving-in-use	mediating control	functionality
	Making meaning	apparent complexity	comprehensibility

Figure 6.5. Four phenomena of learning-in-use separated by scales.

## Chapter 7. Learning-in-Use: Lessons and Looking Forward

The purpose of this dissertation was to shed light on an alternative way to look at learning through an *experiential* perspective. Through a theoretical and empirical investigation, the importance of understanding the learning experience has been demonstrated by the concept of *learning-in-use*. This study has demonstrated that a relationship forms when users engage in learning with an artifact distinct from the knowledge gained about an artifact (e.g., a user can learn very little about an artifact, yet develop a strong relationship with it). This relationship is unique to the individual given his or her background experiences and life situation. A strong relationship with the artifact becomes a great motivating resource for encouraging users to continue learning and deepening their relationship with it. Over time, this relationship can change for a variety of reasons. There were four observed phenomena that promote such change in this relationship including *grasping*, *situating*, *perceiving-in-use*, and *making meaning*. These phenomena emerge in engaged use with the artifact and result from a negotiation in interaction between user and artifact. Both co-shape the user's learning experience.

The key point made in this dissertation is that learning is not just a process to acquire a new set of objective, factual knowledge, but it also involves developing a meaningful relationship with an artifact and having a learning experience that reinforces this relationship over time. Learning is not a zero-sum activity. Learning, dynamic in nature, involves the user moving through a series of transformative events that enhance his or her ability as a consumer, user of



technology, and citizen of the information age. Several good examples of this point occurred for participants using the iPod even when nothing was apparently learned. The majority of the participants using the iPod had no difficulty using it their first time with it<sup>15</sup> and had no concrete goals in the content of their learning. However, in interviewing the participants, rich interaction and relationships had developed because of the iPod's presence. Participant eleven was able to use it as a distraction for his children on road-trips. This participant had gained this knowledge, but simultaneously it enhanced the value and worth of the artifact to him because of that knowledge. Participant five learned that there were only certain apps he could download to the artifact without voiding the warranty or paying for a new operating system. Once he realized this, he certainly learned some new knowledge about the compatibility of apps with the iPod; although, this realization also changed the way the artifact was available to him. Unlike his initial intention driving his interest in the artifact, not all apps he wanted were available for him. Participant ten and her problems with importing video onto the artifact made her realize there were only certain file types that work on the iPod, which reinforced her opinion about the artifact and the Apple brand. Learning is not just a process for acquiring knowledge, but also for users to orient themselves towards the artifact using the affordances it provides and for users to situate the artifact into their broader lives. Learning is about gaining knowledge, but *also* about forming relationships.

This chapter contains an overview of the argument, main contributions, and future work on this topic of the learning experience and *learning-in-use*. First, the three contributions of this dissertation and their implications for interaction design research are described. Second, a *definition of learning-in-use* is given, combining the theoretical and empirical findings together. Third, the experiential perspective and the role that it played in this study is briefly overviewed. Finally, some initial ideas for future research on these topics are presented.

---

<sup>15</sup> This ease-of-use was with exception in the case of setting up email accounts for a few participants and participant seven whose iPod stopped working properly.

## Contribution

There have been three major contributions of this dissertation in the area of learning to use *interactive artifacts* in interaction design. The first contribution was a theoretical investigation into the nature of learning in interaction design. These findings demonstrated that through the use of different methods and approaches as well as different philosophical orientations, different researchers were able to answer different types of problems. The dissertation described five different perspectives on this topic in the field of interaction design including *cognitive, representational, constructivist, situated, and experiential* perspectives. This last perspective has had little treatment with respect to the topic of learning, but has had an influence on the field as a whole and has made great improvements in research on education theory.

The second contribution was a theoretical and empirical inquiry into the learning experience through the concept of *learning-in-use*. This concept drew on similar approaches of experiential philosophy and experiential learning in studies on education and learning. The concept distinguishes itself from similar concepts, such as *learning in use* (Bødker & Petersen, 2000), because of differences in aspects like the relation of usability to learning, the foundation of meaning in motivation versus intentionality, the role of mastery in learning, the co-shaping of experience by both user and artifact, the transparency of use of an artifact, and sociocentric versus egocentric learning. *Learning-in-use* is about the formation of a personally meaningful relationship with an artifact over the *lifecycle* of an artifact through engaged interaction and negotiation with the artifact. The dissertation introduced a study focused on expanding this notion empirically. The findings in this study confirmed and extended the description of *learning-in-use* as participants learned to use two of three different artifacts for a period of five months. A definition of *learning-in-use* is provided in the next section.

The third contribution was the introduction of the *experiential* perspective, introduced in other learning disciplines and more generally in interaction design,

to the study of the learning experience. The *experiential* perspective was core to the philosophy underlying this dissertation. It has allowed for a rich perspective based on the intentional relationship between user and artifact. The efficacy of this approach is examined in more detail further below.

### **Defining learning-in-use**

The following definition has been organized from the theoretical and empirical study of the learning experience and *learning-in-use*. This definition represents the findings of this dissertation and may be extended or altered through future research. The researcher has acknowledged that there were a few shortcomings in the study including not sharing this definition and other analyses with participants, allowing for the potential of alternate interpretations on the analysis, and the fact that three of twelve participants did not participate in the study through completion. These concerns have been addressed in chapter four. Nevertheless, this definition holds based on the empirical and theoretical work of this dissertation.

*Learning-in-use* is the immediate, ongoing learning experience by users of artifacts over the entire *lifecycle* of use. These experiences encompass the internal, subjective feelings and external, objective behaviors of users. *Learning-in-use* is present in users' learning through the personally meaningful relationships they develop with artifacts. In *learning-in-use*, users negotiate with artifacts such that both artifact and user co-shape the learning experience, allowing use to adapt to changing user needs and situations in addition to any changes in the artifact.

Within *learning-in-use*, users seek to negotiate these relationships to be stable, familiar, and habitual. Successful *learning-in-use* is achieved when users address their needs and find such a stable state. Genuine *learning-in-use*, though, requires venturing outside of what is familiar.

Artifacts, by their nature, are multistable, which means they contain multiple valid stable states of use. These different states serve different users with different needs in different situations. *Learning-in-use* allows artifacts to serve these different states through loose coupling, allowing users both to transparently

engage with artifacts and form new relationships with these artifacts when the need arises.

Users engaged in *learning-in-use*—outside of their habituated activity—experience phenomena of *grasping* at a relationship with the artifact; *situating* the artifact in their lives; having changed *perception-in-use*, allowing them to see problems and tasks differently *through* the artifact; and *making new meaning* to share and form new knowledge about these artifacts. These changes relate to potential improvements in these meaningful relationships but may also demonstrate areas of insufficient interaction between user and artifact if *learning-in-use* is unsuccessful. Such changes take place in users only when they actively engage with artifacts.

### **Evaluating the experiential perspective**

The *experiential* perspective has been instrumental in focusing on *learning-in-use* and the learning experience. While being established in the field, this dissertation is the first attempt to apply this perspective to the topic of learning to use *interactive artifacts*. Phenomenological methods were used to understand *learning-in-use* because it allowed for deep, latent structures to be revealed about the intentionality of the learning situation as participants interacted with real artifacts they were motivated to learn. The purpose of this study was to understand important themes of each participant's use and encourage participants to share *their* meanings about the artifacts with the researcher in rich description. Participants would respond to the structured questions, but frequently participants themselves would explain or demonstrate something they learned. Sometimes, the questions would prompt their memories about something they wanted to share, but often they would explain these *newfound* things before the interview started. Furthermore, the study took place over several sessions increasing the likelihood with which participants could become more familiar with the study format and more open with the researcher.

Furthermore, the experiential approach allowed meaning to be co-constructed between participant and researcher. Not only could users share meanings about the artifact, but the researcher could also verify those meanings with participants as they were recorded. This requires the researcher to approach

the interviews and observation with openness about what is observed. This seems most closely to align the concept of the phenomenological reduction in phenomenological research (Moustakas, 1994). Phenomenological reduction implies that researchers unencumber themselves by bracketing, or suspending, the issue of objectivity in their approach. In this sense, both researcher and participant have equal roles in constructing the experience as it occurs in the learning situation. This openness is fundamental to the phenomenological methodology and *experiential* perspective.

Despite the richness produced by the *experiential* perspective, it does have legitimate limitations that may prevent it from achieving widespread acceptance. Most notably, the *experiential* perspective works completely within the subjective experience of participants. Objective factors may be interesting, but only insofar as they contribute to the meaning of the experience they generate (Ihde, 1986). As such, the experiential account is not generalizable in the sense that the *cognitivist*, *representational*, *constructivist*, and occasionally *situational* accounts may be. Experiential accounts can be used as exemplars or case studies for making arguments about the interaction between the objective, physical world of artifacts and the subjective, experiential world of users in the act of using. Also, *experiential* approaches are very time-consuming. This is primarily because of the amount of time researchers and participants must interact with each other to develop the kind of rapport conducive to co-constructing the meaning of experience. Although *experiential* accounts do not need to be longitudinal as this study was, the amount of data that needs to be collected and analyzed in *experiential* studies is enormous and may be too extensive for practitioners to engage in. Furthermore, the training required to effectively elicit meaning from users from an *experiential* perspective also leads to a barrier for using this approach.

## Future directions

The next steps in the work in this dissertation involve expanding on *learning-in-use* in three particular directions. The first direction consists of understanding how *learning-in-use* applies to situations where users already own the artifacts rather than being given the artifacts before the study. When a user owns the artifacts prior to the study, the use patterns and motivations should be somewhat different and using the artifacts will not be directly tied to completing the study as it was in this dissertation. The next step of this study, then, would be to analyze the way the major findings of *learning-in-use* happen when users are using *their* artifacts. Do the findings hold or does the real world play by a different set of rules?

The second direction consists of understanding the design of *interactive artifacts* in relation to *learning-in-use*. In what ways can designers make use of *learning-in-use* or the *four phenomena of learning-in-use* to improve the design of *interactive artifacts*? Designers can have only an indirect control of how learning happens and how it is meaningful for users when it does. Nonetheless, researchers can provide new tools and techniques and identify existing tools and techniques that allow designers to effectively design for positive learning experiences. Also, this direction can inquire into how tools that help support the learning experience relate to tools that help support knowledge and skill acquisition. What are the implications for trying to influence the way users *learn-in-use*?

The final direction focuses on specific aspects of the findings from the study. The first aspect is the relation of the overall familiarity of an artifact and the likelihood with which a user engages an artifact and the level of confidence they have in learning the artifact. Familiarity *seemed* to be connected with comfort and confidence in one's ability. Part of the background level of comfort and encouragement to start exploring new aspects of an artifact was how familiar an artifact was as a whole. If users are very familiar with an artifact, then they may be more likely to try to learn more about an artifact. In this sense, a certain

base level of comfort aids users both in learning something new about an artifact and in deepening their relationship with the artifact.

The next aspect is the role mastery has over an artifact affects the learning experience of the user. This dissertation has stated that the learning experience does not conclude when a user masters an artifact. However, there does seem to be a qualitative difference between the way users think about, use, and describe their use when they have many years of experience as opposed to when they have very little experience with an artifact. This direction would analyze such differences by grouping people by levels of experience with one artifact. This grouping would need to take into account not just the amount of time using the artifact, but also some observable quality in the production or performance with the artifact. Such a study would need to record descriptions of users' perceptions of the artifact, how they use the artifact, the work produced with the artifact, the process of using artifact, and the way the user interfaces with the artifact on a daily basis.

Finally, the last aspect that could be studied in more detail would be to understand the role perspective plays in learning artifacts in *learning-in-use*. Multistability, which is the presence of multiple stable ways of perceiving the use of an artifact, is a foundational principle of *learning-in-use*. A study classifying the ways users perceive their artifacts and the extent to which those perceptions are stable could further this understanding of *learning-in-use*. Such a study could record an episode description; classification of the perspective change by the user, such as mistake, workaround, realization, and so forth; description of emotional experience; and, ideally, a screenshot or key log of what happened in the artifact.

## Summary

The purpose of the dissertation has been to explore *learning-in-use* to address the learning experience as users engage with their *interactive artifacts* through personally meaningful relationships negotiated over the *lifecycle* of that

artifact. Learning has been conceptualized beyond knowledge acquisition to include an experiential component and as an ongoing process even after the user has mastered the artifact. *Learning-in-use* is a complex interaction between users and their artifacts. So much of learning is, in fact, about a personally meaningful relationship that forms between users and artifact. There is much more to learn about the concept of *learning-in-use*, but this dissertation provides the initial step toward its study.



## References

- Bannon, L. J., & Bødker, S. (1991). Beyond the interface: Encountering artifacts in use. In J. Carroll (Ed.), *Designing Interaction: Psychology at the human-computer interface*. New York: Cambridge University Press.
- Bardram, J., & Bertelsen, O. W. (1995). Supporting the development of transparent interaction. *EWHCI*. Moscow, Russia. 79-90.
- Bauer, E., & Tomlinson, B. (2007). Questioning the technological panacea: Three reflective questions for designers. In *Extended Abstracts of CHI 2007*.
- Bell, G., Blythe, M., & Sengers, P. (2005). Making by making strange: Defamiliarization and the design of domestic technologies. *TOCHI*, 12(2), 149-173.
- Benyon, D., Turner, P., & Turner, S. (2005). *Designing Interactive Systems: People, Activities, Contexts, Technologies*. Essex, England: Pearson Education Limited.
- Beyer, H., & Holtzblatt, K. (1997). *Contextual Design: Defining Customer-Centered Systems*. San Francisco: Morgan Kaufmann Publishers.
- Blevins, E. (2007). Sustainable interaction design: Invention & disposal, renewal & reuse. In the *Proceedings of the SIGCHI conference on Human Factors in Computing Systems*. 503-512. San Jose, CA.
- Borgmann, A. (1984). *Technology and the Character of the Good Life*. Chicago: University of Chicago Press.
- Brodersen, C., & Kristensen, J. F. (2004). Interaction through negotiation. In *Proceedings of NordiCHI '04*, 259-268.
- Brown, J. S., Collins, A., & Duguid, P. (1989) Situated cognition and the culture of learning. *Educational Researcher*, 18, 32-42.

- Bødker, S., & Petersen, M. (2000). Design for learning in use. *Scandinavian Journal of Information Science*, 12, 61-80.
- Card, S., Moran, T. P., & Newell, A. (1983). *The Psychology of Human-Computer Interaction*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Carroll, J. M. (1990). The Nurnberg Funnel: Designing Minimalist Instruction for Practical Computer Skill. Cambridge: MIT Press.
- Carroll, J. M. (2003). Introduction: Toward a multidisciplinary science of human-computer interaction. In J. M. Carroll (Ed.), *HCI Models, Theories, and Frameworks: Toward a Multidisciplinary Science* (pp. 1-9). San Francisco: Morgan Kaufmann Publishers.
- Carroll, J. M., & Carrithers, C. (1984). Training wheels in a user interface. *Communications of the ACM*, 27(8), 800-806.
- Carroll, J. M., & Mack, R. L. (1999). Metaphor, computing systems, and active learning. *Int. Jour. HCI*, 51(2), 385-403.
- Carroll, J. M., Mack, R. L., Lewis, C. H., Grischkowsky, N. L., & Robertson, S. R. (1985). Exploring exploring a word processor. *Human-Computer Interaction*, 1, 283-307.
- Chandler, P., & Sweller, J. (1999). Cognitive load while learning to use a computer program. *Applied Cognitive Psychology*, 10(2), 151-170.
- Choi, J., & Sato, K. (2008). Interaction as learning process: Incorporating domain knowledge into system use. In *Proceedings of 5th NordiCHI*. Lund, Sweden, 73-82.
- Cockton, G. (2006). Designing worth is worth designing. In *Proceedings of NordiCHI 2006*, Oslo, Norway, 165-174.
- Cooper, A., Reimann, R., & Cronin, D. (2007). *About Face 3: The Essentials of Interaction Design*. Indianapolis, IN: Wiley Publishing, Inc.
- Coyne, R. (1995). Designing Information Technology in the Postmodern Age: From Method to Metaphor. Cambridge, MA: MIT Press.
- Croon Fors, A. (2006). Being-with Information Technology: Critical Explorations Beyond Use and Design. Ph.D. Thesis. Umeå University, Sweden.
- Day, G. S. (1981). The product life cycle: Analysis and applications issues. *The Journal of Marketing*, 45(4), 60-67.
- de Sousa, C. S. (2005). The Semiotic Engineer of Human-Computer Interaction. Cambridge: MIT Press

- Dennett, D. C. (1971). Intentional systems. *The Journal of Philosophy*, 68(4), 87-106.
- Dennett, D. C. (2003). Who's on first? Heterophenomenology explained. *Journal of Consciousness Studies*, 10, 19-30.
- Dennett, D. C. (2007). Heterophenomenology reconsidered. *Phenomenology and the Cognitive Sciences*, 6(1 & 2), 247-270.
- Dewey, J. (1938). *Experience & Education*. New York: Touchstone.
- Dewey, J. (1944). *Democracy and Education: An Introduction to the Philosophy of Education*. New York: The Free Press.
- Dourish, P. (2001). *Where the Action Is: The Foundations of Embodied Interaction*. Cambridge, MA: MIT Press.
- Engeström, Y. (1987). *Learning by Expanding*. Orienta-Konsultit, Helsinki, Finland.
- Folcher, V. (2003). Appropriating artifacts as instruments: when design-for-use meets design-in-use. *Interacting with Computers*, 15, 647-663.
- Forlizzi, J., Ford, S. (2000). The building blocks of experience: an early framework for interaction designers. In *Proceedings of DIS 2000*, New York, 419-423.
- Gaver, W. W., Beaver, J., & Benford, S. (2003). Ambiguity as a Resource for Design. In *Proceedings of CHI 2003*, Ft. Lauderdale, FL, 233-240.
- Gaver, W., Sengers, P., Kerridge, T., Kaye, J., & Bowers, J. (2007). Enhancing ubiquitous computing with user interpretation: Field testing the home health horoscope. In *Proceedings of CHI 2003*, San Jose, CA, 537-546.
- Goodman, J. S., & Blum, T. C. (1996). Assessing the non-random sampling effects of subject attrition in longitudinal research. *Journal of Management*, 22(4), 627-652.
- Grudin, J. (2005). Three faces of Human-Computer Interaction. *IEEE Annals of the History of Computing*, 27(4), 46-62.
- Harper, R., Rodden, T., Rogers, Y., and Sellen, A. (2008). *Being Human: Human-Computer Interaction in the Year 2020*. Cambridge, UK: Microsoft Research, Cambridge.
- Harrison, S., Tatar, D., & Sengers, P. (2007). The three paradigms of HCI. In *Proceedings of alt.chi 2007*. San Jose, CA.
- Hilpinen, R. (Fall, 2008). Artifact. In E. N. Zalta (Ed.), *The Stanford*

*Encyclopedia of Philosophy (Fall 2008 Edition)*. Accessed October 29, 2009 from <http://plato.stanford.edu/archives/fall2008/entries/artifact/>.

- Ihde, D. (1986). *Experimental Phenomenology: An Introduction*. Albany, NY: SUNY Press.
- Ihde, D. (1990). *Technology and the Lifeworld*. Bloomington, IN: Indiana University Press.
- John, B. (1995). Why GOMS? *Interactions*, 2(4), 80-89.
- John, B. E. (2003). Information processing and skilled behavior. In J. M. Carroll (Ed.), *Toward a Multidisciplinary Science of Human Computer Interaction* (pp. 55-101). San Francisco: Morgan Kaufmann Publishers.
- Johnson-Laird, P. (1988). *The Computer and the Mind: An Introduction to Cognitive Science*. Cambridge, MA: Harvard University Press.
- Kay, A. (1990). User interface: A personal view. In B. Laurel (Ed.), *The Art of Human-Computer Interface Design* (pp. 191-207). Reading, MA: Addison-Wesley.
- Kay, A., & Goldberg, A. (1977). Personal Dynamic Media. *Computer*, 10(3), 31-41.
- Kay, J., & Thomas, R. C. (1995). Studying long-term system use. *Communications of the ACM*, 38(7), 61-69.
- Kintsch, W. (1992). A cognitive architecture for comprehension. In H. L. Pick, P. van den Broek, & D. C. Knill (Eds.), *Cognition: Conceptual and Methodological Issues*. Washington, DC: American Psychological Association.
- Kiousis, S. (2002). Interactivity: A concept explication. *New Media & Society*, 4(3), 355-383.
- Kjær, A., Madsen, K. H., & Petersen, M. G. (2000). Methodological challenges in the study of technology use at home. In A. Sloane & F. van Rijn (Eds.), *Home Informatics and Telematics: Information, Technology, and Society* (pp. 45-60). Boston: Kluwer Academic Publishers.
- Kolb, D. A. (1984). *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, NJ: Prentice Hall, Inc.
- Krippendorff, K. (1997). A trajectory of artificiality and new principles of design for the information age. In D. Boyarski, R. Butter, K. Krippendorff (Eds.), *Design in the Age of Information: A Report to the National Science Foundation(NSF)* (pp. 91-96).

- Larson, R., & Csikszentmihalyi, M. (1983). The experience sampling method. *New Directions for Methodology of Social and Behavioral Science*, 15, 41-56.
- Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge: Cambridge University Press.
- Löwgren, J., & Stolterman, E. (2004). *Thoughtful Interaction Design: A Design Perspective on Information Technology*. Cambridge: MIT Press.
- Mack, R. L., Lewis, C. H., & Carroll, K. M. (1983). Learning to use word processors: Problems and prospects. *ACM Transactions on Office Information Systems*, 1(3), 254-271.
- Masino, G., & Zamarian, M. (2003). Information technology artifacts as structuring devices in organizations: design, appropriation, and use issues. *Interacting with Computers*, 15(5), 693-707.
- Maturana, H. R. (1980). Biology of Cognition. In H. R. Maturana & F. J. Varela (Eds.). *Autopoiesis and Cognition* (pp. 5-58). D. Reichl: Dordrecht
- McCarthy, J., & Wright, P., (2004). *Technology As Experience*. Cambridge, MA: MIT Press.
- Moustakas, C. (1994). *Phenomenological Research Methods*. Sage Publications. Thousand Oaks, CA.
- Nagel, T. (1974) What is it like to be a bat? *Philosophical Review*, 83, 435-450.
- Nagel, T. (1989). *The View from Nowhere*. Oxford: Oxford University Press.
- Nelson, H., & Stolterman, E. (2003). *The Design Way: Intentional Change in an Unpredictable World*. Englewood Cliffs, NJ: Educational Technology Publications.
- Norman, D. (1999). Affordances, Conventions, and Design. *Interactions*, 6(3), 38-42.
- Norman, D. (2002). *The Design of Everyday Things*. New York: Basic Books.
- Norman, D. (2005). Human-centered design considered harmful. *Interactions*, 12(4), 14-19.
- Pantzar, M. (1997). Domestication of everyday life technology: Dynamic views of the social histories of artifacts. *Design Issues*, 13(3), 52-65.
- Papert, S. (1980). *Mindstorms*. New York: Basic Books.
- Petersen, M. G. (2002). *Designing for Learning in Use of Everyday Artefacts*.

- Ph.D. Thesis. University of Aarhus, Denmark.
- Petersen, M. G., Madsen, K. H., Kjær, A. (2002). The usability of everyday technology—emerging and fading opportunities. *TOCHI*, 9(2), 74-105.
- Piaget, J. (1952). *The Origins of Intelligence in Children*. New York: International University Press.
- Pohlmeier, A.E., Hecht, M., & Blessing, L. (2009). User Experience Lifecycle Model ContinUE [Continuous User Experience]. *Berliner Werkstatt Mensch-Maschine Systeme (BWMMS) 2009*, Berlin, Germany, 314-317.
- Preece, J., Rogers, Y., & Sharpe, H. (2007). *Interaction Design: Beyond Human Computer-Interaction* (2nd ed.). West Sussex, UK: John Wiley & Sons, Ltd.
- Preece, J., Rogers, Y., Sharp, H., Benyon, D., Holland, S., & Carey, T. (1994). *Human-Computer Interaction*. Wokingham, UK: Addison-Wesley.
- Rabardel, P., & Bourmaud, G. (2003). From computer to instrument system: a developmental perspective. *Interacting with Computer*, 15, 665-691.
- Rogers, Y., Price, S., Fitzpatrick, G., Fleck, R., Harris, E., Smith, H., Randell, C., Muller, H., O'Malley, C., Stanton, D., Thompson, M., & Weal, M. (2004). Ambient wood: Designing new forms of digital augmentation for learning outdoors. In *Proceedings of the 2004 Conference on Interaction Design and Children*, 3-10, Maryland.
- Rogers, Y., Scaife, M., Harris, E., Phelps, T., Price, S., Smith, H., Muller, H., Randell, C., Moss, A., Taylor, I., Stanton, D., O'Malley, C., Corke, G., Gabrielli, S. (2002). Things aren't what they seem to be: Innovation through technology inspiration. *DIS '02*, 373-378.
- Russell, A. L. (1996). Six stages for learning to use technology. In *Proceedings of Selected Research and Development Presentations at the 1996 National Convention of the Association for Educational Communications and Technology*, Indianapolis, IN, 634-641.
- Scaife, M., & Rogers, Y. (1996). External cognition: How do graphical representations work? *Int. Jour. Human-Computer Studies*, 45, 185-213.
- Sengers, P., & Gaver, B. (2006). Staying open to multiple interpretations: Engaging multiple meanings in design and evaluation. In *Proceedings of DIS '06*. 99-108.
- Shneiderman, B. (1983). Direct manipulation: A step beyond programming languages. *IEEE Computer*, 16(8), 57-69.
- Shneiderman, B., & Plaisant, C. (2004). *Designing the User Interface: Strategies for Effective Human-Computer Interaction* (4th Ed.). Reading, MA: Addison-

Wesley.

- Soloway, E., Guzdial, M., & Hay, K. E. (1994). Learner-centered design: The challenge for HCI in the 21st century. *Interactions*, 1(2), 36-48.
- Verbeek, P.-P. (2005). *What Things Do. Philosophical Reflections on Technology, Agency, and Design*. State College, PA: Penn State Press.
- Verbeek, P.-P., and Kockelkoren, P. (1998). The things that matter. *Design Issues*, 14(3), 28-42.
- Vygotsky, L.S. (1978). *Mind and society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.
- Wakkary, R., & Maestri, L. (2007). The resourcefulness of everyday design. *C&C* '07, 163-172,
- Weidenbeck, S., & Zila, P. L. (1997). Hands-on practice in learning to use software: A comparison of exercise, exploration, and combined formats. *TOCHI*, 4(2), 169-196.
- Winograd, T., & Flores, F. (1986). *Understanding Computers and Cognition: A New Foundation for Design*. Norwood, NJ: Ablex Publishing.

## Appendix A. Scripts

The purpose of this unstructured interviewing people is to explore participants' prior experience as they understand it that they have with the artifact or related artifacts, to understand their perspectives of the experience, and to review anecdotes through cognitive probing of incidents identified as critical by the researcher.

The first interview will focus on introducing the person to the study, assessing prior experience with the device to be used in the study. I will also look at the motivations and expectations about the artifact to track their progress over time through this interview protocol. The subsequent interviews will be used to look at the first few critical weeks of the study including weeks two, six, and twelve (two weeks into each phase of the study, halfway and at the end respectively). I will look at motivations and goals, breakdowns and expectations, as well as contexts of use and functionalities used of a system. Through this interview protocol, I will investigate each participant's perceived relationship with their given *interactive artifact*.

### First Interview:

*Introduction*—First, I want to mention that this is a study to understand the learning process of how people learn to use technology. For this study, you will be using (Photoshop, World of Warcraft, an iPod Touch). You will have approximately three months to interact with and use the technology over the course of the study. There will be three interviews that we will schedule later, one two weeks from today, one six weeks from today, and the final interview at the completion of this phase of the study.

- 1) First, I want to ask you a few questions about your prior experience with this device and other technology.
  - a. (for Photoshop)



- i. Have you used Photoshop or other software before?  
(which)
    1. How long ago and for how long?
    2. What did you most commonly use this software for?  
(in what contexts)
    3. What did you make with this software  
(description)?
  - ii. What reasons did you have for using these programs in the past?
  - iii. Has using these programs been easy /hard for you in the past?
  - iv. Did you ever have any problems with the software? If so, please explain?
  - v. Draw a sample interface for an image editing software like this that you have used in the past.
- b. (World of Warcraft)
- i. Have you owned/used a game like World of Warcraft before or any game at all?
    1. How long ago and for how long?
    2. In what contexts did you normally play games for in the past? (by yourself for fun, when you had friends over, as something to talk about with friends, etc.)?
    3. How did you organize your gameplay into your life at large?
  - ii. What reasons did you have for using these devices in the past?
  - iii. Has using these programs been easy /hard for you in the past?
  - iv. Did you ever have any problems with the software? If so, please explain?
  - v. Focusing on the most important aspects of a game, draw a sample interface for a video game like this that you have played in the past.
- c. (Digital Photography)
- i. Have you owned/used an mp3 player before or other music playing devices?
    1. How long ago and for how long?
    2. What did you most commonly use this device for?  
(in what contexts)
    3. How did you store, retrieve, and organize music in the past?
  - ii. What reasons did you have for using these devices in the past?
  - iii. Has using these programs been easy /hard for you in the past?

- iv. Did you ever have any problems with the software? If so, please explain?
  - v. Draw a sample interface for a media device like this that you have used in the past.
- 2) Next, I want to ask you about what expectations you have about the device.
  - a. First, how do you expect (Photoshop, World of Warcraft, or this iPod Touch) to be useful for you?
  - b. What kind of tasks or activities do you foresee using this device for?
  - c. Without having used it, what do you need to do in order to accomplish these tasks?
  - d. Do you foresee any obstacles that will hinder your use of the system?
  - e. Where do you think you will go to for help with the system when you get stuck with it?
  - f. How strongly would you rate your ability to use this device before using it? On a scale of one (lowest) to five (highest).
  - g. What is the likelihood that you will be able to use the device to accomplish all of your important goals? On a scale of one to five.
  - h. Do you feel that you will be in control of the technology? How so?
- 3) Finally, I want to explore what motivates you to use this device aside from the study that you are participating.
  - a. What goals do you have for using the device?
  - b. What aspects of the device do you expect to find most enjoyable?
  - c. What motivates you to use this device?

Next, allow some free form learning where the researcher will question the user about the device.

Finally, have a session where the user completes the task without any interruption. Ask questions after the task is completed or time runs out based on notes.

{Debriefing questions are based on session observations.}

Thank you for agreeing to participate in this study. For the next three months, I would like you to continue learning (Photoshop, World of Warcraft, or this iPod Touch). Can we find a time two weeks from now that we can meet again to see how you have progressed in learning this device? {Setup a meeting time.} We will be setting up a few other meeting times later on in the study as well. Finally, I need to remind you that as you are learning this device, I will need you to write brief diary entries on the virtual diary system for this study. I will send you a link later today showing where you can post these entries. Also, continue to save any files you deem important and make sure you use the diary system to {keep track of any applications you use through this {iPod Touch, video game}, record things that you create using the system}. If you ever have any questions

about the study, you can feel free to email me and I will try to help you the best that I can.

Subsequent Interview:

*Introduction*—I wanted to check back in with you and try to understand your experience of learning to use the device better. I wanted to return to a few questions I asked you the first week and ask a few new ones about your specific experience.

- 1) First, I want to ask you check back into your expectations you have about the device.
  - a. How has the device been useful for you?
  - b. What specific tasks or activities have you used this device for?
  - c. What resources have been most useful for you in circumventing problems?
  - d. How strongly would you rate your ability to use this device before using it? On a scale of one (lowest) to five (highest).
  - e. What is the likelihood that you will be able to use the device to accomplish all of your important goals? On a scale of one to five.
  - f. Do you feel that you will be in control of the technology? How so?
  - g. Have your expectations about the device changed at all?
- 2) I want to explore what motivates you to use this device aside from the study that you are participating.
  - a. What does this device allow you to do that you cannot do any other way?
  - b. What goals do you have for using the device? Have they changed at all?
  - c. What aspects of the device do you most enjoy?
  - d. Why do you want to use this device?
  - e. Has learning the device been enjoyable?
- 3) Please describe how you relate to the device so far. Tell me the overall story of what it has been like learning (Photoshop, World of Warcraft, or an iPod Touch).
- 4) I was hoping you could further explain your thoughts on a few anecdotes I have noted from your notes in the diary. {Depends on necessity}
  - a. Depends on each anecdote found.
- 5) Can you tell me what functionality (e.g., features) you have used of this interface in this since we last met?
- 6) Finally, thinking about your life as a whole as opposed to just your interactions with this device. Are there any daily routines that you have that you feel have changed as a result. For instance, when I got a new iPod I found that my workout routines had changed as a result of bringing the iPod with me when I worked out changing what working out was like. (Further description can be given if necessary).

Next, allow some free form learning where the researcher will question the user about the device.

Finally, have a session where the user completes a task without any interruption. Ask questions after the task is completed or time runs out based on notes.

{Debriefing questions are based on session observations.}

Thank you again for meeting with me. We need to find a time to meet (one month from now, six weeks from now, or next week to start the next phase). Are you able to plan that far in advance or would you like to setup the meeting later? When? {Setup a meeting time.} We will be setting up a few other meeting times later on in the study as well. I want to remind you again that virtual diary system is very important to the study. Also, continue to save any files you deem important and make sure you use the diary system to {keep track of any applications you use through this {iPod Touch, video game}, record things that you create using the system}. Thank you for your use of it thus far. Again, if you ever have any questions about the study, you can feel free to email me and I will try to help you the best that I can.

## Appendix B. Experience Diary

The experience diary will be meant to capture participants' learning experience in learning to use the *interactive artifact* that they have been given. It will be ongoing throughout the course of this study. It will ask participants about their use of the artifact and how that learning has progressed, about any resources they used recently, any problems they might have had, and their emotional response to the artifact. Unlike interviews, this will need to be very short and more frequent taking about ten minutes on average to complete. Participants will be sent reminders once per week to make sure they continue to fill out experience diary entries. The data collected will then be used for interviews with people later, so if they mention specific incidents or anecdotes, participants can comment on them further in the interviews.

Current link of test diary:

<http://www.williamryanonline.net/study/diary.php?id=1>

Questions:

{Record date, time and participant id}

- 1) In one sentence, sum up what your relationship is to your device.
- 2) Since the last time you have written a diary entry, please describe anything you have tried to do with the system or new contexts you have used it in. Please list different uses by numbers.
- 3) List any problems you have experienced since your last diary entry. Please separate different problems by numbers. For each problem, describe what the problem briefly was, what you suspect the cause was, what you did to overcome it and how you found this out (if you were unable to overcome it, what did you do instead), how long you worked on the problem, and finally how each incident made you feel as descriptively as possible from the emotional terminology list at the side.
- 4) Finally, describe any resources you have used from the list to the right, but please be more specific than the list, and why you used the resource.

Lists:

Emotional Terminology List

Acceptance	Disgust
Awe	Aggressiveness
Fear	Anger
Joy	Sadness
Love	Remorse
Optimism	Disappointment
Submission	Contempt
Surprise	Anticipation

Citation: <http://www.fractal.org/Bewustzijns-Besturings-Model/Nature-of-emotions.htm>

Learning Resource List

Manuals
Program's Help Menu or Search
Tutorials or guides
Setup wizard
Online forums
Local friends or family members
Other

## Appendix C. Transcriptions

Below is the text that was transcribed from interview audio data. It is selected based on relevance to the topic of *learning-in-use*. Though, not all the text from the audio was transcribed. The texts are broken down into the two phases of the study, by artifact type, and by participant. In individual quotes, quoted text represents what was spoken by the participant and unquoted text was said by the interviewer. All available sessions are represented here. The only sessions that are not here were participant one's sessions three through six, participant five's session six, and participant ten's session six because they did not happen and participant nine's session one because it could not be found at the time of analysis.

## Phase One of Study

### Photoshop

*Participant one*

p1\_12\_10\_09\_ses1.wav

**1:30**

Are there any other contexts? Like, what are the contexts in which you used?

“Mostly work, but also personal.”

Ok.

“For, I just, I like to make things”

Ok.

“so, it’s one of my means of expression for me.”

Ok.

“I hope with Photoshop, I take a lot of photographs and I would like to manipulate them and send them out into the world.”

Sure. Yeah.

**2:20**

What reasons did you have for using these programs in the past?

Has it all

“I’d say like.”

Is there a need for work? Like is this part of your job?

“It’s been primarily professional and also personal.”

Ok.

“I do like cards for people, or invitations.”

And those are just like as they occur? Like I have a need to

“Yeah.”

come up with an invitation? Ok.

**3:35**

“I always am sort of winging it or going by the seat of my pants.

And so, that’s what I like about a program, because usually I something need today. These Adobe Suites, you need to invest time for it and you become very good at it.”

**7:28**

Do you foresee any obstacles that will hinder you in your use of Photoshop?

“Possibly my own lack of discipline.”



Ok.

“But I’m counting on winter, knuckling down during winter to learn something new.”

**ability to use: one and a half**

**important goals: four**

**9:25**

“I want to be proficient.”

**9:35**

How do you feel you will be in control of the technology? Or sorry, do you feel you will be in control of the technology? How so?

“Yeah. I think just learning how to use it will. I don’t think of it as much of a control issue”

Ok.

“ as being it’s a tool.”

Ok.

“ And I will be able to use the tool well and it has endless applications and iterations.”

Uh-huh.

“So I intend to become fluent, and know that I’ll always have more to go.”

**10:10**

What goals do you have for using the device?

“Like I said, I want to be proficient. I want to be able to feel like have another means of personal expression. It’s something that’s intrigued me since the beginning.”

Uh-huh.

“ I’ve never had a real necessity to put it in my life,”

Ok.

“ so this is the perfect opportunity to finally knick this off my list.”

So, it’s kind of on this bucket list?

“Yeah.”

**86:90**

Could you tell me like as you were doing this stuff like what were some of the goals that were going on that you had?

“The goals were identifying steps that I knew about this process relating to former processes that I had done and looking for ways to accomplish those not finding them.”

Ok. So,  
“ I guess it was mimicking.”  
You weretrying to relate it to what you already knew?  
“Uh-huh.”

**90:35**

How confident do you feel right now that you'll be able to do this?  
“You mean accomplish this or be involved and learn the program?”  
Just like end up where you want to end up with Photoshop.  
“I'm divided. Part of me feels like, you know millions of people can learn this, so I ought to be able to.”  
Uh-huh.  
“ Right now, I don't feel like I have the wherewithal.”  
Ok.  
“ All the places I have been trying to make it work, I meeting with frustration, so I'm not encouraged.”  
Ok.  
“ But, I don't think I'm any, I have the ability somewhere in me to find the means into and then get going.”

**p1\_1\_20\_10\_end.wav**

**0:25**

“I just didn't have much time to devote to it. Like I said, I am just not an innovator when it comes to playing around with computer programs.”  
Ok.  
“If I get stuck then and I try all these things I know, then I don't know what else to do”  
Ok.  
“ and back off.”

**1:40**

Did you go online for resources at all?  
“No. I didn't.”  
Ok.  
“I know that they exist and in the past I have done that a little bit, and you know that askLynda or the Lynda.com has a lot of good tutorials, but I just didn't take the time to look at those.”  
Ok. What were your thoughts, because I know you tried it in the session that you did. What were your thoughts of the tutorials

there?

“They’re helpful. I just didn’t really take the time to download what I needed to.”

**Approximate: use two times, ten minutes**

**4:00**

Also for the problem, did you, the hard drive issue, how did that get resolved?

“I finally located, I talked to I think two different people, three different people and finally the third-person was able to have some time to fix my hard drive issue.”

Were they UITS people?

“Except [inaudible]. Two people were just people I knew in the community, they were recommended by other Mac users as these are good people.”

**5:45**

So, what were your expectations then coming into this?

“I wanted, well I wasn’t sure what your parameters were, but I thought you would provide a little more guidance or a little more here’s four things that make it work and go work with them”

Ok.

“and see where you get with that. But I was just like a baby duck in the water learning how to swim. Haha.”

Haha.

**8:15**

“So I work well with people, [inaudible], talking with me, nudging me”

Sort of being in more of a situation where you kind of need that so in a classroom where

“Yeah.”

as part of this

“Yeah.”

you kind of had to artificially create your situation.

“Yeah. yeah. I have gotten that with other programs, inDesign, where I feel like I got some basics in a day long course. And now I can go in and make my way. I just need a little more grounding. Some tools just to get the things in motion.”

*Participant two*

p2\_12\_11\_09\_ses1.wav

**1:15**

Have you ever used Photoshop or any software like that before?

“Yeah. I have.”

How long ago and for how long do you think?

“You mean most recently or just in general?”

Well in this case, since it’s up to date, how long have you been using it for.

“I pretty much started when I worked at the TCC, which is about a year ago about last January.”

Ok. so almost a year?

“Yeah.”

What do you most commonly use this for?

“Honestly, I use it to help customers whenever they print off giant plotter jobs. Really, I just tell them how to make sure everything is, make sure it prints out right.”

Ok.

“Cause there’s a lot of little things on there.”

So it’s a formatting thing?

“More. Yeah. Mostly is what I have done. What I have used Photoshop with.”

Have you actually done any graphic editing or photo editing with it?

“The only graphic editing I ever done was creating a little icon for our little personal chat thing. I make a farmsworth and a Dr. Nick, you know one of Matt Groening’s characters thing. So I just [inaudible] and crop some things out.”

So, a little bit, but still not a lot.

“Yeah.”

**2:55**

Then in that work setting it’s always been about just the formatting stuff?

“Yeah. It’s just been formatting, getting making sure everything like. If they’re making a giant picture whatever like that, create the new image to 36 by 108 or so. Just, I’d be dragging and dropping pictures on there and make sure it’s all set to the right one layer so it’ll print out.”

Ok.

**4:00**

How hard or easy was it for you to actually learn those specific features that they described or not the graphic editing, but the “Formatting?”

formatting? Yeah.

“It wasn’t really that hard, but it was mostly through repetitions is what remembering exactly where everything was. Cause there was a lot of options though. I remember that and if you haven’t used it in a while, all of a sudden, you have to do it again, and it’s like you don’t know exactly what it is you have to go to.”

Ok.

“So I remember that being a problem til this summer when I had a permanent shift, where they had those kinds of plotters where people did have those kinds of issues”

Ok.

“ and just doing a lot then.”

Can you tell me how you actually went about learning what the certain procedure for formatting it was?

“Mostly just you know having other consultants, other employees, come help me, help me do it and show me how everything goes, and then just kind of replicating those steps myself.”

Ok.

“ You know remember that in my head and remember which way to go with all that.”

**6:30**

How do you expect Photoshop to be useful for you?

“You mean just in general or?”

Yeah. Like sort of even long range, like beyond where you work now.

“Well, you know. I got a new digital camera more recently and it would be nice to touch up pictures or stuff like that.”

Ok.

**10:00**

Where do you think you will go for help when you get stuck with something?

“Probably just google, google everything or maybe see if my work. Cause my work provides training. So they might have something on Photoshop that I might be able to use.”

**ability to use: three**

**important goals: four**

**11:40**

What goals do you have for using the device? What immediate goals do you have?

“Probably learn how to add pictures and make them look nicer. My girlfriend, for example, knows how to use Photoshop. I want to learn how to touch things up and make things look nicer.”  
Have you ever like done that with her? Or has she mostly just done that by herself?

“She has always done things by herself. I don’t think I have ever really been there when she’s done that stuff.”

**69:35**

“I have not, however, used the color balanced, I don’t think I’ve ever used the color balance.”

Ok. How did you find out about that?

“I kind of. I was just kind of like I thought about it. I knew they had stuff like that in there. I had never used it personally, but I knew they had stuff like that. I had to search around and find it. I did.”

And what made you think that was useful in this situation?

“It looked like the same image as the other just with a shade of red, everything was shaded red. So, I figured it would be easier to find a hue changer”

Ok.

“to put in more reds than blues or anything on those kinds of lines.”

**p2\_1\_18\_10\_ses2.wav**

**0:30**

What can you do that you can’t do in any other way?

“Well, it does allows me to modify certain parts of a picture or something like that. For example, like last night, one of the pictures I made was essentially, I took well something sappy and sentimental a picture of myself and my girlfriend.”

Uh-huh.

“Kept that part colored, but essentially I guess drew around it.”

Uh-huh.

“and separated the rest of the picture from it.”

Uh-huh.

“Turned the rest black and white. And you know made that sort of hazy effect on it also. Just to you know do something like and

make it little things like that, make things pop out or make thing blend in more.”

**1:50**

“Make things look good. See if I can’t make any like you can’t see on a newspaper or in a magazine or something like that.”

**5:25**

“That’s basically what I have used it for is to show off to my girlfriend.”

**6:40**

What resources have been useful?

“I haven’t used any resources just because I’m getting out of the break. My best tool when learning how to use a computer would be exploring. All the options... really explore dropdown menus and items and figure out some of the functions...”

So you rely on the interface to guide you?

“Yeah. The interface and do little searches on the screen itself. Maybe not here, but back in the day.”

**ability to use: three and a half to four**

**important goals: four**

**9:10**

“When I figured out filters, I realized there was a little bit more I could do with it than cut out one picture onto another picture... How so?

“You know, I figured out people make a lot of pictures and put on star bursts and blurs. I figured there has to be a way to do this...”

Ok.

“Last night, I just kind of explored a little bit., looked under filters and that’s all there was to it.”

**approximate use: first week: one half to one hour, not so much afterwards**

**overall story:**

- **playing around with it**
- **get an ideas of how it works**

- so far pretty easy
- how I can clean things up a bit.

p2\_3\_1\_10\_ses3.wav

**0:44**

“It allows me to edit images...It allows me to do blurs.”

**3:49**

“Goals have not changed. “

Has learning been enjoyable?

“Kinda. This is not something that I can just sit down and do.”

**4:25**

“Good tool that will help me do some work.”

**5:00**

“When I needed to relax it took a backseat to everything.”

**ability to use: three and a half to four**

**important goals: four**

**9:40**

“I haven’t been able to use it as much as I like, but anything I come up with in my head, I am able to eventually get it out.”

**approximate use: zero hours per week.**

**10:55**

“Photoshop has taken a back seat to work, school, and entertainment.”

**Overall story:**

- when I use it
- open up, take picture, figure out what I want to do, and find settings
- not just clicking around, but there is a procedure



*Participant six*

p6\_12\_17\_09\_ses1a.wav

**3:50**

What sparked the change from Paint Shop Pro to Photoshop?

“Photoshop is more professional and that’s it. It’s just a more professional tool. I don’t know what exactly sparked the change. I know you can do a lot more with Photoshop. It’s more, and it’s very similar. You get a lot more even though it’s a little bit more difficult. There’s a lot more.”

**5:25**

What specific reasons have you used Photoshop for in the past?

“And also for class assignments. I have taken a Photoshop class.”

**6:45**

“My photoshop class actually taught me that. Like with masking and how to get stuff for actual print quality, and messing with RGB values. There’s a lot of stuff I don’t know how to do.”

**14:10**

Where do you think you will go for help for the software when you get stuck with it?

“Well, yeah, I.”

Or what will you do.

“Yeah.”

So you do the “work around” that’s one.

“Work around. But, like I guess, if I need help with I guess with trying to figure out a technique.”

Uh-huh.

“First, I need to be aware that the technique exists and I need to have made some mental plan that this is I want to do.”

Ok.

“So, I guess just google it,”

Ok.

“you know just find it on the internet and the internet is just amazing with all the tutorials they have and usually they’re pretty good.”

Ok.

“Actually half the time with tutorials, I’ll find a tutorial I want to

try and make a layout fit to that tutorial and use that techniques. A lot of times I don't even know what I want to do, it's not like I want to make it like, oh I want to make it look exactly like this. But I'll see visual styles and like try to. I don't know, it's not like the creativity always generates from me, I guess is what I'm saying. I see it from exterior things."

**ability to use: three and a half or four**

**important goals: four or five**

**p6\_12\_17\_09\_ses1b.wav**

**46:25**

How did you go about figuring out those kinds of things? What was the reasoning process to sort of work through, Ok. This isn't working right, so I need to get it to look, work right.

"Well, some of it's just like I'm right clicking and I'm like, Oh yeah, Oh yeah. There is this thing called the smart object and it does have these certain things."

Uh-huh.

"So a lot of it's, not that I'm smart, but just that I have seen, like I've played with stuff, so I already have this previous knowledge of how things should work. But I also get reminded that these things are here by when I look at these menus."

So, it's, it's in your brain, but it's not immediately accessible.

"Right, Cause I mean I haven't played with Photoshop, like I've played with Photoshop. I haven't done graphics Photoshop stuff, probably in like a year or two."

Ok.

"I have done some photo manipulation with curves"

Uh-huh.

"this semester, but that's the only Photoshop probably I have done since the spring."

What, just out of curiosity, would you consider that rediscovery like learning? Do you. How do you feel about?

"I don't think it's learning, because I already know it's there. Like it's not like it's something new. I'm just being reminded that I know it."

**p6\_1\_12\_10\_ses2.wav**

**1:45**

What goals do you have for using the device and have they changed during the course of the study?

“I guess I have been paying attention a bit to how I do stuff, maybe not necessarily how I do stuff, but like what I know and I realize that there is a lot of things I don’t know.... I was making a poster and I had four quadrants and in one of them... I wanted to make it look like a post-it and I realized I didn’t know, so I googled it.”

**2:50**

“I know that there are things that I know, but I also know that there are things that I don’t know that I don’t know.”

Wait. You don’t know that you know or you know that you don’t know?

“I know there is this vast area of Photoshop that I don’t know or I don’t even know the capabilities of.”

**3:30**

What do you enjoy most about Photoshop?

“I do like working in it, because it allows me to be creative in a different way. I obviously have an end goal in mind. I like playing with it and I like the end product of like, Hell yeah, that looks good.”

**5:20**

“Photoshop is the only tool. If I went back to something like Paint Shop Pro, I would get really frustrated because I would have to learn an entirely different system and I’d have to go through this process of Ok. This is a Photo application software, I know every photo application software can crop a photo. Ok, How do I do it in this one?”

**6:00**

Has learning the software been enjoyable?

“I don’t see it as learning, I see it as playing.”

**ability to use: three and a half to four**

**important goals: five**

**overall story:**

- **in the last four weeks**

- haven't grown that much
- it's just like word
- you know what to do and sometimes you don't

**22:27**

"Not now, but it kind of changes how I look at photography now."  
She mentions as she is also taking a class that involves digital photography and a lot of Photoshop work.  
(There is also an example of her stitching photos of her roommate together into one photo and she had to think about how she would take the pictures to do this in Photoshop).

**75:30**

How did you go about figuring out how to do something in Photoshop...

"It's pretty easy to look at this and break it up into layers of like what's first. Like, clearly this dude's first because Thunder, the text here implies that it's underneath and that's pretty much how you are going to get the text here is by having it underneath. These circle things, right, which are clearly under the text. When I look at stuff, when I replicate I think about how it has to build upwards."

**76:20**

"And then you have this color scheme over actually, which is something I did different than last time. This time I did it individually, but I think if I did it again I would just do it where this whole hue and saturation thing would just affect everything."

**77:30**

Any new features or functions that you used today that you haven't seen or used before?

"You know stuff, but you forget that you know stuff. And you are constantly making distinctions of like, "Oh, yeah, Oh yeah, that is how you do that," so I don't think I really learned, nothing is new, new..."

Sort of like rediscovering some stuff

"I don't even like the term rediscovering, like maybe rediscovering, maybe that's the appropriate term, but it's like reminding."

7:40

What aspects of the software do you enjoy the most?

“Doing stuff, like doing stuff in Photoshop is kind of like for me how other people work in clay. Like my roommate is doing stuff in sculpture and like a lot of times she will tell me how it’s very cathartic for her and like just working with the clay and it’s time that she can just zone out. She’s working on something, but doesn’t need to think very deeply about it, that’s how I feel. I’m just doing it and I know how to do it.”

8:50

Why do you want to use and learn Photoshop?

“Because I have to. I don’t have to, but I’m super comfortable with it in the first place.”

Yeah

“And, it’s just my go-to application for designing like visual stuff. Like, I know how to use, I tried to use In-Design for a project and I was just so frustrated.”

Right, I saw that in the diary

“Yeah. It’s just so different and pissed me off so bad. It’s like “Ah, you’re worthless application,”... It really did things so differently then what I expected it to.”

**ability to use: four**

**important goals: five**

**overall story:**

- **So much to need to know to know what you are doing**
- **Need to know what you are doing**
- **What your intended output is for (web, print, mobile)**
- **particular audience in mind.**
- **When first started, didn’t know what I was doing—just playing**
- **Eventually get it (eventually has a geographic map of where stuff is)**

- **different grasp of what software is and what see you can do with it**

**17:25**

“I have a firm grasp of what I’m doing and how I’m doing. I think the limitations of me and the software together, I have a better understanding. And I have a much greater appreciation for someone taking the time to figure out goofy stuff like this, step-by-step.”

*Participant ten*

**p10\_1\_13\_10\_ses1.wav**

**0:45**

Have you ever used Photoshop or any software like this before?

“Yeah. I used Photoshop. As part of a summer job once, I was using Paint and just got frustrated with it to make graphic designs, little posters and stuff.”

Uh-huh.

” So I went and tried to use Photoshop. And it worked ok. I sort of got to the point where I could use layers”

Ok.

“it was mostly just cropping and stuff.”

**1:30**

“When I was doing graphic design for my visual class later on, I basically used Paint because that was all I needed.”

**3:20**

Has using Paint or Photoshop been easy or hard for you in the past?

“Paint is. You got to learn about what different things do and all the buttons and sometimes even when they look the same across programs they are different. So, that’s been really confusing. And then Photoshop just has so much that you can do with it. I’m like How do I? I’m sure there’s a way to do the stuff I want to do, but it’s sometimes hard to find out what it is.”

Fair enough and where have you looked for that stuff?

“Google.”

**4:30**

First of all, what goals do you have for using the device?

“I would like to mess around with photos, I just think it’s fun. You know family photos and things like that, it’s useful to be able to deal with them. I’m involved with various fandoms, so we do photo manipulations, make icons, that sort of thing.”

Is that stuff that you do with Paint or is just stuff you aspire to do?

“Stuff that I would like to do, but you know the general ignorance barrier.”

Ok.

**5:15**

What aspects of the device do you expect to find most enjoyable?

“It works. I mean when you have software and it does something ‘That’s great.’ I don’t, I mean, I’m not, the question doesn’t make sense in the context for me I guess.”

Fair Enough.

“I don’t intend for using Photoshop to be an awesome experience, I just want it to work.”

**ability to use: one to two**

**important goals: four, three (depends on how much time I put in).**

**p10\_2\_12\_10\_ses2.wav**

**0:40**

How has Photoshop been useful for you so far?

“We’ve been doing a lot of graphic design for our project website. And, so Photoshop has been very useful mocking up demos and things. Photoshop has also been really useful you know for doing actual design work.”

Yep.

“I’ve been using it mainly as part of our project so far.”

What exactly do you mean by design work? What have you been doing with it?

“Know what does the web page look, what kind of scripts are we going to have running. What are visual effects supposed to be versus what they look like. Things like that.”

**2:10**

What resources have been most useful for circumventing any problems that you've had?

"So far mostly we have just been doing things in groups. So, other people occasionally will look things up."

So you are also relying on each other for the different knowledge sets that you have?

"Right. And just playing around with it."

So, just sort of working your way through it and just sort of experimenting. That's what you mean by playing around with it?

"Yeah."

**4:00**

That was the other thing I was going to ask you about your diary because you started talking about you found another way to do the color changer. Could you talk a little bit about that?

"Both, one person, we were trying to change colors, there were three of us and each of us knew a different way to do it."

Oh. So you learned from other people?

"Yeah."

Ok.

**ability to use: between one and two, maybe between two and three**

**important goals: five**

Have your expectations changed at all over the course of the study?

"No. It's, you use it to manipulate photos. You can use photos for all kinds of things. But basically, my expectations have stayed the same."

**Overall story:**

**I don't know that there is a story**

**I use it for what I want to and then I shut it down.**

**10:00**

How have you gotten to the point in terms of what you know about Photoshop. So, it's not just an immediate use question, it's more about like in terms of your experience and knowledge, how have you gotten there?

"I just, I'll play around with it see if it does what I want it to. I'll ask people. I meant that's. I have a pretty utilitarian relationship



with Photoshop. I open it, I use it, I close it. There's no extended use or anything like that."

**11:35**

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod Touch, excuse me when I got a new iPod, I found that my workout routines had changed as a result of bring the iPod with me. So has there been anything like that so far for this?

"I mean I, I don't know. As part of the project, I'm spending more time thinking about visual design. So I mean I'm thinking about Photoshop more, but that's probably just a project."

**12:00**

Do you think of yourself more, as more of a visual designer, so not saying you are a visual designer, but you feel more capable of visual design

"Yeah."

having worked through Photoshop?

"Yeah. If you don't work through Photoshop, you can't be a visual designer."

Ok.

**69:45**

With regards to replacing the color in the elephant. I know you used the color replacement tool last time, and why did you decide to go with it this time. Like why did you sort of go back to it? What (I was getting at her learning a new way.)

"Because replacing it by hand would be hard."

Ok.

"It, the depth changes here, like how far it is from the black to the shadow."

Ok.

"So, that means just trying to get a brush and painting over it would be tricky."

Ok. And so the replacement tool what would that allow you to do?

"When you go over it just replaces a colors"

Ok.

"instead of wiping out all the colors."

So, it's a more focused in what it's trying to do?

"Yeah."

Ok.

**74:50**

Do you have an overarching strategy? And how do you evaluate your actions against that strategy if you have one?

"I really have no strategy. If I do have a strategy, it would be when I sit down at Photoshop, I don't ever get stymied. Like with the outline, I was like, well, this is hard, so I'm going to do something different."

Ok.

"But my, I mean, if I, I guess it's more of a goal than a strategy."

Ok. So, it's interesting because, sorry, sorry, you were going to say something else.

"I was done."

So you were talking about the button, and when you first loaded up you're like, I'm not going to worry about the bevel basically.

"Yeah."

And then you got the basic shaped down, then you went back and you figured out the bevel. So how did you determine to stick with that problem and not stick through the outline or something like that.

"Well, putting the bevel on the button was something that needed to be done. And I realized that the outline on the scoreboard was not something that didn't need to be done because we have the background for our website. So the background provides a border."

**p10\_2\_12\_10\_ses3.wav**

**1:00**

What aspect of the software do you find the most enjoyable?

"Changing colors around on stuff is pretty cool."

Like.

"It's a tool. I use it like a tool."

Ok.

"Is a hammer enjoyable? Perhaps for some people."

Ok.

**ability to use: three, four**

**important goals: three**

**6:15**

"Some real HCI people have deep relations with their software or something. I don't."

**average use: one or less**

How long on average have used Photoshop approximately per week?

“Per week?”

Yeah.

“An hour or less. We’ve got most of the design work for the project out of the way.”

Ok.

“And all of my other class are more focused on back end stuff. So not much design work”

Ok. So would you say that it’s really dropped off since the time before it then?

“Yeah, so we hit the later half of the semester so all the pretty easy stuff is done and now it’s making sure all the bugs are worked out. It doesn’t require Photoshop.”

**story:**

- **it’s a hammer.**
- **I figured out how not to drop it on my foot. That’s the end.**

**7:30**

“It’s interesting that you have all these questions in your survey that keep trying to get at some kind of emotional relationship with software. I mean, I have emotional relationships with some pieces of software that I use very often.”

Ok.

“ It’s just,”

And this is not one of them?

“No. Were you looking at that in the study or is that an HCI thing?”

Well. I’m honestly looking at what your responses are. And believe it or not, I’m actually learning a lot about your particular perspective about this.

“Cool, thanks.”

The one thing that I will say is that everyone is different, everyone approaches it in some form. You may not say there is relationship, but you obviously there is a way that you interface with the software.

“Right.”

And the way that you approach that software by you is that it’s a hammer. But other people define that relationship differently.

**12:25**

What would you ideally change about Photoshop to make it better for you?

“The tool names some of them are really confusing. And the interface up here, you have to know what the terms are. And since, we’ve been doing this one a lot. Oh where did it go. Trying to find where the color replacement tool. These aren’t clearly defined. And this whole limits thing that’s not clearly defined. So I just leave it at the default values.”

**56:10**

Do you have any kind of an overarching strategy? And how do you evaluate your actions against that strategy if you have one?

“I have no strategy.”

Ok.

“I am strategyless.”

You are strategyless. How do you determine what to do?

“Depends on what I’m doing. If I have an end result that I want, then I try to pick the tool that will get me there the quickest.”

Ok.

“Or when I have, when I’m just playing around, I try to find a tutorial to follow. Or I just start messing around”

Ok.

“and I’m like, hey you can emboss wavy lines and it looks cool.”

## **WoW**

### ***Participant three***

**p3\_12\_14\_09\_ses1a.wav**

**3:25**

How did you organize your gameplay into your life at large?

“Whenever I didn’t have anything else to do. I definitely had priorities like school and homework and everything. My parents did watch me and made sure I finished my homework before I played, but I always made sure to get it done so I could play.”

**3:57**

You mentioned fun, but what other reasons did you have for using this device in the past?

“It was a good social mechanism. Like I said, a lot of the time I spent with my friend was playing the video games, and I made new friends doing this as well. I figure out some other kid at school that we didn’t know played the game. And we would talk to him and befriend him. And it was a way to make new friends.”

**7:00**

Did you have any problems with this software beyond just...  
”with World of Warcraft?”

Yeah. Any specific problems?

“I stopped playing probably back last January and that was because I had a lot problems with technical support and I was doing account transfers. And they messed a couple times, and it was just a hassle to have my account switched back to where it was. Like my characters that I wanted to move. And their customer service was pretty lame, and a lot of the things that I had to do, go through were pretty extreme.”

**9:58**

“Whenever I stop playing WoW I’ll come back to it just for the PvP aspect of it.”

**ability to use 5**

**important goals 5**

**p3\_1\_15\_10\_ses2a.wav**

**2:35**

Why do you want to use World of Warcraft?

“I guess one reason would be to have fun, just like you would with any other game, but another reason would be to escape I guess like you would in any other RPG like sub-reality. It gives you a chance to do things that you wouldn’t normally do, not particularly like in real life, but in this other game world.”

So it allows you to explore other things...

“Yeah”

...that you can’t in this world.

**3:10**

Has learning the software been enjoyable for you?

“Yeah it was relatively easy. This is reflecting back to when I first played, not necessarily during this research.”

Ok.

“Because I played for a really long time. It was fairly easy learning.”

Ok. And, so I guess it has definitely been enjoyable now?

“Right because there hasn’t been any major difficulties.”

Well, ok then the question is that in this period where you are starting out again has that been enjoyable, or has it been monotonous, or has it been boring.

“I guess, because I played it before, it has been as enjoyable as when I first time that I played. Because I know what’s going on, I know what to expect, I know what I have to do. It’s kind of like going somewhere for the first time, traveling, knowing what to expect, there is an anticipation there. But if you have been there before, you know what to expect, you know the whole drive, you know if it’s going to before. It’s kind of like that, I guess.”

**ability to use 5**

**important goals 5**

**story:**

- **pretty enjoyable, because your abilities progress, within the scope of the game**
- **as you level, you gain better abilities and you get to go new places**
- **so, it’s been good relearning it, because I haven’t played it for a couple months**

**p3\_3\_5\_10\_ses3.wav**

**ability to use 5**

**important goals (no number)**

**story:**

- **I remember the hype, in 2004—I didn’t know anything about it, just about Warcraft III**
- **I downloaded it on a 56 K modem. Took me a week and a half.**

- It met all of my and my friend's expectations, where the environment is almost endless
- After playing year after year, you see a patter of Blizzard releasing the same content, just increasing the loot. Started just doing the same thing over again.
- Now it seems there is a big culture behind WoW, and the way WoW players view each other.
- I don't hide that I play WoW from people. Everybody's a nerd about something.
- WoW is going to be around for a long time.

**11:05**

How does that make you feel as a learner of the game?

"It makes me feel like I accomplished it, like there's not much else I can learn about it. I don't really know as a learner. I feel like anything else they put about I already know, it's just learning the story behind it."

**12:35**

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod I found that my workout routines had changed as a result of bring the iPod with me. So has there been anything like that with World Of Warcraft?

"Not recently. But I can relate to it from whenever I played before. It definitely changed the amount I put toward school and homework and everything. I would organize stuff around raids. Like I said before, I blew off friends sometimes to go on raids, because it was an instance where I needed an item."

Eventually you'll just need a new item anyways.

"Yeah. Exactly. You gotta go back and do the same thing over. It didn't necessarily change my life drastically. It just changed what I did with my free time. Instead of being active, I just clicked away."

*Participant four*

p4\_12\_14\_09\_ses1.wav

**5:00**

In what context did you normally play games in the past(e.g., by yourself for fun, when you had friends over, as something to talk about with your friends, or any thing else like that)?

“It used to be, well, when I was here playing by myself, playing you know just for [inaudible] and at least occasionally at least trying to play this cooperatively with my brother back home in Singapore. That was actually our means of bonding. And then when I went back home for an extend period, we’d play together side by side.”

**8:00**

Did you ever had any specific problems with the software and if so can you explain?

“Specific problems would be just playing. Trying to get the connections to work when I’m here and my brother’s still back home. There have always been network issues trying to get us to connect together for some reason. We’d try a bunch of different ways. It only works in some contexts. I had to put it on a PC. When I play on my Mac, it’s almost always impossible. So, that was the main issue we faced and it has always been a big source of frustration.”

**10:40**

Do you foresee any obstacles that will hinder you from using this device?

“Probably my schedule. I know I’m going to be pretty busy during this break. But starting in the new year I’m supposed to be pretty open in my schedule, which was why I was pretty ok with doing this study. I know there will be factors beyond my control that will suck up my time, but hopefully that won’t be too much of a problem.” [probably referring to the study itself rather than learning]

**ability to use: three**

**important goals: four**

**89:25**

“This is nowhere close to where I want to be in terms of my immediate goal, which is level five”.



**90:20**

As you were playing more and more and more, how did the interface present itself in terms of its understandability?

“It was pretty understandable. I felt like everything was kind of small. I mean I’m used to small, but it is just that it would have been nice if it were scaled a little bit kind of bigger so it’s not like I feel like I need a bigger display to see all the information I want to see. Because I generally understood based on playing experience games like these. I think general for me, The general feeling I got was it was pretty easy to understand—mostly the displays and how to interact with it.”

**p4\_1\_15\_10\_ses2.wav**

**0:22**

You mentioned that you haven’t had a whole lot of time, so that’s fine. Just trying to see wherever you are at right now.

“I’m still at a rather basic level.”

Ok.

” I haven’t been doing much recently except for like taking quests. And it’s still very low level.”

Ok.

“And I don’t know if you read the diary, the latest entry that I wrote. I kind of bemoan the fact that the initial stages, it takes forever just to level up to a level where you feel more confident about your abilities or more confident thing you do [inaudible], It just feels like you need to be a level five, level ten before the action starts to happen.”

And I did notice that you had mentioned in your diary that you are still waiting to play some higher level characters,

“Yeah.”

because I guess the beginning levels seem too like procedural.

“Right. It’s too easy. After a while, the pacing doesn’t feel like it matches what you would know by the time you reach a certain level. After you fight the same number of monsters, it’s like the quests still make you fight the same variations monsters in the same area, which means you are still limited in the same geographic area. There is not much, like you feel more immersed. You just feel like you are going back and forth in the same area.”

**5:15**

What goals do you have for using World of Warcraft? And have they changed at all over the course of the study?

“I don’t think they have changed. When I first started, I wanted to learn, I wanted to get immersed in the environment. I still keep those goals. I want to be immersed, but I think it’s more define now what immerse means. I’m very much still just achieve whatever the goal of whatever class I am in, so anything extraneous like side skills. I don’t really bother with that. I don’t know if it’s because of that particular goal in mind. Maybe it’s because I’m so focused on this goal it feel so slow in terms of the rate I’m improving and the things I’m able to do with my character.”

**8:15**

How has World of Warcraft been useful for you?

“It gives me insight into why it’s a popular game.”

Ok.

“Why people get so immersed in MMORPGs.”

Ok.

“After a while it started making me look at other MMORPGs. Not that I’m playing them. It’s just It’s like ok now I understand better, on a more personal level, why it’s so popular, why It can be so addictive, and why it can be so immersive, because it’s world. It’s a completely different world. And people are wired to fantasy kind of style, stuff. Which I am to a degree, can get very involved in it.”

**ability to use between: three and four**

**important goals: four**

**how often played: once per week for one and a half to two hours**

**story:**

- **learning curve is not steep at all, esp. with prior experience with this type of game**
- **needed to learn hot keys, which I learned quickly**
- **navigation, combat, etc. was straight forward**
- **if anything (problems?), it’s being stuck with the rudimentary kind of stuff.**

**15:50**

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new IpOd I found that my workout routines had changed as a result of bring the iPod with me. So has there been anything like that so far for this?

"I wouldn't say my routines changed per se. But this is definitely one more thing that competes for one more options of what to play when I have time."

**74:35**

What do you feel is the next step in learning to use the software?

"Really going online and see what tips people would offer"

Ok.

" as regards to the game."

And what specifically would you look for?

"Combat tips, geography, like places to go. If I could find a game guide online that would be great because that would help me figure out what all these things like. What is gold dust? Where can I find it? Where is Fargo Deep? What's up in the woods? Where can I find it? Why can't I buy it from camp? That make it worth. All that sort of stuff."

**p4\_3\_3\_10\_ses3.wav**

**ability to use: four**

**important goals: four**

**how long used: once per week, each time was at least an hour**

**story:**

- **it's been interesting. It was slow at the beginning.**
- **The learning curve was higher than I expected. You really needed to put in a whole lot of time.**
- **In retrospect, the game assumed that because you bought it and you were really interested in doing it automatically assumed that you'd play the game for an hour or so a day for the first week to get immersed.**

- If you were a casual gamer, it didn't really address that.
- If you only play for an hour a week, then the following week you might have forgotten and it wasn't as immersive or engaging anymore.
- Given the frequency that I played it over time, it makes more sense.
- Drawing on my experience from Warcraft III, it made it easier.
- If you were a casual gamer, though, I would imagine it would be more restrictive than inviting for getting into the game.

**13:10**

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod I found that my workout routines had changed as a result of bringing the iPod with me. So has there been anything like that so far for this?

"It hasn't changed. In fact, what it's done is make me more aware of the fact that I wouldn't have chosen to play this game over other games that are more accessible to me. In fact, for example, I think it was a few days ago, knowing that I could play the game and in some ways I should. Actually, the allure of playing PS3 was more attractive to me, and I actually chose to play PS3 than WoW because it felt like I wasn't really going anywhere at that point in time. And I wanted something quick and I wanted something that I didn't have to immerse myself into as much. So, that really affected the decision and after the fact I reflected on that and maybe that's one of the big issues or barriers that made me not invest as much time as I should have into the game. And I wouldn't say it's a natural, it's an expected outcome of what this game was designed to be, but it was an interesting observation for myself."

So it's like a time-management thing

"Yeah."

Gave you a different way to look at it?

"It was awareness."

*Participant nine*

p9\_12\_21\_09\_ses1.wav

**1:25**

First of all, have you ever owned or used a game like World of Warcraft before? or any game at all?

“Well, I own video games, but I don’t think I have ever played any games as quite like World of Warcraft”

Ok.

” and I have never played it.”

Ok, what do you mean quite like World of Warcraft?

“Well, just like MMORPG, I guess. I never really owned that, I play mainly XBOX 360, like Halo and Call of Duty, but never really RPGs like that.”

**2:10**

“Not really got into PC gaming so much, mostly console games.”

**3:45**

How would you say you organize your gameplay into your life at large?

“Well, right now. It is a big part, because school’s over”

Ok.

” and I can finally sit back, relax and play. But as of the past five weeks, it’s been to the minimum because of all the end of semester stuff kinda coming together and taking up a lot of my time, so basically I have to budget it around work and school, well right now I’m unemployed so school.”

**5:45**

So next I wanted to ask a little bit about what motivates you to use this device or software aside from the study you are participating in.

“Are you talking about World of Warcraft or video games in general?”

Just specifically World of Warcraft, so, well, ok, go ahead...

“Well I was just going to say, I like video games. It’s a game I have never played. so I’m interested in figuring out what it’s all about and seeing if I’m any good at it. I have heard it’s pretty challenging so that’s another thing, I’d like to see if I can take on

the challenge.”

What goals do you have for using this device or this game?

“Other than the study?”

Yeah, other than the study.

“Just to get a feel for the game, and see whether or not it’s worth me subscribing to it and paying the monthly fees for it.”

**ability to use: three**

**important goals: five**

**10:45**

Do you feel that you will be in control of the technology? And how so?

“I’m going to probably say that’s a 50/50 thing. As far as like as I said, you seem to catch on pretty quickly, but at the beginning it will probably control me a little more trying to figure out how to do everything properly.”

Ok.

“during the game.”

**p9\_1\_14\_10\_ses2.wav**

**1:15**

What goals do you have for using World of Warcraft and have they changed at all during the course of the study?

“I don’t believe they really changed. I mean I’m still trying to figure out what everything is, because for one I mean the world is quite large and I haven’t gotten around too much. And Just trying to do as many missions as I can. But even that gets confusing because I don’t really know where it’s telling me to go. So basically just, yeah, that”

So around the quests really?

“Yeah. That and building my character because I have seen a couple characters running around the map and I noticed one was slightly or I thought was slightly weaker than me. So, I decided to duel and got my ass kicked.”

Haha.

“So yeah, that taught me not to mess around with other people too much, but at least I didn’t have to go find my body after that.”

**4:00**

Have you interacted with anyone else who has the game?

“No.”

**4:20**

Has learning the software been enjoyable overall?

“Overall yeah. I have been finding it kinda hard to play as often as I thought I would because over Christmas break I got a new game for my XBOX that I have been putting a lot of time into.”

I saw the comment you put on your diary about that.

**ability to use: two**

“Probably have to go with a two. It’s a lot less than I thought I’d be. I thought I’d be by now way up there, putting hours and hours into it. But I just hasn’t progressed as I thought I would.”

Has that been as issue of just like having the other game so you haven’t had the time for it?

“Not just that, but it also has to do with not knowing where to go. I kinda get lost about where the quest wants me to go to finish that certain quest. And what to do. So it has a lot to do with knowing where to go to finish them.”

**important goals: three**

**7:15**

Do you feel that you will be in control of the software? How so?

“I suppose yes and no. I know the basics of it as far as running around the world and killing things or attempting to kill, but there is other things like I just need to learn the maps and what is good and bad as far as the main goal of the game is.”

**7:45**

Have your expectations about the software changed at all during this four weeks?

“Yeah. I would say it’s not as addicting as I thought it would be. I haven’t really caught on like I thought I would, I thought I would play it for a few hours and I would just decide that I would sit here for five, six hours in a row nonstop and just playing and playing. But really, at any point I can turn it off and go do something else because it just hasn’t been as intriguing as I anticipated I suppose.”

**average use : one week I probably didn’t touch, at least three to five hours per week into it, maybe more—depends on the week.**

**9:50**

“When I went back home and basically had nothing to do at my parents house. If I couldn’t play my other game because somebody was wanting to play the Wii or something in the basement living room, I’d just bust out my computer and sit there and kinda watch them play and”

Play on here.

“play along on here by myself. At that time, you know I could put in five hours at a time, rather than sitting there.”

Sure.

“Doing nothing. But now I come back here, I live with my girlfriend and her sister. And usually when they’re around, I’m not playing a whole lot. So they kind of distract me from that part of it.”

Sure.

**83:15**

“Whenever you were saying you think there was someone in that area that could sell me something, I didn’t know exactly where to go. And I figured I could go to the one place I knew for sure would have something.”

**p9\_3\_4\_10\_ses3.wav**

**1:00**

What goals do you have for using World of Warcraft and have they changed at all during the course of the study?

“Well, about halfway through when I was having trouble with like the missions and stuff, my goal was just to get it over with. But now, that they have made it easier, it’s more enjoyable since they basically tell you where to go for the missions. So my goal...”

So the latest update has made it easier?

“Yeah. A heck of a lot easier. So, yeah, it’s more enjoyable and easier to play now.”

**1:55**

What aspects of the software did you enjoy the most?

“The update.”

Haha.



**2:25**

Why did you want to use and learn this software?

"I just heard that it's a fun game and addicting and you could play it for quite a long time without it being a bore and you know being old or whatever. So, I just figured that would be a good thing. Plus since it's free, that's a plus"

Uh-huh.

"to being able to play you know basically as much as you want."

Ok. Has learning the software been enjoyable?

"Half and half."

Ok.

"Like I said, when I was having issues with trying to figure out where I needed to go to complete quests

Uh-huh.

"that wasn't enjoyable and I didn't enjoy that. "

Ok.

"But now with the updates, I can get through quests quicker and easier. "

Ok.

"And actually feel like I'm progressing. "

Ok.

**ability to use: two**

**important goals: two, maybe three**

**average per week: one hour per week, very little compared to most gaming he does**

**story:**

- **frustrating at the beginning, challenge**
- **recently it's become more enjoyable**

**60:40**

Do you have an overarching strategy when you play? And how do you evaluate your actions against that strategy?

"Not really? I'm just trying to figure out what I'm doing. I'm just kind of confused at the moment because this giant circle building confuses me."

What?

"This Giant Circle building."

Undercity?

"Yeah."

*Participant eight*

p8\_12\_18\_09\_ses1.wav

**\*\* Missing Data \*\***

p8\_1\_17\_10\_ses2.wav

**0:25**

What does this software allow you to do that you cannot do in any other way?

"I guess sometimes in real life I have like trouble communicating with people."

Ok.

"I wouldn't just go up to a stranger and start talking to them. In this, I don't feel the like you know pressure, awkwardness of saying, Hey Hi, How are you?"

Ok.

"It's a nice thing, rather than, in this society you have this awkwardness, but in the game you don't."

Ok.

"It's pretty nice."

**3:15**

"Oh yeah. I was going to tell you. Yesterday I found out, I went to this, is it South, Northland or Southland or something like that. It's like above Wetland."

Ok.

"Let me show you. But like there's a, That place is full of enemies to attack. I always been thinking where I go killing all these like, they call Defias, bad people."

Ok.

"But I never though other people could kill mine."

Ok. Ok.

"But I think I killed one time. I was just standing there."

By another player?

"Yeah. I was just standing there, I was sitting on a horse outside of Darkshire. I think that's what it was. And this guy just threw a flash of light at me, and I was like phew, I didn't die. And then he threw another one, and I died. And I was like darn it. But I guess he was like, he had the writing on it, he's a bad guy. So, it was a

player and I was like show some compassion.”

Haha.

“ I’m trying to survive here. It’s the realistic part that fascinates me.”

**9:05**

“And then I went into Badlands. And then I went in there, I think I was still like level twenty something back then. And it’s like I couldn’t move at all. Every time I moved, like something attacked me, like they hit me one time and I’m dead.”

Ok.

“There’s another player in here. I actually added him as my friend. He helped me a lot with the quest.”

Ok.

“He is, has multiple accounts. He had one level same as me and he has one level as 80. And he was like, I asked him for help get me out.”

Uh-huh.

“Oh, yeah that’s the king of the guild that I’m in. He’s pretty nice. He gave me like all these like bags.”

King of the guild. Haha.

“Yeah. The bags of sixteen slots. I had ten before, and I just kept dying.”

Ok.

“ Or not dying, but filling these up.”

Yeah.

“ So he helps me and I try to help other people.”

**12:20**

Has learning the software been enjoyable?

“It has and it hasn’t.”

Ok.

“ Mostly it has. I really liked when I first like discovered, every little things when I think that there is nothing left to learn. And then a new city pops up or a new something just popped up that wasn’t unexpected. But the bad part is that for a while I was stuck in Dun Mohr, something like that.”

Ok.

“ It was like one of the cities. And it was all snow, and the levels, the critters, if that’s what it’s called them, the people I was supposed to attack was way below my level and really boring for me.”

Uh-huh.

“So, for like a week I was kind of like stuck there and I didn’t

really do anything. Every time I tried to go back in there and tried to get out, I just lost interest because everywhere you go it was just mountains and it's like, Ah, I just don't want to play that anymore."

Was it because it was all snow and it just didn't look as good?

"No. It's because. First of all, I discovered this place, I have no idea, like unexpectedly."

Uh-huh.

"Like if I expectedly discovered, like for example Westfall, Duskwood. And I discovered it and I knew it was coming. But for that one I was in like Iron Forge"

Uh-huh.

"and then I just walked through something and end up there. and rode the trim, tram something like that. So, it was unexpected and I didn't know what to do. Once I got there I had no quests, and I just walk around and after discover all the places, I didn't know what else to do"

Uh-huh.

"and I just kind of lost interest in it."

**14:30**

How has World of Warcraft been useful for you?

"I never thought about it that way. It's just fun."

**16:35**

What resources have you used for circumventing problems?

"Resources. So, the guild is one, and I think the person that helped me the most, is the friend I added, but he's not in the guild, he's in a different guild. So, he helped me a lot. But he doesn't play there anymore. And the guild helped me a lot. And the person who helped me told me to go to this website. A whole bunch of t's, h's and o's. It's like Thottbot?"

Ok. Yeah, I know what you're talking about. Thottbot.

"Oh is it? But it's this one, huh, yeah this one. Where you can just type in. Like it's so troublesome. When I first found it, I was like oh, helpful. But now I have to go back and forth, it's really annoying."

**ability to use: two**

**important goals: four**

Have your expectations about World of Warcraft changed at all?

“Before, I just thought it was a game, my expectations was not very wide. I thought it was just a very simple game. You do this step-by-step.”

Uh-huh

“But now I think it’s this huge expansions”

Uh-huh.

“where it’s just like everywhere. It’s not step-by-step, you can do this, you can do that, whatever method you want to do.

Uh-huh.

“So knowing that it’s even more that I first expected. Now, my expectations increases. I expect it to be more interesting that my first thought.”

Ok.

“ If it was my first thought, right now I’d think it was really boring.  
“

Ok.

“But I like it. Before I didn’t really think about you know so much out there, but now I know my expectation increases.”

**average use: during break ten hours per day, somewhere around there, last week ten hours a week, during the semester it will be about ten hours per week.**

**story:**

- **At first, I was really lost, no idea what was going on.**
- **My first resources, I talked to my friends. They were really excited and all wanted to help me.**
- **This character I didn’t even create, my friend created this ugly hair, but I went to the salon to get it cut.**
- **Everyone told me different thing. People said to attack I can sometimes continuous press it [every time], but some else told me I just need to press it once. I think the later one is correct**
- **At first I wanted to take all of them [quests], now I only take, oh it’s another quest, they’re not really that exciting anymore. There’s so many, and you can only take 25**

- **I realized you can train for different professions, at first I picked tailoring and blacksmithing, but I didn't do anything about it until level 27.**
- **Someone taught me to use the hammer to make products out of it. I had to find a forge to, I asked a friend where I could buy one, but he laughed and said I couldn't buy one, because it's the size of an oven.**
- **I try to do the quest to discover and learn new things.**
- **There's so much, I can't explain everything.**

**26:05**

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod Touch, excuse me when I got a new iPod, I found that my workout routines had changed as a result of bring the iPod with me. So has there been anything like that so far in any part of your life?

"For Christmas break, usually, I spend time watching movies with my mom. "

Ok.

"I guess this Christmas break, I just played that game. "

Uh-huh.

"I mean my mom is still there"

Uh-huh.

" , but it's like were' we're not not watching a movie together or doing something together. "

Ok.

"So at home, that changed. At school, I guess just sometimes I would find a movie watch, if I have free time"

Ok.

"but right now, I just think to play this game."

**86:30**

And, finally, how easy is the interface to understand and did that change during the session?

"You know what was frustrating me yesterday. Everytime I click on here, my character would pop up."

Ok.

"It's not doing that today."

Ok.

"And I changed the setting to show my health and experience bar, but it's not doing it, so. I mean like the interface, I'd say it's pretty

easy to understand. Every inn looks the same, every like blacksmith places looks a lot the same.”

Uh-huh.

“ I’d say it’s very easy.”

Ok.

“Just like there is hidden shortcuts or things, if you didn’t know, you wouldn’t go look for it.”

Has it always been that easy or has that changed during the course of the study?

“It definitely changed. It’s become easier and easier. Like, at the beginning, I didn’t know how to open to loot, or mining or anything. But after like one simple explanation or look up, I understand it.”

p8\_3\_5\_10\_ses3.wav

0:14

Oh you made two [characters]?

“Oh actually so, this is my friends account. That’s his, that’s his player, not mine.”

I see.

“Like it’s a joint account and I guess you can triple, or yeah, triple the experience if you play together.”

Really?

“Yeah. It’s pretty cool. “

Huh.

“[Inaudible] .I told him it’s ridiculous. So, basically when I got to level 60, everything like, He played with me until level 60, so everything was triple experience, so it was really easy. And then from 60 to 69, it just killing me.”

Yeah, it gets worse and worse.

“And it’s a mage. So I get that.”

Yeah you gotta be in a group.

“I’m not really good at playing on, getting hit, getting away from players, so player against player. So every time someone hits me, I give up.”

Haha. Yeah.

5:40

Has learning the software been enjoyable on the whole?

“It has. Because like sometimes I will catch myself thinking, oh I wonder how they did this. Like for example, they would have like, she would fire a frostbolt.”

Uh-huh.

” And I would totally think like how software, how do people create this, like instead of going a distance, why is it they move the fireball from one place, or one axis”

Uh-huh.

“, is that what it’s called?”

Axes?

“Axis. From like one position to another rather than thinking it like depth way.”

Uh-huh.

“ Sometimes, I catch myself thinking that and I find it very fascinating.”

So, you are interested in the developmental aspects of this as well?

“Yeah.”

**8:40**

“It’s kind of fake, but it’s kind of real because there are real people playing in it.”

Uh-huh.

“ And it depends on who you are playing with that you have a bad or good experience from it.”

**9:00**

What resources have been useful for circumventing problems?

“Some of the resources I used. Most recent ones, besides like online and asking people in there, my friends and then. This one has add-ons, like they tell you where to go.”

Yeah.

“I don’t know how to get that, but it was, my friend gave it to me. So, rather than me going to online, and actually ”

Uh-huh.

“ find the quest, and going back and forth. “

Uh-huh.

”This is way easier.”

Actually, this game in the last patch and actually that was happening on the other server too.

“Oh.”

Yeah. So.

“See I didn’t play that at all afterwards.”

Ok.

“So, I didn’t know, but now it’s so much easier. And, I totally forgot the question.”

I was just asking about resources.

“Oh. And so, friends is one. I think I learn most from friends,



because this doesn't tell you very much. And sometimes I still do need to go online. Yesterday, I was doing one where you had to go into a tomb. And to complete the quest, I did it three times and I still couldn't do it. And then later I read that it was for three players."

Oh. Ok.

"Yeah."

That would help to know.

**ability to use: close to a four**

**important goals: four**

**average use :30 hours per week**

**story:**

- **at first, I feel that this is a huge software that is beyond my skills, I feel that I would not be able to do this.**
- **right now, I am better, but I still feel, I'm not like in this. Maybe not even mediocre.**
- **For the quests, I can tell others what to do if they are new, but overall, I feel that I'm not as successful as others.**

**16:35**

Could you tell me about the transition from the private server to the public server. So when you started over on the public server, how was that experience?

"At first, I really really, didn't want to because on the private one, I already played up to 52, 53. So, I worked really hard to discover all the places, explore them. And then, but like my friend just like dragged me into it, he even bought this account and told me, you have to play with me, blah blah blah. At the very beginning it was so boring because, I couldn't ride a horse,"

Uh-huh.

"I couldn't do anything, I was just like running around. And he got a level 80 guy to go into a dungeon and grab a whole bunch, I don't know what they call, monsters."

Uh-huh.

"And they came over, or he killed them in front of us, so we got all the experience.

Uh-huh.

"And then when we get to, So that's how we got to level twenty. We probably did ten quests before that. And then afterwards that

we did dungeons, over and over and over.”

Uh-huh.

“ Each dungeon we could level probably,”

Uh-huh.

“ because we had that three times experience. “

Uh-huh.

“And, so, afterwards I just played dungeon, I didn’t do any quests.

And right when we got to 60 he wouldn’t play with me anymore.

He went back to his other account. Because after 60, there was no more three times experience and it was too hard. And I was like, you horrible, horrible person.”

Haha. He just left you.

“Yep.”

Haha. Well, I mean you made it another nine levels.

“It was, it was really hard.”

Yeah.

“ Like I just wish I could like do three quests and be done with it.

Suddenly, it goes from one day being able to go two or three levels, to like one day you can’t even get pass one level.”

Right, yeah.

“ But I guess I like the challenge.”

Ok.

“ I can do it,”

Ok.

“ I don’t need other people’s help.”

Ok.

**20:05**

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod Touch, excuse me when I got a new iPod, I found that my workout routines had changed as a result of bring the iPod with me. So has there been any routines that you have that have changed?

“I mean at the very beginning when I did this, I just like whenever I had time, or bored”

Uh-huh.

“, I do it. Now, I feel like I play it every, I get, and sometimes even make time to play this. I guess this game is addicting.”

Ok.

“ Sometimes, I even bring, like my friend asks me to spend time with her, and I bring my laptop to the library to play.”

Ok. Ok. So that’s a big change.

“Uh-huh.”

The whole how you sort of work it in, work your play time in to

your life. At first, you were just filling your free time in with, then it really started changing.

“Yeah.”

That’s interesting.

**23:00**

“Just because you’re a higher level, doesn’t mean you understand everything.”

## **iPod Touch**

*Participant eleven*

**p11\_12\_21\_09\_ses1.wav**

**1:07**

Have you ever owned or used an mp3 player before or other music playing device?

“Yes.”

Ok. Could you talk a little bit about how long ago and for a long?

“It was probably about, what two, three years ago. I was a sales associate for Verizon and sold their phones.”

Ok.

“And you could play your mp3s on there. You could buy them over the airways and what not. Some of them were touch displays, similar to the iPod Touch.”

Ok.

“But, the iPod in general I never owned.”

Ok. How long ago was that?

“When I worked at Verizon? Three years ago.”

So that was right when the touch technology was coming out then?

“Right yeah, some of it wasn’t the best, but it was getting there when I left.”

In what contexts or situations did you most commonly use that device for?

“What type of situations?”

Yeah. For instance for work, for play?

“Well with the job, I had unlimited access to it. So, I mixed a little bit of both. I used it to train employees, I used it for my personal use, and then also for company use to.”

**5:05**

What goals do you have for using the device?

“Some of my family members have the iPod touch.”

Uh-huh

“And they use it a lot. So I want to learn how to use it. My parents just got one. I don’t know why.”

Ok.

“Because they don’t really use that kind of stuff. but, I want to show them how to use it and not look stupid while fumbling through it and show them how to use it too.”

Ok.

“ They got it for Christmas.”

**6:10**

What aspects of the device to you expect to find most enjoyable?

“I think the app store and the Touch Screen”

Ok.

“ is what draws me to the iPod Touch.”

**8:30**

Do you foresee any obstacles that will hinder your use of the iPod touch?

“Well, that I’ve never used it before. And also, I don’t own any Mac computers, so I’m interested to see how it interacts with PCs”

Ok.

“ as opposed to Mac technologies.”

Where do you think you will go for help if you get stuck with the iPod Touch?

“Where would I go for help?”

Yeah.

” I would first go to Apple’s website,”

Ok.

” I would check their forums to see if anyone else has had that issue. I would ask my family that own one, friends that own one. Usually, that would get it taken care of. If not, I would send Apple a message,”

Ok.

“or get in contact with their tech support.”

**ability to use: five**

**important goals: four**

**0:30**

What does this device allow you to do that you cannot do in any other way?

“The biggest thing that I’ve done is download movies and music for trips up to my hometown of Fort Wayne.”

Ok.

“And that’s become very useful for my wife and kids while I’m driving up there. And that keeps them more quite .”

Like full movies?

“Yeah. I downloaded inglorious Bastards not for the kids.”

Haha. Right

“The kids they more enjoy going on and playing the little apps and games and stuff. So I use that quite a bit.”

**ability to use: four (haven’t figured out email)**

**important goals: five**

**average use: two to three times per week, one and a half to two hours per week combined**

**story:**

- as far as the ease of it, it’s been very easy
- the syncing, downloading it to computer, uploading from computer is effortless, just hook it up and go
- the most difficult part is logging into iTunes
- as far as how I relate to it, I do—because it relates to my lifestyle because it’s easy
- I like things to do what I want them to do.

**10:55**

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod Touch, excuse me when I got a new iPod, I found that my workout routines had changed as a result of bring the iPod with me.

“It sounds probably kind of weird. But the biggest change is when we travel,”

Uh-huh.  
“and I actually let the kids use it”  
Uh-huh.  
“because they’re entertained in the car they’re not bored, but my routine has not changed.”  
Ok.  
“So.”  
Ok.  
“Besides getting on your journal and writing.”  
Right.

p11\_2\_24\_10\_ses3a.wav

**0:35**

What does this device allow you to do that you cannot do in any other way?  
“Honestly, right now, nothing.”  
Ok.  
“I, the usage on it has dwindled for me”  
Ok.  
“over the timeframe.”  
I kind of noticed that.  
“Haha. The [inaudible].”  
It seemed like it went like learning, a little frustrated, excited, happy, and then it’s like indifferent.  
“Haha.”  
Stopping.  
“I couldn’t find things to do with it after a while. “  
Ok.  
“that were new.”  
Ok.  
“So it just felt like more of a tedious task than anything.”  
Ok.  
“So, I didn’t it wasn’t making anything easy for me, so.”  
Ok.  
“You know I just really never used. Well, I tried to use it, but I.”  
Fair enough. Also, notice how I tried phrased that question  
“Yeah.”  
Just in case, things changed.

**1:45**

What goals if you have any still, would you say that you have for the device and have they changed during the course of the study?

“Well, they definitely changed during the course of the study. I really towards the end was seeing if this was something that I liked to have.”

Uh-huh.

“Really, if there was something new that popped up that I would like on it. It’s a great device and it did everything I expected it to. It’s just for some reason my old habits kinda came into effect and I didn’t utilize it.”

Ok.

“It was really more of a pain to carry around and use than a convenience. If that makes sense.”

Sure.

“I was going to use it to you know track dieting, but it just never got utilized like that.”

#### 4:10

Has learning the technology been enjoyable for you?

“It, learning it was. I think I said in previous interviews that I like to get a hold of new technology and play around with it, see what it can do. It’s just once the learning curve it. I guess I was just bored with it after a while.”

Yep. That’s what you put on there.

“Haha.”

#### 5:10

“But, it was nice to receive emails. I never did get it set up to send emails. That would be nice.”

#### 6:30

Going back to the first question, what was it at that point it, your use started to trail off?

“I would say when I wasn’t able to setup the email easily. And then for some reason, things just started popping up that I didn’t like. I noticed that you know like my computers been having issues, so I had to send it, I have to send it in again now. But they reformatted and do all that stuff, once it’s at Asus. And so, I went to put music back on my laptop and they won’t let you do that, so”

Ok.  
“, because I downloaded it from my desktop. So, my desktop had all my music on it, which I couldn’t put it on my laptop, which I would like. So things just started popping up, that kind of annoyed me about it.”

**ability to use: four (email)**

**important goals: five**

**use: fifteen minutes to one hour per week**

**story:**

- **I thought it was pretty enjoyable learning, it's ease of use and customization was fun**
- **lots of things you can download it.**
- **at the beginning, it was fun,**
- **then I became bored with what you could do with it**
- **and it became more tedious than anything**
- **and life situation started to pick up—became a lot busier.**

**12:15**

“And probably, honestly, my school picked up. And you know my wife decided to go for her doctorate and all that. I have been a lot busier. That's probably another reason I feel into old habits.”

### *Participant twelve*

**p12\_12\_21\_09\_ses1.wav**

Have you owned an Mp3 Player before or any other music playing device?

“MP3 Player? Yes.”

And could you tell me a little bit about that device?

“The one I have right now is just the iPod shuffle.”

An iPod Shuffle? Ok.

“Uh-huh. I just use it to listen to stuff when I'm exercising,”  
Ok.

“ which I haven't used it very much this semester.”  
Ok.

“ I mean I have had other MP3 players before, but I don't know what they are. [inaudible]”

How long ago would you say?

“The other ones?”

Like how long?

“year or two, three.”

Over the last years you have had a few.



“Yeah.”

And how long have you kept each of them?

“Well I got the shuffle a year ago and it’s the only one I have. And the other one I had, I gave to my daughter because hers broke Haha,”

Ok.

“ and I probably had it for five or six months.”

**3:00**

And any particular environment or circumstance?

“Mainly just for working out, and exercising. I do have it, I do have the Shuffle set up now to be able to use it in my car, but I almost never use it in my car.”

Drive in silence?

“Yes. That is my reflection time. Haha”

Haha. Fit it in where you can.

**4:25**

What goals would you say that you have for using this device? The iPod Touch.

“Well, one of the things I think about, when I think about an iPod Touch is that it’s more than just an MP3 player. I don’t know if I’m just going to be using it as an MP3 player, or if I’m going to be using other things on it as well.”

Ok.

“ So, I look at the Touch as being a lot more robust than your typical, you know my Shuffle or anything like that.”

Uh-huh.

“One of the things that I like about the touch is the display, so that I can navigate easier. And I don’t even know, does this one do video?”

No. No video. I don’t think.

“Like pocast videos? ”

It will play them back.

“It will play them back.”

I don’t know that it will take them.

“Not record. But it will play back videos. So, that’s one thing that I look at, is being able to play podcast videos on a mobile device. I mean, my laptop is mobile, but not as mobile.”

Ok.

**6:20**

So, what motivates to use and learn this device?

“The designer in me. Haha.”

Ok. What do you mean by that?

“You know, just, designers are always wanting to keep exploring and learning things. I’m as interested in the study, as the study,”

Ok.

“ as much as being a participant.”

Ok.

“Does that disqualify me from being in the study.”

No. As long as we get that up front to begin with, it’s fine.

“I mean , I’m interested in, it’s the nature of being a designer.”

**7:25**

What do you expect, how do you expect this iPod touch to be the most useful for you? How do you expect it to be useful?

“That I will have found enough utility that I can give a good enough argument to justify to my wife why I need an iPod Touch too.”

Ok.

“ Because I just got one for her for Christmas.”

Ok.

“Haha. Basically to explore the real functionality. To me, I’m interested in seeing how useful it is as a mobile computing device.”

Ok.

“Cause I know that it has, that you can access the internet, that you can access WiFi. So I’m just curious to see how well it does that. So I’m thinking a lot about it beyond an MP3 player.”

**ability to use: five**

**important goals: five, maybe four**

**11:20**

Do you feel you will be in control of the technology?

“Yeah.”

How so?

“um.”

I guess by control, I mean, make it do what you want to do.

“Well other than the fact that I know that it’s an Apple product, and I can pretty much rely on the brand.”

Ok.

“I mean, but to be honest with you. Trying to give a gut response to it, I’m pretty confident that it will be reliable to allow me to do that, based on my experience with the MacBook.”

**69:05**

Is there anything you didn't make progress on?

"To me, it's really frustrating to not be able to jump over here and use it like I do stuff on my laptop right now."

Ok.

"You know, Gmail. If I get ready to send an email to somebody, I don't have to type in the full email address, you know it's going to find it for me."

Ok.

"So then I look at that and I ask, is it really useful for sending email. Maybe I'll use it just for checking email. You know, maybe replying, but not initiating a conversation. So I think it's one of those things that I'm mapping in my mind, at what point, do I use this, do I use this or do I use, point to my laptop, or do I use my cell phone and send a text message. You know that's the thing, where I'm looking at, how am I going to change the way in which I interact with people. "

Ok.

"If I want to contact my wife. Is there something, She has an iPod Touch, I have an iPod Touch. Is there a way for us to effectively communicate with each other? Other than ways we do it traditionally now, which is either via email or starting a chat session through Google."

**72:25**

How did you go about figuring out how to do a specific thing?

"What specific thing?"

Any specific thing that you had to explore? Can you think of some example?

"Well, a number of things that you were asking me about. I know about the functionality because I have seen other people using it. So, I'm relying on my observation of other people using it, basically iPhones. And I'm translating that to an iPod Touch."

Ok.

p12\_12\_21\_09\_ses2.wav

**3:15**

What goals do you have for using the iPod Touch? And have they changed at all during the study?

"A little bit. I kind of thought I'd be playing more games on this"

Uh-huh

“, but the only game that I downloaded is this Sudoku app. “

Ok.

“Really, I don’t know it’s as much a function of the device, as I just don’t have time to play games.”

**7:30**

“I don’t use it as much as I thought I would.”

Ok.

“ And I think that is mainly driven by the fact that I do spend so much time on my laptop.”

Uh-huh.

“ Typically, when I’m at home, if I’m not reading a book, I’m on my laptop, “

Uh-huh.

“ and I’ll have this sitting next to me. And there’s a few times that I’ll use Tweetie app on here, as opposed to TweetDeck on my laptop. “

Uh-huh.

“ Just depending on what I’m using. So I kind of use this as a secondary device.”

Ok.

“And that’s something that I didn’t necessarily anticipate.”

**10:30**

So, your wife got an iPod Touch as well. Is there any kind of interaction between the two iPod Touches in terms of just you talking about them that affects how you use the iPod Touch or do you actually have any apps that interact with each other at all?

“We haven’t tried doing that, we haven’t tried downloading the bump app or anything like that. Mainly, it’s just generating a dialog over the fact that both of us have one and my wife is not real a user of technology. And so, from that perspective, it’s really interesting for me to see how she adapts to it.”

Uh-huh.

“ I don’t know if I mentioned this to you, I was talking to somebody about this the other day. She was really reluctant and hesitant to get on Facebook and use it.”

Uh-huh

“Did I tell you about that? ”

Uh-uhn.

“Well that’s one thing that I noticed that was really, really interesting. She’s on Facebook all the time on her iPod touch,”

Uh-huh.

“which is not something that she did with her laptop, and not something she did with her desktop.”

Uh-huh.

“ So she has a desktop computer for one of her jobs, and a laptop for school and studying, and now she has this. So, she’s been on Facebook for a while, but been very infrequent”

Uh-huh.

“does she log onto Facebook. Now, she’s on Facebook all the time. She reading other people’s walls, she’s commenting , she’s liking things. She actually was trying to figure out how she could send a picture to herself on her iPod so she could put it on Facebook.

Which she could do, but it’s a pain.”

Yeah.

“So, that was one thing that I noticed that was interesting. It basically it allowed some way this device broke down a barrier she had over something.”

**19:20**

So it’s a difficulty in comparison to in the situations that you can do that, you could just as easily pull out your laptop which is I guess, more effective for you?

“More efficient.”

More efficient.

“Yeah. I think it’s more a matter of efficiency. Trying to read through an email. And then if I want to reply to somebody, trying to use the little keypad on here.”

Uh-huh.

“ I don’t like the keypad, the touch, you know. I mean from a tactile perspective, you’re not hitting a screen your not hitting buttons.”

Ok.

“I don’t like that.”

Ok.

“ It’s really hard.”

Ok.

“I think there’s a big learning curve on learning how to use it.”

**ability to use: four**

**important goals: three**

**average use: I’ll use it regularly, but for short periods of time.**

**story :**

- the biggest thing is seeing that bringing a new device into the mix
- the way I find myself using is not the way I originally anticipated.
- Use it much more just to do quick checks
- not using it as an MP3 player
- not using it to play games really
- it's a device of convenience that when I'm sitting at the table eating, or sitting on the couch or talking to my wife and use it and it's not very intrusive
- you can sit there and have a conversation with it open and its not as bothersome

**28:55**

"And my wife, if I have my laptop open and whatever and we're talking and I have my laptop open, that will bother my wife. And if she sees me looking at the screen, she thinks that I'm not listening to her, paying attention to her. Whereas with this, I can just have this, and I can bring the Weather channel up, pull something up, and I can close it. She doesn't think twice about it. I guess because of it's nice cute little size."

Yeah.

**63:50**

How confident do you feel you are able to learn this device?

"Haha. The device itself I feel I'm ok. The thing that tripped me up both times has been the WiFi settings."

p12\_2\_22\_10\_ses3.wav

**5:10**

What goals did you have for using the device and have they changed at all during the study?

"I think one of the goals that I said was playing games. And I really didn't play games."

Ok.

“ The only thing I downloaded was this Sudoku app.”

Uh-huh.

“ I don’t know, I just, to me, the size of the screen was kind to me, I thought, a constriction. You know it’s kind of cute little entertainment. I’m not the kind of person who would sit down and waste hours playing a game. I’m more focused on getting stuff done.”

Ok.

“ So that was one of them. The other was what I could access that I couldn’t, what I could do, how the apps, how I would interact with the apps related to my laptop. And again, what I found out was.

What was the second part of that questions? How did it change?”

Yeah. How did it change?

“I found that basically if my laptop was handy, I’m spending so much time with my laptop that I really didn’t spend as much time using this as I thought I would. I thought it might be handy to check email and stuff like that. I didn’t find the Gmail, not, app to be very user friendly, basically because I’m having to use the touch screen to write,”

Ok.

“ versus having to use the keypad on my keyboard on my laptop.”

**8:06**

“I liked the push technology, updates being pushed to me, where I could pick and choose what was being sent to me.”

**ability to use: four**

**important goal: four, maybe three**

**story:**

- **it’s got some usefulness to it.**
- **it’s limited in my opinion**
- **as long as I have access to my laptop, it’s not really doing much for me beyond what I can do, because I have all that functionality in my laptop**
- **pretty easy to learn except for the network access that threw me off the first time**
- **it took me two times to remember, it was not really intuitive**

- average use: a couple times a day intermittently, no more than five to ten minutes each time

*Participant seven*

p7\_12\_17\_09\_ses1a.wav

**1:40**

Have you ever own or used an MP3 player before or any music playing device of some sort?

“No.”

Nope? Ok. How did you store, retrieve and organize music in the past?

“Just on my laptop.”

On your laptop?

“Yeah. And I have some CDs.”

Ok.

“Yeah.”

How do you play the music typically?

“On my laptop.”

Do you have a CD player?

“On my laptop?”

Just separately.

“Yeah. But I don’t use it usually, but I do have one.”

Ok. What reasons do you have for using your laptop as opposed to you know a CD player for example.

“I just like to use one thing, like, just keep everything you know consistent. Rather than having too many devices to deal with.”

**4:05**

What goals would you have for something like an iPod Touch?

“Just I’m like a developer and designer for mobile devices. So I wanted to learn more about it through this.”

**6:55**

Where will you go for help if you get stuck in something you’re trying to do with the iPod Touch?

“I think I’ll just Google it, like try to find out online.”

Ok. Is that the only place or is there other?

“Well, maybe I can ask someone who has used it and just share experiences.”



ability to use 5

important goals 5

p7\_12\_17\_09\_ses1a.wav

23:30

How did you go about figuring out how to do some specific thing, whether it be to download the app or to get the music onto it, or anything like that. How did you go about trying to, like sort of what was your overarching idea of what you were doing? How did you problem solve I should say maybe?

“Oh. Problem solve. Yeah, I’m just treating it like another computer, a small computer.”

Ok.

“And actually, I have been using PDAs a lot so I know that you sync it with big [inaudible].”

Ok.

“So I was trying to transfer my skills from the PDA to here.”

p7\_1\_21\_10\_ses2.wav

1:00

What does this device allow you to do that you cannot do in any other way?

“Well, what I was trying to do last week was I’m trying to develop a website for handheld devices.”

Uh-huh.

“ So, just, it’s just good that I have it right now, “

Uh-huh.

“so I can check it here. ”

Yeah.

“So, that’s something that I’m doing new with it.”

That’s not something you can do with anything else?

“No, it’s just not something that I did before.”

3:18

Why do you want to learn and use this device?

“Because I just think it’s like the next generation. I think like,

because, I don't have, my cell phone is, is not, I don't have an iPhone, but I have a Sprint phone."

Ok.

"And it's almost like a smart Phone but not really."

Ok.

"It doesn't have all the features. But I was looking at the website of Sprint and they were showing like the next Generation of Sprint phones and they are going to be very similar to what iPhones look like. So, I just feel like this is the next generation, maybe this is what all the new phones will look like."

**ability to use: five**

**important goals: five**

**approximate: use six times, one day I'll use it a lot and then I won't use it for two or three days**

**story:**

- **it's been very intuitive**
- **I already had some experience with handheld devices**
- **almost like a computer, so it's not very hard.**

**p7\_2\_25\_10\_ses3.wav**

So, I just wanted to get back in touch with you about the study. And I know, unfortunately we couldn't meet up at all, and I'm sorry I tried to meet up those couple of days. I wasn't able to meet with you unfortunately. But I guess the problem with the home button has always, for the last couple of weeks.

"Yeah."

Ok.

"I asked a couple people to try it as well. And nobody could."

No one could get it to work?

"Yeah."

Ok. I'll have to take a look and see.

**1:20**

What does this device allow you to do that you can't do any other way?

"Like if I, if it's with me, you know, I can just check, if I need to

check an email urgently, I can do it. But you know I can do it on my phone because I have a data plan.”

Ok.

“I guess that’s.”

Would you say that this is less effective because your phone allows you to do it as well?

“Well, I don’t know, for some reason, I can’t get on the university network,”

Ok.

“ but with this I could.”

Ok.

“ And that was one advantage I think.”

**1:58**

What goals did you have for using the iPod touch and have they changed at all during the study?

“Yes. First, I just wanted to get used to the application, find out its capabilities, see if I can use it in my research. Then, I discovered it’s very handy, I can take it different places and just use it when I want to it. I think like there is a lot of excitement at the beginning and then it veers off, and it’s like yeah, you need to work like this, so you need to sit in front of a desktop. And that’s always more effective, because you can do so many things with the desktops.”

**4:10**

What resources have been useful for you for circumventing problems?

“I think I was just trying to figure things on my own. If I couldn’t figure things out, I’d leave it and come back to it later.”

Ok.

“So it’s. Yeah. I didn’t really use any resources.”

**ability to use 5**

**important goals 5**

**5:30**

Did you feel that you were in control of the device? How so?

“I was really frustrated when I couldn’t get the home button to work. So, I just really didn’t feel like I’m in control of the device.”

**approximate use: used it the week after the previous interview, then it stopped working**

**story:**

- it was just a different operating system
- the PDA's you can use stylus, this is a different operating system, different environment
- this is touch based
- it's pretty easy to get used to.

*Participant five*

p5\_12\_16\_09\_ses1.wav

**1:30**

Have you ever owned or used an MP3 player before or any other kind of music device?

"Yeah. I've had an MP3 Player before."

Ok.

"It was when they first started getting popular. It was a little thing that didn't even have a screen on it and just the forward and back button for songs."

Ok.

"It could probably hold about twenty songs. "

Ok. What kind was it?

"I don't even remember. It was a present."

About how long ago was that?

"It was"

And for how long did you use it?

"I think I got it my freshman year of high school."

What year was that?

"Oh, 2003. Maybe?"

Ok.

"And I didn't use it very long, because I didn't really listen to music"

Ok.

"much back then."

**6:38**

What motivates you to use and learn this device?

"I think the touch screen is awesome."

Uh-huh.

“That’s one of the coolest features I have seen on things. I love touch screens.”

Ok.

“And just having an MP3 player is something I can listen music for.”

Ok.

“ And then probably just the whole apps thing again.”

Ok.

“Because I think it will be really cool to start using and playing all the different games on them and stuff.”

So a lot of it is technology related

“Yeah.”

just using the technology.

**8:35**

Is there going to be any overlap in capabilities between the phone and the iPod Touch?

“I don’t think so. See, my phone’s just a little”

Ok.

“Doesn’t really do anything”

Ok.

“Besides call.”

**11:25**

Where do you think you will go for help with the device when you get stuck with something?

“Message boards. I’m sure there’s some huge iPod forum, message board that I can go to”

Ok.

“and probably find everything I need.”

Ok.

“ And all of my actually, two of my roommates have iPod Touches. ”

Ok.

“So, I’ll probably just be able to ask them about it.”

**ability to use: one**

**important goals: five**

**65:05**

Anything else that are some of the first steps that you are going to do at this point beyond iTunes? or is that the only big one?

“Well, I mean, that, once I get that done, well there’s that. And

then I'm going to have to get music."

Uh-huh.

"But that goes through iTunes, so. That'll be, that seems like it's the focal point, it's the gateway."

Uh-huh.

"Get iTunes open and I can start messing around with that. So once I get that, I'll get the software that I need, then I can put the music on it, and start downloading the apps."

**p5\_12\_16\_10\_ses2.wav**

**1:30**

What goals do you have for using the device?

"Huh. The number one goal right now is to get software on it so that I can do, so that I can download apps."

Ok.

"That's [inaudible]."

And how have your goals changed during the study?

"Uhm. At first it was, it was just, uh, you know, I want to use it so that I cannot be bored on the way to class and stuff. And then I found out about the whole, uhm, 'it costs money to upgrade software to the new firmwares.' And, until then I can't download apps and stuff. So, I've been looking online at a bunch of different ways to get the software for free."

**3:30**

Is there anything else that makes it so cool?

"I'm very impressed with the speed of the Internet and the browser. Because my phone has the Sprint 3G network, which is supposed to be pretty not bad. But this thing blows it out of the water. I think it feels almost like a laptop with it's internet capability. Which is cool."

**7:35**

What resources have been most useful for you in circumventing problems?

"My roommate because he has one."

Ok.

"And maybe just specifically with getting the music on here. He's helped me do everything so far. He's the one that showed me how to put music on it in the first place. And, how to, he showed me like the whole apps library and the steps. And then he realized I

didn't have the software and he was like, Oh, you didn't, I heard of ways on the internet you can get the software for free. You should look those up and stuff. So pretty much every question I have had, I've gone to him, just because he's had one for a while."

Sure.

"So, he seems to know a good deal about it."

How often do you think you talk to him about it?

"Couple times a week maybe."

Couple times a week.

"So far. I mean, it's been very. So far, it's been me getting used to the thing."

Ok.

"And cause you know I didn't know a lot about it coming in. I feel like that would decline after a while that I wouldn't talk to him as much."

**ability to use: three**

**9:00**

"I'll say a three. Because I haven't been able to do some things yet, like put apps on it"

Ok.

"As far as things that I want to do, that's really the only thing I haven't been able to do yet. I don't, I mean, I'm pretty sure that I could add music. I don't think that would be an issue. Just because I didn't do it myself the first time, I'll give myself a three."

And you haven't added any music since that time your roommate helped you?

"Well, I had, he burned me some CDs from his iTunes library"

Uh-huh.

"and then I had a couple CDs and I imported them into your iTunes library."

Uh-huh.

"And had a couple of songs. And then I was like, well, can I have the rest of your library."

Haha.

"And he was like, that would take for hours to burn all the CDs, so just sync your iPod with my library. So I synced, I plugged my iPod into his computer"

Uh-huh.

"and it erased all the stuff on my iPod."

Uh-huh.

"And then just synced it up with his library."

Ok.

"So now I have a bunch of music, but apparently I can't add any of

my own. Which I was thinking about that and that makes sense because you know, you take somebody else's library and add your own, you're just stealing each other's libraries."

Uh-huh.

"But I guess if your just swapping them for the time being, it's not illegal. Because I can't add anything to it, or else it would. Like I think if I plugged it into my iTunes, it would resync it and wipe it."

**important goals: five**

**average use: thirteen to fourteen hours per week, not just focused on the iPod, while he does other stuff as well**

**15:50**

So please describe how you relate to this device so far. Tell me the overall story of what it has been like learning the iPod Touch.

"It's been pretty easy. I was surprised because I have always been one of those people who has been PC versus, over Mac."

Uh-huh.

"And then, I have been using this, and you know that's one of the things Mac boasts is the whole easy to use stuff. And it really is pretty easy to use and to get stuff. And to get it, to figure out how to use it and how to work it. I know it's not Mac, but same developers."

Uh-huh.

"It's only been a month or so and I feel I'm pretty proficient in using it, with the exception of I haven't added music myself. But I don't feel like, me and my friend have really similar music tastes. So at this point, I don't even feel there's a need to, because I have a ton of songs on here. So, I feel like it's been very easy to learn how to do most things."

So think, can you tell me a story, so you're telling me that Mac boasts itself as the easy to use, so tell me a story somewhere during the last month where all of sudden that just makes sense to you, or maybe something that sticks out in your mind where suddenly, it just, that impression just became really solid to you.

"It's probably when we were doing, when I was putting music on you know this for the first time, CDS. He burned me some CDs and I stuck them on my computer. And there was like. I went to iTunes, and up on one of the toolbars, there was like important CD icon. And I mean you click it and I mean it might have been some menu that I went through I hit ok or something. And it just went through,"

Uh-huh.

"listed off all the names of the songs as they came through, put



‘em all on there, and for like two of them it found artwork”

Uh-huh.

“online for the songs, and put album artwork with them, and it just started importing all of them. And I’m like, wow, that is really cool.”

Haha.

“That I don’t have to deal with you know if a song doesn’t with album artwork, it puts it on there, and I don’t have to worry about any of it. And it gave me some album artwork. That was probably when I was like this is really easy to use.”

way to class and stuff. And then I found out about the whole, uhm, ‘it costs money to upgrade software to the new firmwares.’ And, until then I can’t download apps and stuff. So, I’ve been looking online at a bunch of different ways to get the software for free.”

**42:05**

Have you made an iTunes account yet?

“Uh-huh.”

Ok.

“I think I have.”

And. So, have you, then, tried to use that account to download software or songs from the store?

“I tried to download an app”

Ok.

“Oops. But, uh, it told me I couldn’t because it told me I didn’t have the software.”

Ok. For, For our activity, let’s just try to do that this time. Uhm.

So, let’s start with the objective that you will find some application that’s free and try to download it.

“Ok.”

Ok?

“All right. App store. So, I hit the app store. It’s loading up the apps. And I remember going through this last time I did this, but it took me forever. And there’s all these different tabs here at the bottom and it makes it, it makes it relatively easy to search for them. There’s the featured one’s, you know, I’m assuming, the one’s that iTunes thinks are cool, that Apple thinks are cool. So, they put these up here under the categories of all the different apps. Uhm. The top 25 downloaded apps. And then, the search function, which I didn’t see last time.”

Ok.

“And it made it very difficult to find what I wanted. So, all. What’s an app? There’s a game on the computer called ‘Bubble Spinner,’ that I play on the computer.”

Ok.

“So I’ll search for that. [he searches for it]. Bubble Spinner Lite. Addicting Games.com. Free. So, I’ll walk through what I’m doing. I type in Bubble Spinner Lite, or I type in Bubble Spinner, I came up, it filled the rest in. And, you know, it’s the only one that matches it. MTV, uh, networks, Bubble Spinner Lite. I hit this, info, gives you all the info on the app. Gives you some screen shots. And it looks like, Yep, that looks like what I play. [inaudible]. Oh yeah, just has options, couple screen shots is what they look like. And there are reviews that I can check it out with. Free. And, I hit install. Oh, this application can only be used on an iPhone. So, that’s not the same problem I was having before. So, I’ll go to the one that I know doesn’t work, it’s the one that I really want, which is NBA, NBA Gametime, is that it? No. It was like NBA Lite or something like that. Oh here we go, NBA Gametime, Oh, nope.”

So what happened there?

“I hit the wrong one. I’m not sure how to get back. I’ll just re-search it. Oh, that’s the one that I want. NBA, Game, then, Lite. And I hit Free, Free, Install. It didn’t do anything. I hit it again, and then it gives me the error that I have been coming with, ‘the application requires the iPhone 3.0 software update.’ Huh? I actually haven’t been seeing the iPhone error, I have just been seeing this one. And, uh, it makes, you know when I started thinking about it, I was ticked off. You know it makes sense why the error is there, because before Will gave the iPod to me, he wiped the iPod. I could tell that because like there was nothing on it. So, obviously the firmware got wiped too. And, uhm, I was really surprised when I went online and saw how expensive they were. Because like, uhm, I was, when I first plugged in into iTunes, it was like, ‘you can download the software upgrade for \$5.’ And, I was like, ‘\$5 for the software update?’... And there are a lot of apps that you can’t use without the software updates, and if you don’t have any software updates you can’t use any of them. And I told Will that I was uncomfortable spending money for this if I wasn’t keeping this, you know it’s a personal thing. And he said, you know, it’s fine...”

Is there a circumstance where maybe it’s just this game that requires the 3.0?

“Yeah I’ve seen that. Well I guess I’ve only tried a couple things. I’ll just start trying things I guess. Who knows? This one requires 3, ah, iPhone 3.1 software update, which is the newest one. The other one just required 3.0. So, [inaudible]. 3.0. Uhm, there’s one my brother has, this one app. That I remember him having for a long time. I don’t remember what it’s called. It’s the lighter one,

where you just have a lighter on the screen and that's it. And, I wonder. I mean, that's as simple as it gets, right? So, maybe. Oh!"

So, you

"It's going to let me download it."

Ok.

"I have no idea what my account information is, none whatsoever."

Ok.

**50:35**

"I haven't the slightest clue what it is. But, it's a positive thing, because I can, at least I know now that there are some apps that I can download."

**58:20**

"I have an account, cool. So now, I will go back to the app store. And download this app, see if I can download this app. [participant goes to app store]. It gave me an error. Authorization failed, please connect to iTunes."

Why do you think it did that?

"Hmmm. Uhm. I have no idea. Oh! I bet I know why. I bet it's because, like I was saying earlier with. You can't add music when it's not on your account. So you couldn't share music. And I bet it just treats apps as like the same thing, like the same data type, so it's not going to let me do that."

**p5\_2\_21\_10\_ses3.wav**

**10:00**

"It was nice to be able to log on you know, and check ESPN, because I'm a daily ESPN reader."

Ok.

"So I can check ESPN and I can check my Gmail really quick. And that was nice. And every morning I could check the weather in Bloomington, because I have it synced with my home network. So, I'd wake up and I'd roll over, I'd pick up my iPod"

Ok.

"and check and see what the weather was for the day. I don't have to boot up my computer."

So, it's kind of like it's handiness

"Yeah."

It's there. Ok.

**11:50**

So, you mentioned your roommate, have there been any other resources that have been useful for you in circumventing problems?

“Yeah. I did a lot of forum hopping when I was looking at the whole account splitting and the update, software update and that kind of stuff. I did a lot of forum hopping to see you know if there was any way. And I didn’t mean to scare you when I said that I wanted to, that there was a way to get the software, I wasn’t going to mess with the firmware”

Ok.

“ or anything like that. I didn’t want you to get that impression.”  
That’s fine.

“There was something that I found that said you could do it, but I didn’t want to do it without your permission. So, but I did do a lot of forum hopping. Reading up on different ways to do stuff.”

It’s just interesting to know like the point that you got to and the fact that you were even a little bit motivated to do it, but I was going to try to circumvent it if I could and buy the software for you. But since there was the other issue anyways it doesn’t really matter.

“Yeah.”

**ability to use: five**

**important goals: three**

**approximate use: six hours per week**

**story:**

- **at the beginning I was fumbling around and didn’t know what I was doing**
- **I get home and over the next days, or week or two, it was me messing around with it**
- **checking out the contacts and notes features**
- **it was more using it than reading up on it. It was more of a hands on thing for a lot of it**
- **if I had more technical questions, I’d start with my roommate, or maybe I’d go to google**

- and there's so many users that on google, that out of like 15000 people with the same problem and 14000 had an answer
- really easy to circumvent any problems and to find solutions for them
- well, I didn't really have any huge problems, but little things that I have questions on
- it was easy to learn the basics, then if you have any questions—there's plenty of people out there with answers

## Phase Two of Study

### Photoshop

*Participant four*

p4\_3\_3\_10\_ses4.wav

0:50

So, first of all have you ever used Photoshop or any other software like this before?

“Yes I have.”

Ok. Could you explain that a little bit more.

“I have used it on and off just to do touch up for images that I have or. What else? Creating layered images that I’ll import into After Effects for animation.”

2:05

In what context have you used the software mostly most often is it for work, for play, anything else?

“Yeah. Almost exclusively for work. I mean school work and work work.”

6:15

What goals do you have for using Photoshop?

“Goals? I really want to become, be the best that I can with it. You know. Do stuff that I have see people do in magazines or, yeah I mean, digital artwork and stuff like that.”

Ok.

“Be as close to the Photoshop wizard as possible.”

Ok.

6:45

What aspects of the device do you expect to find the most enjoyable?

“What aspects? Like the power of manipulating layers.”

Ok.

“And the cross-functionality that it has with the other products I use within the Adobe Creative Suite.”

**ability to use: three**

**important goals: four**

**1:20**

“What Photoshop allows me to do compared to other software, I guess, is just make things, create stuff surprisingly. I mean I always, you know, thought that Photoshop was more towards like touching up photos, which is what Photoshop’s primary purpose is so to speak. But I mean, the ways that I’m more inspired right now is just creating graphics. And Photoshop let’s me do that quickly. Not as high fidelity as I would like compared to something like Illustrator where. I mean there are some tutorials that I have come across where they actually make you start off in Illustrator and then go to Photoshop, which is really cool. But the idea of playing with points and vectors, I haven’t really done that at all right now yet, but that is the next step for me that I want to go into right now.”

**2:30**

What goals do you have for using the software and have they changed at all during the course of the study?

“My goals have changed a little bit. I mean I guess in the past it was just exploring what I can do, now it’s a little bit more directed towards creating graphics, creating interfaces, also. Still that was where we were last time in creating an interface. I still want to do that, somewhere, somehow. I’m not sure if Photoshop is the best tool to do this at the time. I haven’t really delved deep enough into that area yet. My current interest is just creating graphics, icons.”

**3:25**

What do you think has caused the change in goals you have had?

“I think just the different things that are inspiring me right now as I look around with regards to what people have done with Photoshop. Touching up photos is fine, but I don’t really find it as interesting as it is with creating stuff from scratch.”

**ability to use: three**

**9:30**

How strongly would you rate your ability to use the software having used it for four weeks on a scale of one being the lowest and five being the highest?

“I still want to say three. Because, the more I delve deeper into Photoshop, the more I’m not really I’m feeling I’m knowing the stuff, the power that’s under the hood.”

Uh-huh.

“You know. I probably I will feel like I’m staying at three for a while until I actually get through a whole bunch of different tools.”

**important goals: four or almost a five (four and a half)**

**average use: at most two hours per week**

**story:**

- **it’s been interesting exploratory experience**
- **feels like I’m exploring more**
- **In past, I used it for panoramas and retouching and that’s such a small piece of that big pie of what Photoshop is capable of**
- **The more I delve into it eventually there are a lot more layers that photoshop can do**
- **I’m falling in love with it more and more as I go through this**

**58:50**

Can you walk through, you know you tried to figure out how to put the text on a path a bunch of times. And you actually backed off and said ok well, “Here’s this option and it will make it a lot easier and a lot quicker.” How come you went first to do that sort of text on a pathway as opposed to just looking at what kind of options do I have with the text?

“Right. I guess my mind just went with what whatever I remembered from the past project, which obviously I confused it with what Photoshop could do with text and I also probably forgot that I could do this when I did this same exercise in the past. And so, it’s only after maybe just fooling around a little bit with like just the text and realizing that in front of me was this little option, Oh text for a pathway, Morphing the text. Why didn’t I remember that?”

Uh-huh.

“So I it was a realization that it wasn’t a function that I used often enough”

Ok.

“to remember. Which I should now for the next time we do this.”

Uh-huh.



1:20

What goals do you have for using this device and have they changed at all during the course of the study?

“I guess I wouldn’t say that they’ve changed necessarily. It’s just come to the fore a little bit more in this phase like in the last few weeks. Part of the thing that I had to do with an After Effects class that I’m taking involves me manipulating layers in Photoshop. And so, I kind of go back and forth on it and we’ve done a little bit of that at the beginning of the semester, and now it’s a culmination of things that we’ve learned so that have kind of resurfaced over the past few weeks when I was [inaudible] for my final project.”

**ability to use: I think I said four before, but I need to downgrade to three and a half**

**important goals: four**

**average use: one hour at most per week - compares a little bit more—but just barely**

**story:**

**interesting journey**

- **I started off biting off more than I could do.**
- **the interface looked interesting**
- **it was in line with what I wanted and needed to do**
- **because I needed to get something out for my website**
- **that put me off the learning process for a while**
- **I have looked for other things for inspiration, such as icons**
- **the more I found stuff to inspire me, the more I kept going further**
- **I hit a stopping point, and I had to stop for a while**

*Participant seven*

p7\_2\_25\_10\_ses4.wav

**0:50**

Have you used Photoshop and any other software like this before and which ones are they?

“Yeah, I’ve used. Well, I have taken training courses on Photoshops,”

Ok.

“ and I went to similar ones like Fireworks and I guess Illustrator is pretty similar. “

Ok. For how long have you been using Photoshop and how long ago? And some of these other examples, how long ago were you using them?

“No. I didn’t use it I just took training courses.”

Oh. You took training? I missed that. Did you actually get into the software during those training courses?

“Yeah.”

**3:15**

Did you ever have any specific problems with the software? If so, can you please explain them.

“I don’t remember any specific problems, but like some tools are hard to grasp. Like it has a lot of tools.”

Uh-huh.

“Like for example the pen tool. I think it’s in Photoshop. It’s pretty hard to understand. And it takes time. Like, if you don’t have a lot of experience with computers, then it’s kind of hard to get used to it. But once you get used to, once you develop enough expertise you can use it pretty easily.”

Ok.

**5:30**

Without having used it, what do you need to do in order to accomplish these goals. These tasks you talked about?

“Like without ever using it or I didn’t really.”

Well at the point you are at right now, and you [said you] want to learn how to do websites, you want to do images for websites, how do you think you can get to that point where you can make images for websites?

“I think I first need like an understanding of like graphics. And

then, I can understand the tools better and like you know as graphics have a lot of different aspects. And like, what does it mean to, like what does contrast mean, what does hue mean, like how does it affect image, images. And just understanding that should be done before.”

Ok.

**ability to use: five for the things that I know how to do, I don’t know what else can be done**

**important goals: Not answered**

p7\_4\_6\_10\_ses5.wav

**0:25**

What does Photoshop allow you to do that you cannot do in any other way?

“Because I work with images a lot.”

Uh-huh.

“So I mean it has gradients, channels, and then hue/saturation, you can change that as well. The other options were Gimp and Paint.”

Ok.

“They don’t have all those very complicated features where you can manipulate images.”

Ok.

“So, I like Photoshop.”

Ok. So it’s mostly the amount of features that Photoshop has?

“Yeah.”

**ability to use: three**

**important goals Not really answered**

**4:50**

To what extent were you able to use the software to accomplish all of your important goals on a scale of one to five?

“I didn’t use the tool for my goals yet.”

Ok.

“ I have just been learning”

Ok.

“you know playing around with images.”

**average use: five or six hours [total]**

story:

- **I just wish there was a thing I'm missing**
- **I wish I knew more keyboard shortcuts, because I find it intuitive rather than finding it in the menu**

**8:15**

Have you picked up any keyboard shortcuts at all?

"No. Like I was automatically using all the keyboard shortcuts that are useful, that are used in other Microsoft products."

Uh-huh.

"But they don't work here. Like Control-Z, Control-Z is used for undoing in"

Uh-huh.

"in Word, I think."

Uh-huh.

"but it doesn't work here."

**p7\_5\_6\_10\_ses6.wav**

**ability to use: three or four**

**important goals: three**

**average use: four or five hours total**

story:

- **it was interesting to realize you have to think like an artist**
- **you have to be willing to experiment and explore**

*Participant eleven*

**p11\_2\_24\_10\_ses4.wav**

**4:50**

Did you have any specific reasons beyond the like, you know, beyond just the context in which you did them? But were there reasons why you were using Photoshop as opposed to Powerpoint or something?

“Right. Yeah. The main reason is that my, my wife uses it.”

Uh-huh.

“So I knew that I could go to her for help if I ran into any”

Ok.

“ issues. And I knew it was a powerful software. It would be more than capable of doing whatever I needed.”

**12:20**

Is there anything you need to do to prepare yourself to start to use this at all do you think? To kind of get yourself in the right mindset to do this?

“Oh the right mind set. Yeah, that’ll be key. It’ll have to be when my kids are asleep. So, it’ll probably be late at night. I’ll need to find images that I like.”

Uh-huh.

“You know, it’ll just need to be quite in my house and make sure that I have the software”

Uh-huh.

“ on the particular computer I’ll be using it for.”

Ok.

**ability to use: two**

**important goals: five**

**81:50**

In general, when you approach these kinds of problems, do you have any kind of an overarching strategy as to what you are doing?

“My main strategy is to pick, like to break it down into pieces.

Like my first, was to get the elephant head onto the eight and a half by eleven sheet”

Uh-huh.

“ and my next was to get the circles behind the elephant head. So, I just, I guess I layer it in my head. Breaking it down into the various layers it might be. But besides that, no I don’t think I would have a site that I can go to that would explain how to put elephant heads on circles.”

Ok. Sure. Yeah. For the part at the beginning, did you have any goals for the stuff that you were doing on your own?

“Ah. No, I was really just playing around with it. “

Ok.

“To see what I could, you know kind of what I could do with a few pictures.”

Ok.

“blending them together. It was much nicer having something to

try and to achieve.”

Ok.

“Like your elephant head there. “

Ok.

“Like I really wasn’t learning much playing around with it.”

Ok.

“I was learning more by trying to do that.”

Ok.

**p11\_4\_12\_10\_ses5.wav**

**0:25**

What does the software allow you to do that you cannot do in any other way?

“Ok. Like I think I said before, I was kind of interested in it as far as my wife uses it a lot to photo edit.”

Ok.

“That was my original thought was that I might be able to help her out in the business. But, as far as that goes, it might be further questions, so.”

Ok.

“She just has certain ways she wants to do things.”

Ok.

“So, I’m just backing off on that. She uses a lot of ah, where it’s automated, she like buys, not buys it, but. It’s all set up for her where she clicks and it goes through. What do they call that? I can’t remember what it’s called. But, uhm.”

Ok.

“You can purchase some online and get them for free. Another reason I wanted to do it was just being able to create better web pages, that type of stuff. [inaudible]”

Ok.

“More professional type stuff.”

**1:55**

So actually, could you talk a little bit more about that? She just has a process?

“Right. She was like me, she started and had no clue how to use it, but knew that it was one of the top programs to edit your photos.”

Uh-huh.

“So, she just kind of sat down, read some books. But she has, through the years, she’s gotten exactly how she likes to do, have

the settings on each picture for her printing company that she uses so that they all turn out the same. And it's all, she has it setup already for her to do, so she doesn't have to manually do it."

Ok.

**8:40**

What resources have been most useful for you in circumventing problems?

"Google. Once again, I just search what I want to do and you can find"

Ok.

"tons of tutorials out there. Which is my plan to go through and find a site that works well for me. I just haven't found it yet, I don't think."

Has your wife been a resource at all for you?

"She's been pretty busy, so I haven't really messed with her about that. Haha."

Ok. Fair enough.

**ability to use: two**

**important goals: two**

**10:20**

Have your expectations about the software changed at all?

"I actually thought that I would have more fun learning it. Which I might if I do find a proper tutorial. But at this point, it's just been more irritating."

What do you think is preventing having more fun learning it?

"I think it was just that I can't sit down and get it to do what I want it to do."

Ok.

"There's a lot of things that I can do like that. I'm not really a sit down and read the instruction book guy."

Ok.

"You know. I like to sit down and figure it out and I haven't been able to do that so far."

**approximate use: two to three hours total**

**story:**

- As far as how I feel towards it now, it's still optimistic.
- I feel I can learn it with some effort

- But it's been frustrating so far.

74:00

What would you say are your next steps in terms of really trying to understand Photoshop? Your next steps to do?

"Really just putting in the time. And going through a few tutorials. Like you saw, I picked up the control-F"

Uh-huh.

"you know to duplicate your actions just by doing that one. And that's kind of how I learn."

Ok.

p11\_5\_6\_10\_ses6.wav

1:45

What goals do you have for the software? And have they changed at all over the course of the study?

"They have changed. I wanted to be kind of an expert at it by the end of the study, and now, I just, I want to know some of the basic features."

Uh-huh.

"That's what it's kind of shown me is that, I didn't know anything about it. Which I thought I already knew the basics of it."

Ok. Did you really think that you could be an expert or were you just hoping you could be an expert?

"I was, I guess it was more towards I thought I would be."

Ok.

"Because I thought I'd put in more time into it and I thought it would be easier to learn. But I didn't put in the time, that I should have to become an expert."

Ok.

"So."

What prevented you from putting in the time?

"I guess just lack of interest. I never got interested in the program."

Uh-huh.

"Like I thought I would. I thought I would kind of get lost in it. Just browse the internet and tweak things."

Uh-huh.

"And do whatever. And I found that I was more attracted to other things"

Ok.

"In my life at the time."



**ability to use: two**

**important goals: three**

**8:55**

Have your expectations changed at all about the software?

“I think so. Like before I kind of viewed it as a photo editor, whereas now I think you can do much more with it as far as create a whole design out of nothing. Is that what that question is about?”

Well, yeah. I’d say that sort of answers that question.

“Yeah. That’s my view on it. I never, I always though you had to start with something to get something in Photoshop.”

Ok. Why did you think you had to do that?

“Just because every time I used it, it was with photos, probably because of my wife and at the, at my job. All it is, is people printing posters on the plotters”

Uh-huh.

“so it was all photos”

Ok.

“ that I was dealing with there too.”

**average use: one to two hours total.**

**study:**

- **frustrating, I think**
- **maybe because I haven’t had a real goal of what to do**
- **so I just kind of go out there and find something**
- **some tutorial that really didn’t mean much to me.**
- **learning it, I haven’t really liked like I thought I would**
- **might have been because I had all this other stuff going on,**
- **but I haven’t really gotten into it.**

*Participant three*

**p3\_3\_5\_10\_ses4a.wav**

**1:10**

“I would have liked to have had some online. Like now we have Lydia.com and that’s just awesome. I wish I would have had that when I was learning it.”

Uh-huh.

“You know so I would have had a more thorough learning experience with it, rather than just seeing what this does and what that does.”

**p3\_3\_5\_10\_ses4b.wav**

**1:50**

What are your goals, what goals do you have for using Photoshop?  
“Image perfection, like with my art. Getting it digital is another thing. I definitely use Photoshop a lot to, if I sketch anything out hand drawn, if I want to put anything online, or if I want to trace it and make it digital and edit it.”

Uh-huh.

“Like say, with my last project, I have been using Photoshop to scan in images and then taking it from that to Illustrator, well I could just go into Illustrator. But with Photoshop I have been doing some cropping and change it into different formats with Photoshop too.”

Uh-huh.

“So really it’s just been a gateway for me to get everything online and modify everything that I want it.”

**ability to use: three**

**important goals: five**

**p3\_4\_5\_10\_ses5a.wav**

**ability to use: four**

**important goals: three and a half**

**7:30**

Do you feel you were in control of the software and how so?

“I feel like in a sense it’s controlling me, in what I’m able to use

and my capabilities to a very far extent. In another sense, I control it as far as what I want to put on the page, it doesn't automatically put things on there, I have to choose what effects I want on the image."

Ok.

"But I think I touched on it last time, of the potential restrictiveness of the program."

Uh-huh.

"That's just something I've talked about in a class before."

**average use: one and a half to two and a half hours per week**

**story:**

- **it's been a casual learning process**
- **it's related to how I learned WoW, it's not that I absolutely have to learn it**
- **but if I want to learn something new in an image, sometimes my aunt will refer me to various tools in photoshop**
- **she's a photographer, she'll tell me what tools to use and I'll dabble in that for a while**

**11:30**

Are there any new functionalities or features that you've used since we last met?

"No. It's really just different ways that I've used them. Like I'd say the Lens Flare, I've messed around with that a few times."

Ok.

"I used that before."

Yeah, you used that last time we met.

"And I've kind of been trying to set up the menu, like the interface"

Uh-huh.

"in the same way each time that I do it. So I can get accustomed to knowing where everything is at."

Ok.

"Kind of like you would set up your desk the same way"

Ok.

"each place that you go."

That's knew? You haven't done that before?

"Well, it's just a different way, I'm going about using the program.

I guess, rather than, I like to have everything out and open to begin

with, rather than searching for it as I'm doing everything."

Ok.

"I guess it's a new attack plan."

Ok. Yeah. So that's very interesting. If I can ask, like what sort of brought that on? Like why did you start doing that now?

"It's kind of an influence of a lot of things outside of Photoshop and this research project of just like being more efficient, I guess, with what I do."

Ok.

"And that, it really comes down to seconds whenever you'd be searching for your tool, but it's just a comfort thing, too."

Ok.

"More of like an ease of mind thing, I guess."

Sure.

### 13:15

Thinking about your life as a whole as opposed to just your interactions with this device, are there any daily routines that you feel have changed as a result. For instance, when I got a new iPod I found that my workout routines had changed as a result of bring the iPod with me. So has there been anything like that with Photoshop for you?

"Yeah. I actually, recently with the nice weather and everything, I've started to go hiking a lot more and rock climbing. And I forgot my camera a couple times, but on one griffy trip, I brought my camera and a lot of the pictures I take, I think about what different things I can do with Photoshop."

Ok.

"And what different effects I could do. If any need to be added in. And also, it kind of, with that, it makes me think of memories and stuff a lot more."

Ok.

"You know memories that I make."

Yeah. Actually someone else mentioned something pretty much like that in terms of photography, which is pretty interesting.

"Really."

Yeah.

"And like it's special editing effects on some images too that clarify those in your mind to remember."

**p3\_5\_18\_10\_ses6.wav**

**ability to use: three and a half to four**

**important goals: four to four and a half**

**average use: total about an hour or two**

**story:**

- **can't say that I learned much more than I knew before.**
- **I had a lot more other things going on, but didn't sit down and study for this research**
- **I regret because I could give you a lot more information.**
- **It's not frustrating, I'd just like to know more where I'm at**
- **I've had Photoshop for free the past four years, I should be a guru**
- **it's not my biggest interest, but I'd still like to have it**
- **I like knowing what I know with it right now, I can do simple things with it, I can do cool effects with it**
- **I'm content with what I know.**

**15:15**

What would you ideally change about Photoshop?

"I think that it should include it's own tutorial."

Ok. How do you think that would be?

"Help option. Like"

Like what would the tutorial do?

"Basically, run through what the tools do and what your menu options are."

Ok.

"As far as the menu on the top, what each category would hold.

Like say for the filters"

Uh-huh.

"Nobody, someone just opening Photoshop might not know what a filter is."

Yeah.

"Like what is an actual filter."

Yeah. Yeah. Yeah.

"What's the pen tool do. Because it's not just like a click and draw, it's like a click, point and drag,"

Uh-huh.

"Kind of like Illustrator. A lot of the tools the names of them,

you'd think they'd do something different and they don't. Or they don't do what you'd expect them to be."

Ok.

"Like from their names. So a quick crash course, of what everything can do for you would be good. Aside from having to use the help menu, or. Like people don't want to read,"

Uh-huh.

"They want a video to teach them."

Or maybe even more ideally to actually do it.

"Yeah. Yeah. Just have them, like maybe, highlight tools,"

Yeah.

"and say 'if you need to do this, click this tool.'"

## WoW

### *Participant twelve*

p12\_2\_22\_10\_ses4a.wav

**ability to use: four**

**important goals: four**

p12\_3\_25\_10\_ses5a.wav

**0:50**

"Maybe where I used to maybe spend an hour or two, couple hours watching TV. I would replace that with WoW instead of watching TV. So even though I'm doing that, my brain is relaxing and I think it's a little more productive than watching TV."

p12\_3\_25\_10\_ses5b.wav

**0:10**

What goals do you have for using the software and have they changed at all over the course of the study?

"They have definitely changed. Going in, I didn't really go in with

a whole lot of predispositions. There was just, I know this is a game, I know this is you know an online game,”

Uh-huh.

“a massively multiplayer online game. At that’s about all I knew about it. I didn’t have a whole lot of expectations other than I’d be playing some game. After starting to play it, to me, in the areas that I’m working in and researching, it was interesting to me to see how motivated, how it motivates people to keep moving forward.”

Uh-huh.

“You know, you just would have this thought, ‘Oh I just have to get this one quest done’ and you’d say that three or four times.

Haha”

Uh-huh.

“So you’d have to literally like say I’m stopping at X time. And whatever, wherever I’m at at that point in time, I have to know I’m going to be at a place where I know I can stop.”

Ok.

“But the dynamic of that in that it is, that there’s this motivation and drive to keep moving forward and having these quests thrown in front of you, and it’s a new challenge, and you have to use one of the skills that you just picked up as your leveling up—that balance that goes on is very interesting.”

**5:35**

“To me, it’s just kind of interesting seeing the different dynamics of groups. How interactive they are. I mean I have done some, gone all the way through the whole dungeon, and we never talked.”

Yeah.

“We just did the whole thing. It’s like, ‘Yeah. We’re done.’ I mean we didn’t even say anything when we were done. They just completed it, and they portaled out of there.”

Uh-huh.

“Others, we talked at the beginning, we stopped in the middle and talked, we shared stuff that we looted, we got to the end, we talked about other things, you know you added them to your friends list.”

Uh-huh.

“But you know, it’s never been the same.”

**ability to use: four**

**important goals: four**

**average use: twenty hours on a heavy use week, with typical week about ten hours, this week only three to four hours**

24:00

“If I spend any less than two hours I don’t really feel like I accomplished anything.”

Ok.

“To do one of the dungeon quests, haha, I started one and my wife was sitting there for quite a while waiting for us to eat dinner, because I wasn’t done, and. I mean she was patient and understanding and everything, but it’s like, I can’t stop, because I’m in this group with four other people, and they’re depending upon me.”

Ok.

“She doesn’t understand it.”

Ok.

“But it’s like I felt this obligation to this group”

Uh-huh.

“to finish the whole dungeon with them.”

Uh-huh.

“And it took a lot longer than I had estimated that it would take. It ended up taking another 45 minutes after I thought I would be done with it.”

Ok.

“So, and you’re not aware of the passage of real time when you’re in the game.”

Uh-huh.

“Especially when you’re really engrossed in some of those things.”

Uh-huh.

**story:**

- **I think the dynamic of playing the game causes you to think about a lot of things in a different way**
- **there’s many different ways you can play the game**
- **people are going to gravitate towards the way they want to do that**
- **I’m a very goal/task-oriented person**
- **my quest long always has 25 tasks on it**
- **I’m almost ways focused on accomplishing quest, getting experience leveling up, and improving my skills**



- the process of doing that you're thinking about how to do things efficiently and effectively
- I've noticed that I'm sharper at doing that when I'm not in the game, then I was maybe before I started playing the game
- so it's allowed me to hone those skills that I had
- it's allowed me to see that there are a lot of problem solving things that you do where you can see patterns where it takes less energy to do that.
- when I'm not in the game, I'm much more focused and efficient than before I started playing

**70:55**

What made you re-evaluate your stance not to even sort of interact with the auction house?

"Well, from our conversation, that there might be something of value there that I may have overlooked previously. "

Ok.

"I was really taking the path of least resistance, which early on made sense."

Uh-huh.

"But I mean, I'm getting to the point now, where I can't buy stuff at a higher level. I have a lot more coin. And I'm realizing that you have to continue to get creative to improve your, you know, capabilities on equipment and everything."

Ok. Ok.

"And my guess is, I mean, I don't know if people made this stuff, you said, you know, I've already made some stuff, crafted some things. And I just went and sold it to a merchant. But now I'm realizing that I can go ahead and make it and sell it. And I'm seeing a whole new world of commerce opening up that is, like, not the retail world, but the eBay world of World of Warcraft."

Yeah.

"Which I enjoy doing. I've sold a ton of stuff on eBay."

**p12\_5\_4\_10\_ses6a.wav**

**11:20**

"I think initially, probably, with the limited knowledge that I had of the game before I started playing it that was pretty much the

only objective I was aware of going in”

Uh-huh.

“was leveling up to you know level 80 and what it’s going to take. But as I’ve been playing the game, I have become aware of all of the different goals and objectives you can achieve, like leveling up different professions. Which takes a whole different set of, you can’t just keep leveling up, leveling up and ignoring those professions.”

Uh-huh.

“What has happened is it’s become much more complex than managing character and managing the game.”

Ok.

“Which some people could look at and say ‘that takes the fun out of it.’ but for me, that’s part of the challenge.”

**19:50**

“I kind of found out about it just through interaction. And realizing that something else was going on in the game. That I hadn’t, really had the need to know about it.”

Ok.

“So, now I’m teaching other people about it all the time. I’ve taught three people in our guild. They didn’t know. They were pricing green items too low and they were pricing white items to high and they weren’t selling. You know, they just had no idea. That one guy that was using the bank vault. He basically was using the guild vault as a bank tab, because he had so much stuff.”

Uh-huh.

“And he didn’t know. And I looked at him and I’m like, ‘Dude you could sell all this stuff, and you could probably just from everything sitting in this one tab, you could probably get 1000 gold from it.’ But he didn’t”

**23:15**

Has learning the software been enjoyable?

“Yeah. I don’t think of it as learning the software.”

K.

“I know that’s what I’m doing, but I don’t think of it that way.”

What do you think of it as?

“Playing a game.”

**ability to use: three and a half**

**important goals: four**

**average use (not answered)**

**34:25**

“One of the things that I have noticed is, it’s not a game you play for an hour or so.”

Uh-huh.

“Ok. It’s not like I, it’s not like me sitting down and watching a TV show, where I can sit down and watch a TV show or two”

Uh-huh.

“ on DVR for an hour and a half. If I get ready to get on the game, I want to be able to play for three to four hours.”

Ok.

“I feel like I need to have that much time to have a useful experience.”

Uh-huh.

“If I get on for like an hour, I’d feel like it’s almost a waste of time.”

Ok.

“For that reason, when I’m super busy, like I am right now, very, very few opportunities to do that.”

**story:**

- **It’s been fun, probably more fun that I had imagined**
- **I understand why people want to spend time in the game, I’ve actually had some conversations in game about other games and how this compares, pluses and minuses**
- **I can’t speak as knowledgeably about that**
- **overall it’s nice to know when I need to have escape for a while, it’s a place that I can do that.**

**p12\_5\_4\_10\_ses6b.wav**

**0:04**

Ok so for the auction house, I pointed you in that direction

“Yes.”

and it got you intrigued about it

“Yes.”

but it seems like you have progressed a lot beyond me just saying, ‘Hey I think you should check out the auction house,’ ‘I think you should check out,’ it was kind of like ‘nudge, nudge, I think you should check out the auction house.’

....

1:15 “So, yeah, you , you know you piqued my curiosity enough for me to go do some searches for it, reading about it, learning about it, and then, I mean you know all I need to do is do a couple auctions where I get ten gold for something and I’m like, ‘eh’ you know”

I mean, basically, I was like go check it out and that was you know four or five weeks ago

“yeah.”

and now you’re like teaching other people about it. It’s progressed a lot.

“But that’s the way I approach things in general.”

Yeah.

“ If I’m gonna learn about something, I’m gonna learn as much as possibly can about something.”

Yeah.

### *Participant two*

p2\_3\_1\_10\_ses4.wav

11:40

Without having used it, what do you need to do in order to accomplish these kinds of tasks or the goals that you’ve set for yourself?

“Without having used it?”

Ok.

“Sorry.”

Basically, actually, several people have tripped up on this a little bit.

“Ok.”

Basically, what do you need to do in order to accomplish your goals or your tasks that you’re talking about?

“To get other people to play with me you mean?”

Yeah.

“I don’t know. Probably just talk with them, probably see if anyone else wants to join up with me. And see if we want to start up together. Because if I can get two or three other people, you know that’d probably make it more fun. Because when I tried to play this before, it wasn’t very fun because I was doing all this by myself and I couldn’t find a group of people. From everything I’ve ever heard, it’s the kind of game that you need other people to be with to kind of get a sense of community, I think, you know.”

Ok.

“So you’re doing something.”

Ok.

“So I might do that.”

**ability to use: four**

**important goals: four**

**p2\_3\_29\_10\_ses5.wav**

**1:00**

What goals do you have for using the software and have they changed over the course of the study?

“I think pretty much my goals are still pretty much the same, which is to get to see how many levels I can get. But I’m also, though, playing with my girlfriend so it’s kind of a,”

Ok.

“you know modified a little bit to help her out too”

Ok.

“help her get to a good level also,”

Ok.

“good gear.”

How did that get started? Like was she watching you play?

“I asked her. “

Ok.

“I told her about the study I was doing. I asked her if she wanted to get in on it too.”

Ok.

“You know, you know give me someone else to play with. So we’ve, it took a couple of weeks to get our schedules enough in sync to start playing.”

Uh-huh.

“Especially, spring break, she was out of the country”

Uh-huh.

“ for spring break. “

Ok.

“But when she’s gotten back, especially, last week we’ve been really playing a lot with each other. And she’s only two or three levels behind me now.”

**3:55**

How has world of Warcraft been useful for you?

“I think it’s been, it’s been mostly useful, just. Well really, really

it's. That's a good question. I guess, I guess it was no quote, unquote practical benefit. Like it. But at the same time, it also, it has allowed me and my girlfriend to bond a little bit over our you know with our characters and trying to you know level up."

Uh-huh.

"I guess in that sense it's been useful in that it sort of. You know, instead of destroying our relationship, it brought us closer together. Haha."

Ok.

"At least for the moment anyways."

**ability to use: four or five**

**important goals: four**

**average use: ten to twelve hours per week, before that I played less, because of crashing issues**

**story:**

- **overall, it's been pretty self-explanatory**
- **I've been able to go around talk to people**
- **I know enough of the key bindings—I know how to bring up the quest log**
- **it pretty much tells you where to go**
- **so it's pretty easy to know where I need to go and know what I need to do**
- **I've mostly been sticking to the same areas, but lately I've been finding myself wandering into different areas**
- **Has that gotten you into troubles at all?**
- **not really, but once in Stranglethorn vale I could attack the monsters at the top of the area, but as I went further south I had to stick to the road**

**p2\_4\_29\_10\_ses6.wav**

**ability to use: four**

**important goals: four to four and a half**

**story:**

- **mostly just a trial and error kind of thing**
- **I did fairly well for the first 30 levels**
- **I did come into a few issues in terms of quests where there would be a bug,**
- **I've been just been trying stuff on trying new moves**
- **around level 40 I had to re-spec my character, because I realized I had speced wrong for what I needed.**
- **I had it speced for an arms warrior rather a type of warrior with weapon and shield**
- **ever since then, I've found I can take on more people at once and still dish out decent damage.**
- **average use: ten hours or so per week**

*Participant six*

**p6\_3\_3\_10\_ses4a.wav**

**0:55**

"I grew up with a little bit of PC gaming. I'm not a big PC gamer. I don't like it as much "

Ok. Why is that?

"Well I say, that in theory. I don't know. I like little mini-games. I don't, like I don't like WoW because it takes, it sucks up so much time of my life."

Ok.

"Like once I start playing, I'm like, 'Hells yes, let's play.' Like I will take this very. I don't know how many hours I'm supposed to work on this per week, but I will make sure I don't go over those hours. Because it's very easy for me to do that with WoW."

Do you want structure with WoW?

"Haha. I need structure with WoW. Like, like it basically ruined my last, my summer before grad school was wasted on WoW. And it was very fun, and I leveled up a lot of characters and I had a lot

of fun.”

Ok.

“ But it’s too easy to be very enchanted with this game.”

**2:40**

In what context did you normally play games before in the past, by yourself for fun, when you had friends over, as something to talk about with friends?

“I actually play because I like the stories.”

**6:30**

Has using these games been easy or hard for you in the past?

“I don’t know. I think it’s fairly ok. I mean it’s easy. I don’t know. Like I don’t get very far. Like, after three months of playing, I got to like a level 40 ranger, but I loved that character and I loved playing with it.”

Ok.

“But it’s probably not an accomplishment at all. Haha.”

Ok. Ok. Can you.

“I thought she was pretty. Haha.”

Haha. Ok.

**10:30**

What aspects of the game do you expect to find the most enjoyable?

“I feel like I have a relationship with my character, so when I’m doing that I try to make her better. And you know subsequently making me better.”

Uh-huh.

“ But I’m doing it through the game. And I want to see how far I can go with this. You know objectively it’s really just a computer game with algorithms and stuff like that, but I feel really connected with the character.”

Ok.

“So.”

**ability to use: three**

**important goals: two to three**

**p6\_3\_3\_10\_ses4b.wav**



**72:35**

Did you have specific problems and how did you deal with them?  
Or was it pretty much smooth sailing?

“It took me a little while to get reorientated to WoW.”

Uh-huh.

“Like especially in the beginning, I was like, ‘what the hell, why isn’t, you know why isn’t left clicking do what right clicking is doing?’ Because you need to right click to attack and left click does you know walking I guess”

Ok.

“, which is a little weird for me. Yeah. So, it just took a while to reorient to that kind of stuff. But I think I successfully picked it all that up pretty quick.”

**p6\_3\_28\_10\_ses5.wav**

**14:45**

“Whereas, like yeah, like with Photoshop, it’s much more, I’m doing something. And I feel more proficient about how I’m doing stuff. Like I know that the way I’m thinking about Photoshop now and how I’m using Photoshop now is much more adept than when I first started using Photoshop you know or even when I used Photoshop two years ago.”

Uh-huh.

“Like I’m much more proficient at it now. And like I can look at stuff and figure it apart. And it’s much more satisfying using Photoshop than it is to play WoW, actually.”

Ok.

“Because like I’ve built something when I’m done with WoW.”

Ok.

“Photoshop.”

**ability to use: three to three and a half, I think if you’d objectively measure me as two**

**important goals: four, five**

**average use: first week twenty hours, second week less than ten hours, last two weeks maybe one hour total**

**story:**

- **the actual playing is fun,**

- but reflecting on it is not fun
- because I feel bad and guilty when I play
- it's fun and not fun, because I have things I need to work on and things I want to work on
- because it's so easy, it's very addictive and seductive

p6\_5\_5\_10\_ses6a.wav

4:25

What makes you feel like that amount that you specified is too much? Like what about it, that amount of time?

"Because I"

Why not forty hours? Why not twenty hours?

"I mean because I know the hours that I'm listing are probably considered low for playing this game. But I have other things that I have to be doing. And I have other stuff that I want to be doing."

Ok.

"Projects I've started that I need to finish. Books I want to read. And movies I want to watch. And other video games I want to play. And like, I like World of Warcraft a lot, but there is never an end. So there's never that satisfying, 'I did something.'"

**ability to use: between three and four**

**important goals: four**

**average use: maybe an hour a week (not for two weeks)**

p6\_5\_5\_10\_ses6b.wav

**story:**

- enjoyable
- I liked it a lot
- I like the place now, than I do the first role
- I like it and I like the content is wrapping up

- there's a lot more to do and it's a lot more interesting.

*Participant five*

p5\_2\_22\_10\_ses4a.wav

**10:25**

What goals do you have for using the device? for using the software? for using World of Warcraft?

“Goal wise I just want to have fun with it. I know, I do have a bunch of friends. Well not a bunch of friends, but a couple of friends, who are or who have in the past been hardcore players”  
Uh-huh.

“and it sucked up a good part of their lives.”

Yeah.

“I don't want it to. Well I don't think it will come to that point for me, because I don't really have the time to pump in”

Uh-huh

“you know like 30 hours a week. But, I just want to have with it, I want it to not be frustrating. I want to have fun with it. I want to see how high level I can get with the time that I have. Those are some good starting goals.”

**11:25**

What aspects of the device do you expect to find the most enjoyable?

“Probably the expansiveness of the world.”

Ok.

“Because I'm huge about games like that, you know, like Fallout, [inaudible], Morrowind.”

Yeah.

“And, I'm pretty sure WoW is the same way. Huge worlds and [inaudible]. So that might be what entices me most gamewise about it.”

**ability to use: four**

**important goals: five**

p5\_4\_6\_10\_ses5a.wav

**2:00**

What goals do you have for using the software and have they changed at all during the course of the study?

“Well, at the beginning of it, I think I said my goal is to get as high a level as I could. And that hasn’t really come through now.”

Materialized. Yeah.

“Now, it’s more of just a, if I have some free time, I’ll log on and see if I can have some fun with it. But I really haven’t, so far. So, I guess my goal has changed to just trying to log on.”

Ok.

“Because it seems like just playing it is a pretty big time commitment.”

Why do you say playing it is a big time commitment?

“I feel like, I feel like, I think I’ve logged on twice since we met the first time”

Uh-huh.

“And the first time I did, I played like an hour or two or something. And then the second time, I was just killing whatever’s in that area, like boars or something. And, my XP bar is just crawling up. And the highest level is like 80. I’m going to have to do this for like 80 levels. It’s going to be very time consuming.”

**5:00**

Has learning the software been enjoyable overall?

“When, I mean, when I played it the first time, it was pretty fun.

The second time it got, I don’t know. I think if I were more into it, it would be more fun.”

Ok.

“Or if I had the time to be more into it, it would be a lot more fun.”

Ok.

“But, I mean, just logging on, if I were to log on every time a half hour, to log on, and kill five boars, I don’t think it would be that exhilarating of a thing to do.”

**ability to use: two or three**

**important goals: one**

**average use: total three hours**

**story:**

- **I guess in volume it’s miniscule**
- **I haven’t learned a whole lot, I didn’t really do anything new**

- I kind of just ran around and killed stuff, I found it fun shooting stuff with a bow
- I found it entertaining only to an extent
- I haven't really learned so much as I did use with what knowledge I had to kind of just mess around in it.

p5\_4\_6\_10\_ses5b.wav

26:55

Is there a difference between what experience you had in the first area and what you had in the second area?

"Oh. Yeah. There's a huge difference in a least gaining, gaining experience. I gained experience, I probably leveled in like five minutes killing things out here in this new area."

Uh-huh.

"And it took me that whole time I was on, I think I was halfway there I think to get the level. So, I mean I got money really quick. There's a bunch of monsters everywhere."

Uh-huh.

"There's a new little area, there's a new village with guys that have quests. And stuff like that. So, I mean the experience yeah was huge part of it."

But in terms not just of experience, but in terms of how you experienced the game?

"Oh. I mean kind of. It was kind of the same thing though. As far as the tasks go, I was just killing"

Ok.

"things. I didn't know there would be quests out here and even if there were, I didn't know if there would be money."

Ok.

"So, in regards to how it was, it wasn't really a huge difference, because it was kind of the same monsters. There were scorpions and boars back in the first place, and I was killing scorpions and boars out here. Maybe it just has to do with this region or something."

Ok.

"But, it was pretty, it was pretty similar. Although I did get those two weapons, off the two guys out here. I didn't get any in there, so. Maybe, I don't know that had something to do with [inaudible]."

## iPod Touch

*Participant ten*

p10\_2\_22\_10\_ses4.wav

ability to use: four

important goals: five

7:10

Do you feel you will be in control of the technology and how so?  
“Not really. Because I can’t change the technology and I can’t modify the technology.”

Ok.

“It’s an out-of-box experience. I can’t do anything about it.”

Ok.

“So, yeah, there’s no doubt that people aren’t in control of this technology when they use it.”

Ok.

“But that’s the Apple experience.”

Ok.

“They promise it works the first time through.”

Could you just describe to me what you think, like how you would define control in this context?

“It’s the ability to own the device, the ability to say I’ll do with it what I want. And you can’t do that in Apple devices.”

p10\_3\_31\_10\_ses5.wav

0:25

What does this device allow you to do that you cannot do in any other way?

“It doesn’t really.”

Ok.

“My motivation for taking part in this study actually was trying to evaluate if the iPod Touch is something that I want to get.”

Ok.

“Because my other iPod has been dropped one too time too many and is going to fail soon, shortly, soon, it’s going to go to the great landfill.”

Ok.

“And I can say definitely at this point that the iPod Touch doesn’t let me do anything that couldn’t be done with a regular iPod.”

**ability to use: five**

**8:20**

“It doesn’t do very much, so it doesn’t take very long to get up to speed on it.”

**important goals: five**

**average use: after the first week, I didn’t really use it, usually just used it the length of a song or two**

**story:**

- **it’s just been poking around basically**
- **there’s been no real story**
- **the first two-three weeks, I would carry around and if I was bored I’d do something with it.**
- **without spending a bunch of time in the app store, I couldn’t find interesting apps**
- **and I didn’t have time or inclination to do that.**
- **I did watch some videos on it and I went through the non-wifi functions**

*Participant eight*

**p8\_3\_5\_10\_ses4.wav**

**2:25**

What specific reasons have you had for using devices like this in the past?

“Well, the first time I really, I got an Mp3 player was because everybody else got one, like. “

Ok.

“And, I came to college and, as a new freshman, like I came during the summer session. So, as a new student, I just feel left out. So, and also, my friend also kept telling me to get a Zune, because he’s

like a Microsoft fan, ”

Ok.

“ and not a big Apple fan.”

Apple fan.

“And when I told him I was doing the study, he got really angry.”

Haha.

“and I said, ‘Sorry, I can’t don’t anything.’ But, yeah, he pushed me to get the Zune.”

Ok.

“and I did use it for like a half year.”

Ok. How did you feel about the Zune?

“I don’t know. I didn’t really like the design of it. Like how it looks. ”

Uh-huh.

“It’s not as pretty as I wanted to be. Like stuff I like I want to be shiny, and the one I got was black. But inside it, it did what I wanted. The only thing it didn’t do is you can’t store files in it.”

Ok.

“So, for like 30 GB, I’m using like 200 MB to store music.”

Ok.

“And the rest is just empty. Especially when my computer crashed, I was so upset it couldn’t do it.”

Yeah.

“ That was one of the reasons I sold it.”

## 5:15

Have you ever had any specific problems with the device and if so can you please explain them?

“Well, with my Dare, I don’t like that fact that it can’t read Chinese.”

Ok.

“It distorts all my music. Not distorts, but the title, it’s in code. I have to listen to two seconds before I can figure out which one”

Ok.

“ it is that I want to listen to. That’s the biggest problem. So like it’s really hard for me to make playlists.”

...

So, none of them have really dealt well with Chinese characters before in the past?

“I think the Zune. No, the Zune didn’t read Chinese either.”

Ok.

“Yeah. I don’t think so.”

Ok.

“It didn’t fit what I needed. It fit American people, but not me.”



**ability to use: one half**

**important goals: four**

**57:15**

What of the features you saw today were familiar and what of the features were brand new?

“The features, I guess the sliding or, it’s not only Apple products. And I guess I’ve never used where it’s like finger pad.”

Uh-huh.

“I’ve used the iPhone maybe once in my life. And like I’ve never used google maps on a phone before.”

Uh-huh.

“Or, I just never used internet capable stuff on a phone before.”

Uh-huh.

“And I guess the Apple store is like the same how you can download applications on other phones. Basically like wallpaper, sound setting is all the same.”

Ok.

“Stocks.”

Stocks.

“I’m not even interested so I didn’t even look.”

Right. That’s understandable.

**p8\_4\_2\_10\_ses5.wav**

**0:20**

What does this device allow you to do that you cannot do in any other way?

“I wouldn’t say I’m very motivated of using it,”

Ok.

“because I really don’t really find this very useful.”

Ok.

“But it does have certain features, such as internet and games that I can access without paying for it. Like if I were to use my phone to go on the internet, I would have to download and pay for it.”

Ok.

“I’d also have to have a plan for the internet. So, that’s the good thing. But it’s such a hassle to use, so I just won’t even use it.”

**ability to use: three**

**important goals: four and a half**

**average use: less than an hour per week, first week spent way longer  
download games and 30 minutes playing the game**

**story:**

- **it was very easy learning it**
- **just difficult getting used to the keyboard**
- **for example, I haven't even opened some of them, but I get a general idea of what they are doing, but I don't use them**
- **it was easy**

**p8\_5\_5\_10\_ses6.wav**

**2:20**

Have your goals changed at all during the course of the study?

Would you say?

"I wouldn't say so."

Ok.

"Like, my expectations changed. At first, I had like high expectations and then it decreases to very low. "

Ok. Could you talk about what those expectations were?

"Like, I expected to have many applications"

Uh-huh.

"that's free"

Uh-huh.

"and interesting. But like, I guess the interesting ones, you have to buy for. And the ones that's free, it's basically, you play for two seconds and you get bored."

Ok.

"The games aren't even well thought out. For example, just talking about the fish game. I really don't know the name, let me check. It's the, Oh, Tap Fish."

Ok.

"That game, you can't keep playing it, you know. Once you clean the tank, you feed the fish, you buy like other fishes, and [inaudible]."

Ok.

"And there's nothing else to."

Ok.

“And it’s just really boring to me.”

**8:15**

What is it about this that you don’t try and figure it out?

“I guess the time taken to figure out, I could just go on my laptop”

Ok.

“ to find all the answer.”

Ok.

“Maybe if I was at home,”

Uh-huh.

“ where I have no resources. I would use this.”

Ok.

“Here, I have so many other resources, that. One, I already don’t like this product, typing on it. And, if I solve this one time, doesn’t mean I’ll use it in the future. It’s just I think it’s the abundant of resources on campus, that, just like, Oh. Just go on a computer, it’s so much easier.”

So, it’s a lot easier to just go on a laptop instead of trying to figure it out?

“Yeah.”

Ok. What kind of problems have you had that you said, ‘I just don’t want to deal with it’?

“Every time I type my password.”

Ok.

“Every single time.”

So you just avoid typing your password?

“M.”

Ok.

“Just like any typing. Anything related to typing, I don’t like it. Like when I use, go on Youtube”

Uh-huh.

“I look at these, I would want to, I would want to look at a video”

Uh-huh.

“I would try, like at first, I would be like, ‘Oh. Let’s look at this video.’ But, then when I would look at the keyboard and I would be like ‘Oh. Let’s just look at the front page and the most recent ones.’ It’s, I just don’t like this keyboard.”

Yeah.

**ability to use: three**

**important goals: not answered**

**average use: a total of one hour**

story:

- I have been trying to, you know you're doing the study and I want to learn how the product works
- in this process, it has to do with people around me
- with WoW, people around me play
- they show me these interesting things that keep me interested (I'm on 80 in WoW)
- but for this, although some do have iPhones, they're not very enthusiastic about it
- and my one friend, doesn't like Apple products—with his influence, I don't like
- I never used apple products because of that. And they're not there to help/influence me.
- so there's not a lot of interesting things for me to know, unless I go online and discover
- that's not going to happen though

**21:00**

Has the iPod changed any routines that you had?

“No. One more thing in my purse to carry. That's about it.”

*Participant nine*

p9\_3\_4\_10\_ses4b.wav

ability to use: five

important goals: five

p9\_4\_5\_10\_ses5.wav

**1:20**

“I don’t have much music on there, compared to what I actually have stored at home. So,”

Ok.

“I’m going to try to add more music to it.”

Why is that? Why haven’t you already added the music [inaudible]?

“I’ve just kind of had a busy schedule and I haven’t added set aside the time to do it.”

Ok.

“And I kind of want to go through and not just add, like I’ve got full CDs, and I don’t want to add a full CDs. I want to go through and get songs that I like”

Uh-huh.

“off of those and just.”

Ok.

“And just kind of focus it down and get songs that I actually really enjoy and want to listen to.”

Ok. So, it’s not just a blind dump. [inaudible]?

“Right. Right.”

**ability to use: five**

**important goals: five**

**average use: a few hours per week**

**story:**

- **the overall experience of using and learning it has been enjoyable**
- **except for one issue that was easily resolved**
- **I feel pretty comfortable, it’s kind of like part of me now—because I take it with me most anywhere and use it constantly**
- **it’s a nice addition to my music and entertainment**

**9:05**

“So I feel pretty comfortable. It’s kind of like a part of me now, because I take it with me most anywhere”

Uh-huh.

“and use it constantly.”

**p9\_5\_5\_10\_ses6.wav**

**ability to use: five**

**important goals: five, maybe four**

**average use**

**story:**

- **the initial learning was difficult because I didn't figure out how to delete apps**
- **I don't know why I didn't look online, because I had plenty of space to add apps**
- **the email, didn't matter that it worked, but the accomplishment was enjoyable.**
- **fairly straightforward.**

## **Appendix D. Interview Narratives**

### **Participant One**

#### **Artifact One: Photoshop (exp: three, pref: seven)**

##### **Background**

- Experience with inDesign (I think)

##### **Motivations**

- Editing Photos for Friends
- Aiding in making fliers and publication material

##### *Changes:*

- No Changes

##### **Expectations**

- She would have enough time to spend learning Photoshop.
- She could access class like instruction on how to use the software.
- While her initial attempts clearly to leverage her knowledge of previous software were not successful, she thought that eventually

##### *Changes:*

- The time that she thought she had not materialized.
- She thought that the study session would be structured more instructionally than it was.

##### **Story**

This participant had tried to get into Photoshop, but never found the right excuse to try to learn it. Having experienced with layout software packages, she felt that she could relatively easily apply her knowledge to this program. She had a few “false starts” to her learning of Photoshop and she had Photoshop installed on her computer before even starting the study. She thought that this would be an opportunity to effectively get into Photoshop. In the first session, she attempted to use the Lydia.com tutorial system to train on Photoshop, but the materials she received did not match her expectations of instruction on Photoshop and she

became visibly frustrated. She instead tried to work on an image that accompanied the tutorial even after she quit using the tutorial. It seems that the study may have caused a little bit of anxiety because she repeated that she would prefer to go through the Lydia tutorials more thoroughly on her own. She completed some aspects of the final task of the first session, but she also recognized the bridge of what she still needed to learn. She stopped after the first session, because she ran out of time to invest into learning Photoshop in the study.

### **Artifact Two: Not completed**



## **Participant Two**

### **Artifact One: Photoshop (exp: four, pref: four)**

#### **Background**

- Experience with Photoshop in making it work with UITS Plotter (did not use many graphical capabilities though)
- Used Paint before
- Girlfriend has experience, hasn't used it with her though

#### **Motivations**

- Editing Photos for Friends

##### *Changes:*

- Realization (not change): not really enjoyable experience, but not dreadful or boring

#### **Expectations**

- Wanted to try to be able to bring in pictures from digital camera to edit photos
- Good tool that can help him do work
- Tools for cropping & smoothing edges

##### *Changes:*

- Photoshop does more than just combine photos, you can actually alter them through filters

#### **Features**

- Quick selection tool, filters

#### **Story**

This participant has interacted with Photoshop as part of his job with UITS. His use dealt mostly with helping people resize their images for the plotter in Photoshop. He had not really used the graphical capabilities of Photoshop before. Through this position, he picked up many different tricks about working with Photoshop that he was able to actually utilize for the study. In the first study, working on a funny image for his girlfriend, he started out with a basic idea and with some manipulation and playing around with the interface able to recreate the image that he wanted. He used tools like the quick selection tool to make the task much easier for himself for selecting portions of one image to bring it into the second image. In the second interview, he was already experimenting with adjusting filters and transparency between different layers within the image beyond just putting them into the picture, by making a ghost image of his friend in a hazy field—he knew the purpose of layers, but hadn't used them a great deal

coming into the study. His understanding of what to do had clearly progressed from the first meeting and his abilities were enhanced with Photoshop. On the first task, he was able to do everything to some extent, but ran out of time to make fine grained adjustments. Much of his time was spent redoing the work that he had done. The second time he did the task, he did some exploration about how to recreate the image most effectively, but finished it satisfactorily for himself within the time limit. In the last interview session, he brings in another image from his real life, a picture of his cat, and wants to try to add the cat to a jungle image, but he wants to situate it behind some trees in the foreground. He is able to add images of Ewoks from star wars behind trees, realized he needed to use multiple layers. On the last task, gets all the way through the task and only has a little bit of problem with the text where the text was not appearing right because he may have been putting it too close to the circle. By the end of the study, he realized he didn't use the software as much as he liked. He mentioned using his knowledge of Photoshop to help out at an experience at the Boys & Girls club where he had to teach children to use a graphics editing program at Pixr.com.

## **Artifact Two: World of Warcraft (exp: four, pref: five)**

### **Background**

- Used to play WoW a little (to level seventeen)
- Played Star Wars Galaxy (another MMO)
- Played many different console games and some other PC games as well

### **Motivations**

- Interested in trying to play the new game
- Interested in leveling up as far as he can
- Wants to try to get other people he knows to play with him

#### *Changes:*

- Surprised by how playing the game with someone else can actually affect the real life connections with another person.
- Mentioned feeling more bonded with girlfriend because they played WoW together

### **Expectations**

- An entertaining game

#### *Changes:*

- Really he learned about the importance of various features in a game, such as needing to spec his character correctly—he mentioned having to respec his character because he was wasting talent points on things that didn't maximize his ability as a armor and sword warrior. He also realized that having the best armor was important and it was something he needed to work towards at the end of the study

### **Story**

This participant mentioned having some experience with WoW before, but he didn't really get that far into the game. It was clear though in the first interview that he had all of the basics down and he knew what the basic goals of the game were. He went through the basics of obtaining a quest, completing it, getting some new gear, killing monsters, and selling loot from those monsters without any problem. In the second interview, he mentioned having a technical issue using the game with his desktop (not on his netbook). He found out that he was having a problem of crashing of the game that was a result of having his machine overclocking. Once he reduced the overclocking, it reduced the crashing. He found this out by reading on the Blizzard forums from other users who had similar problems. He also mentioned in this interview that he had started playing with his girlfriend and helping her to get caught up to him. He described the positive

impact playing the game together had on their relationship. In this interview, he's in an area that was slightly too high for his level of character. He was able to turn in a few simple turn in quests, but was unable to fight many monsters in the area (though he did fight a few individual monsters for experience). At the end, he picked up a quest to fight pirates and he decided to do it, but once he got there, they were too powerful. He killed one that attacked him, but was killed by a second one. By the third interview, he had progressed very far into the game (level 72). For this interview, he went around the country side finishing several quests and fighting monsters for quests he had already picked up. For the task, he sells loot that he had collected and actually travelled all the way back to Stormwind to get to the auction house so that he could look for the best equipment that he could find. Clearly, the auction house was something that he worked into his repertoire of experience, but didn't talk much about it in the interviews. It was clear that he enjoyed the experience of the game.

## **Participant Three**

### **Artifact One: World of Warcraft (exp: seven, pref:six)**

#### **Background**

- A great deal of experience with World of Warcraft

#### **Motivations**

- Entertainment
- Escape into a sub-reality—do things you wouldn't normally be able to do

#### *Changes:*

- No Changes

#### **Expectations**

- World of Warcraft is a very slow game and so he must group close quests together
- The best equipment is available at Auction Houses--always.

#### *Changes:*

- No changes

#### **Features**

- Not really, used a new class than before.

#### **Story**

He came into the study with a great deal of experience in using World of Warcraft. He did not have any real problems with the game and its challenges though he had not made much progress between the first and second interview. There were a few times where he would pull too many enemies than he could handle at his level, but he had a strategy for emerging out of the situation without any problems—run away long enough and you should be fine as long as you haven't lost too much health already. The only real question mark was he completed the task. He rarely spent much of the time collecting money, the first part of the task, but tried to find the best equipment at the auction house. The first time he couldn't find anything for him to use once he got there. The second time, he realized he did not have enough money for it, then I mentioned he could get some extra bags (which he had mentioned needing). Clearly, he knows what he is doing at this early stage of the game (the key structures and expectations of the game), but much of this model is based on playing on the WoW live server, not the private server. By the last interview, he admitted to me that he was actually giving WoW a second try. He had been out of WoW for a while and wanted to see if he just needed a break, or if he was really done with it. He learned that he was done with it. He had used it much past the second interview do to school work

constraints. In the last interview, we just didn't even go into the game at all due to this admission.

## **Artifact Two: Photoshop (exp: five, pref: four)**

### **Background**

- First used Photoshop six or seven years ago. He spent most of his time learning by exploring the software on his own
- His aunt provided the software for him and actually used the software herself—interacting him with a little bit about it.
- Wanted to get into photography

### **Motivations**

- Uses Photoshop for Projects as part of his fine arts cognate
- Wants to enhance his ability as an artist
- Photoshop is a must for expanding into a digital domain

#### *Changes:*

- No Changes

### **Expectations**

- Expects very similar interfaces between adobe products
- Already has a set way of working with Photoshop—he has a grasp on the basic tools.

#### *Changes:*

- Has some difficulty because he needs to go back and forth between Photoshop and Illustrator for projects that he is working on. Terminology and interface layout is vastly different for him.
- Wants to change the layout of his Photoshop to be as efficient and effective for him as possible, so he doesn't have to remember where various tools that he uses are located.

### **Story**

This participant had a pretty solid grasp of Photoshop already, but realized there was much still that he could learn about the software and its uses. He was already involved in a social process around the software as his aunt shared knowledge and the software around using Photoshop, which she had learned as part of her work. A lot of his knowledge came from exploration and interacting with her prior to starting the study. During the study though, he was enrolled in a fine arts class that asked him to use image manipulating tools to work on projects prominently Illustrator, but also Photoshop. Bridging Photoshop and Illustrator was new for him and something that he was trying to grasp during the study, though he never explicitly brought both of these programs into the study interviews. For the first interview, he works on editing a photo he took on a camping trip, removing cars and RVs revealing a more natural landscape relying

primarily on the clone stamp and blur tools. He works on a second image of his favorite artist who is rock climber, and he starts to work on pulling the climber out of the background. Once he gets the climber's body out, he spends the rest of the time looking for a background, changing the shape of gradient he wants to add several time, finally just adding gradient on the background. He decides to blur climber into background a little bit and add a lens flair. In the task, he is able to complete the image of the elephant logo without any great difficulty except for the way he changed the elephant color—he need to backtrack his work because of a mistake once and then was able to complete it. He said that in the task he realized that he was able to adjust the images using vector points, which was something new that he learned. In the second interview, he works on a class assignment. He already has the foreground worked out for the assignment, but wanted to redo the background. Even though this needed to end up in Illustrator, he was doing the graphics for the background in Photoshop. His approach is very exploratory, backtracking from what he may start to do, but once he backtracks, pieces of that original approach may remain in the new approach that he takes. At one point, he accidentally added a new layer to the background and liked how it looked keeping it and some of the previous changes. In the task, he works through and gets stuck on the circles a little bit and changing the elephant color. In the last interview, he revealed that he hadn't learned a whole lot during the study, which is partly because he is farther along in his knowledge of Photoshop and partly that he didn't have more time to put into it. In the first part, he made a logo for the department that he was working for the summer. His process was somewhat straightforward, not making many changes or removing many things from his logo. In the final task, he had a lot of difficulty because he tried a new approach with the circles, which ended up taking him more time. He created them as smart objects, thinking that he could expand the image size of each of them individually to increase the size, but this essentially linked all the circles together, meaning he couldn't change the colors. He was able to finish the image, but not as well as he would have liked because he ran out of time.



## Participant Four

### Artifact One: World of Warcraft (exp: one, pref: five)

#### Background

- Experience with games but not MMORPGs (RTS & FPS a little bit)
- Would play with brother as bonding experience (Defense of Agents) -  
> Derived from Warcraft III

#### Motivations

- Trial run to see if games like this would be entertaining [curiosity] ->  
“See what the fuss is about” 9:20
- Diversion
- Has friends who play the game that he can talk with about it, but not as big of a factor

#### *Changes:*

- The update made a difference in the ability to complete quests

#### Expectations

- The game would give clear indicators about where the player would need to go and what the player would need to do.

#### *Changes:*

- Leveling up in the game is very slow.
- Not everything was explained well.

#### Story

The player started out very methodically exploring the world. He took an analytical approach to playing the game trying to reason at each step what the game was trying to encourage him to do. He also clearly felt that the rewards that he was getting from the monster early on was not sufficient for his goals and wanted to explore new areas to find monsters that gave better rewards. Although it took some time, he gradually started to understand the questing system, equipment system, fighting system (although early on he still had not progressed past simple attacks). The tasks he was able to accomplish in time, but he did not clearly understand the money system until the end of the first interview and was still only learning to apply this knowledge during the second interview. At the end of the second interview, he wanted to find a guide online describing what things are and where they are—he started to find such guides online towards the third interview. By the third interview, he had not had much time to play, but had increased play the week before the interview, noting what a difference that the update made in his ability to play the game. In the third interview, he went to complete some quests where he was killing monsters that were far below his level

and were very easy to kill. He also mentions how slow the leveling up has gone. He soon starts to explore the next level with monsters that are a little above his level, so he backs off and continues the quest in the area he was working in.

## **Artifact two: Photoshop (exp: five, pref: seven)**

### **Background**

- He has worked with Photoshop for the past two years, with a big increase in the last year due to work and school constraints.
- Also this semester has been working with a Photoshop and After Effects together.

### **Motivations**

- For a long time, he has used Photoshop to make changes to photos, but he now is interested in learning about creating graphics from scratch.

#### *Changes:*

- There was a slight change during the study in that he became more interested, but the direction of his interest in doing graphics work was essentially started before the study.

### **Expectations**

- Just starting to understand the consequences of using Photoshop for making graphics

#### *Changes:*

- I think he was beginning to appreciate how much more he had to learn about Photoshop during the study, and how the program's depth just keeps growing.

### **Story**

This user started out the software already knowing about it, and already having started to form some opinions. He knew that there was a lot more that he still had to learn and was in fact, just starting to use Photoshop to seriously make original graphics using the software. His approach was to rely on Tutorials that he would find online particularly PSDTuts.com. In the first session, he looked at working on a website interface that he found on the website. He works on the tutorial following the steps as closely as he could, but, as he proceeds, he thinks that what he is working is just a little bit off from the website, this is not enough to stop him from proceeding through the tutorial. At one point in the tutorial, he needs an even further external resource to find how to import brushes, which he quickly finds and is easily to add the brushes, but this required working to coordinate what was going on in Photoshop, the tutorial and the external resource he found on Google. In the second session, he worked on creating a three dimensional box. He had already started it before the study, and was already a few steps in. He mentioned having to skip the first step he did in the interview, because he couldn't find a shipping label that he liked to put on the box that the tutorial suggested, but he felt it wasn't necessary. He had few problems following this tutorial although did have a few procedural and interpretive problems that he

was able to work through. The task he worked on of creating an elephant logo, he had an issue trying to add text to a path until he realized that he could easily use text options to recreate the same effect. In this instance, working on the more robust approach was not favorable due to a time constraint. In the final interview, he works on a three dimensional logo and this time has absolutely no problem because he is watching a video that shows exactly what is happening. On the final task completion, he was able to easily make the elephant logo look right, except that in none of the tasks did he actually change the color of the elephant, he claimed that this was because he just never noticed it—he only worried about getting it into the image, and removing the background from it.

## **Participant Five**

### **Artifact One: iPod Touch (exp: three, pref: seven)**

#### **Background**

- None

#### **Motivations**

- Touch Screen & Something Mobile for entertainment
- Entertainment purposes, music and games

#### *Changes:*

- This hadn't really changed
- Access to music was apparently more important than access to games/apps

#### **Expectations**

- Thought it would be able to work out with it
- An iPod Touch would allow him to store his music.
- He would be able to listen to his own music and his friend's music
- He would have access to all the thousands of apps for iPod Touch/iPhone

#### *Changes:*

- Too bulky to work out
- He realized that once he synced the iPod Touch with his friend's computer, he no longer could have his *own* version of this iPod touch—meaning that if he wanted access to his friend's songs, he would not be able to download his own music to it or his own apps to it, unless he relinquished control of his friend's songs.
- Some of the apps are actually available only for certain versions of the iPod Touch or the iPhone.

#### **Story**

The iPod Touch is not something that he had a great deal of experience with, but it was something that he was extremely interested in learning about. He had experience with other MP3 players before, but the iPod Touch and its interface were somewhat new for him. He had no real difficulty with the interface, he even learned several aspects on accident like page flicking and rotating the screen. He had more issues with syncing and connecting the artifact to the network. He also had trouble with some of the assumptions of an Apple product, such as the universal username and password. By the second interview, he had the

interface interactivity down, but still struggled with some of these issues. One of his main problems was getting applications on the artifact. He had contemplated hacking the device to force it to download some of these apps, at which point the researcher offered to pay for upgrades to avoid damaging the artifact. The participant realized though that if he were to make those changes or even do the upgrade, he would lose the music from his friend's computer. In effect, he had synced his iPod for the study to his friend's account making it his friend's iPod that he was borrowing. He valued the music more than the apps so decided to maintain the status quo. The last interview did not involve much use. He primarily only used the music feature, because he could not download any new apps to the software. He demonstrated in the task though, that he understood how to do this.

## **Artifact Two: World of Warcraft (exp: one, pref: seven)**

### **Background**

- He had played Dark Age of Camelot (another MMO)
- Played it with a friend for two months, but didn't have much motivation to continue
- Played console games

### **Motivations**

- Looks at game as a recreational opportunity
- Won't invest three or four hours into a game at a time (though he used to do this occasionally when he was younger)
- Wanted to see how high of a level he could get.
- He was excited about the expansiveness of the world

### *Changes:*

- Just wanted to see if he could play more, because he wasn't leveling as fast as he expected.
- Did not get very far out of the starting area so he didn't see much of the expansiveness of the world—may have contributed to his lack of interest.

### **Expectations**

- He knew from a few friends use that the game may require a lot of time to play, and he was not willing to invest that time to play the game.

### **Story**

This participant mentioned how he was excited to play the game, but also said that he would only have a specific amount of time to contribute to the game (and as it turned out, that was only if the game would interest him enough). From the start, he knew other commitments might prevent him from playing the game as much as he needed to get very far into it. In the first interview, he created a character and followed the tutorial instructions to learn the basic game mechanics. He is able to plug into some of his prior MMO experience, such as looking at the map using the 'm' key on the keyboard. He is able to complete the first couple quests, but gets a quest at the end where he needs to wake up some sleeping peons. But he is unable to find any peons that are sleeping. He finishes the interview stumped by that quest. By the second interview, it was clear that he had already lost interest in the game. He mentioned enjoying the first few times that he played, but by the third time he wasn't enjoying it much. He told me that he still couldn't figure out the peon quest even after Googling it. He continues on a quest in the same area as the first interview, this time he grouped with someone to

enter a nearby mine. He completes the quest, but after a server crash and logging back in, he realize the server didn't count his completing the quest, so he has to do it over again, by himself. He runs for the exit, but is killed by too many monsters. He turns in the quest and gets the reward. At this point, he moves out of the starting area into the second area. He realizes that the monsters out here are higher level and give better loot. He ends the interview in the nearby town after killing some monsters in the area. Even after this change from the first area to the second area, he still thought the game was pretty much the same as in the first area, even though he could get more experience out here. It still wasn't enough to pique his interest.



## **Participant Six**

### **Artifact One: Photoshop (exp: four, pref: five)**

#### **Background**

- Had a fairly extensive experience with Photoshop
- Had used Paint Shop Pro before Photoshop

#### **Motivations**

- Editing Photos for Friends
- Career related work, for poster, etc.

#### *Changes:*

- No Changes

#### **Expectations**

- She was confident that she could do pretty much anything with Photoshop, if she didn't know how, she was sure she could find out.

#### *Changes:*

- No changes as she had no major impediments in her work.

#### **Features**

- Warp tool ("reminded of it")

#### **Story**

This participant had been involved with amateur graphic design for a long time working with other programs like Photoshop, but moving on to Photoshop before when she realized how much more power it had. Much of her own activities in both observations revolved around prepping images to be displayed on the internet. By the second time, she decided to make a Photobook for her aunt, which she had mentioned starting in the first interview. She had no problems in the two tasks, but needed to backtrack once in the first study to create the background in a more effective way (such that she was happier with it). She carried this new strategy over with her to the second time she did the task (actually mentioning that she remembered to do this from the previous time). It seems that there has not been a great deal of learning (although her use is definitely being shaped by prior use, per the Photobook example), because she has more experience than a typical novice would. This is simply a matter of her needing to find more complex challenges that are either situational, technical (which she acknowledged she still did not know a lot about), or motivational. In the last interview, she looked for a tutorial to follow on PSDTutorials. She reads through the entire tutorial before deciding to use it and wonders how to do certain parts of it, but decides to do the tutorial anyway using an image from Flickr. As she works on the image, she loosely follows the tutorial steps finding out that

something that she was doing outside of the tutorial was actually more interesting. She also realizes at the end that the thing that was the most interesting about the tutorial was basically an image that gets added in and not a filter. She was not as impressed by the tutorial at the end. For the task, she is able to complete it and was now working on improving her efficiency at completing the tutorial—getting it done as quickly as possible.

## **Artifact Two: World of Warcraft (exp: five and a half, pref: five and a half)**

### **Background**

- Grown up with console games
- Not as big of a PC Gamer, but has played PC games
- Has played WoW before (one summer two years ago)
- Hasn't played games in a while

### **Motivations**

- Finds the game very fun. It's a fun game to play not just because of the quests, but also because of the player that she gets to develop.
- Stated as a goal that she should not play too much and she tries to balance the gameplay with the rest of her life.

### *Changes:*

- She had trouble dealing with this early on, but at the end when she needed to finish things for graduation—she realized that she could stop playing and take care of her life requirements

### **Expectations**

- Expects it to be addicting
- Doesn't think of the game as easy or hard, but connects with the character she creates whether or not she accomplishes anything with it

### **Features**

- Follow function of another player, visited new areas

### **Story**

This participant has played the game in the past. She finds it enjoyable because of the character she gets to create. She also mentions that in general for games, she likes following the storyline. She has played WoW in the past, and said that it sucked up a lot of her time. She is aware of this, and knows that she needs to balance her play time, with real life requirements. Because of her experience, she knows the starting area very well and is able to pick up quests, attack monsters, pick up loot, and use equipment. Playing the game after the first interview, she still has difficulty ending on staying with a timer that she was using to limit her gameplay. She would often finish one or several more quests after the timer went off. She notes though that her play has started to trail off both because school and work demands have picked up and also because she's getting to some parts where she is getting stuck. She mentioned that she had worked with other players in the game to help her complete some quests, but also had some questions for me in the second interview. Mostly, she did not know what area to

go to next for her level, because the monsters she was fighting were too low level. I point out a few options for her, and she goes to an area that she already had visited. She heads to the Splintertree Post that a reporting quest has takes her to in Ashenvale. She runs there from Orgimmar first heading in the wrong direction, then the researcher mentions that she needs to go through the Barrens. She gets to the Outpost, and does one quest and we run out of time. Before the last interview, she really did not have as much time. She had a conference she needed to go and also had some technical issues that she didn't solve *because* it prevented her from playing the game. Her play dropped off, even though she was having fun playing it, but other responsibilities were taking over her time for WoW. In the interview, she goes out to a beach in the Zoram Strand area of Ashenvale. She picks up several quests there that she works on, and is able to complete most of them easily enough, but the quests are giving much higher experience. She hearthstoned back to Splintertree Post thinking she could turn in a quest there, but that was not where she needed to turn it in. She can't buy equipment here, though, for the task and so we ended the study.

## **Participant Seven**

### **Artifact One: iPod Touch (exp: five, pref: seven)**

#### **Background**

- Has used PDAs before -> experience w/ syncing
- Did not have experience with iPod Touch or any mobile music device

#### **Motivations**

- Interested in learning the iPod Touch to understand it from the perspective of its technical construction
- Interested in possibly developing for the iPod Touch/mobile devices (though not in this study).
- Entertainment.

#### *Changes:*

- No Changes

#### **Expectations**

- Wanted to evaluate it from a research/development standpoint
- It's a small computer like a PDA

#### *Changes:*

- It is handy to have with her

#### **Features**

- Internet -> needed to register device

#### **Story**

The participant had a strong technical background, but did not ever use an iPod Touch or mobile music device before. She had a professional interest in getting to know the iPod touch as a developer and designer of mobile devices. On the whole, she understood what all of the apps were for, even though she did have some interface issues with how to return back from an application to the main page. On the task, she was able to locate an application after much searching (actually reading customer reviews for the best Piano app), but she was unable to download it during the first study. When she returned for the second interview, it was clear that her use of the artifact was very focused using the Internet Explorer (for email—as opposed to the Email program), Music, and sometimes the Clock. She had some network access issues related to the university network, but was able to work it out on her own. She continued to have difficulties with the back button throughout, but despite this, she describes the relationship with the artifact in affectionate terms of excitement and enjoyment. Towards the end she had a

problem with the home button, which we were not able to fix. These problems started just before the second study and we weren't able to figure it out.

## **Artifact Two: Photoshop (exp: one, pref: seven)**

### **Background**

- She took training courses only on Photoshop, Fireworks, and Illustrator.

### **Motivations**

- Doesn't have grand goals.

### **Expectations**

- Didn't think she was using the software during the study, but insisted she was learning only.
- Thinks she needs a background in the language of graphics before using the tool.

### *Changes:*

- She said she had a slight change in what she expected she could do. She thinks that she has better understanding of what is possible through the software.

### **Features**

- She learned how to apply new styles.

### **Story**

She had spent some time learning to use the software, but had never really gotten involved completely with the software. She started the software without any strong goals and without any real direction to using the software. During each session, she started by going onto Google and looking for a starter image that she could start to modify. She never started with her own image. In the first session, she worked on a playground image. She spent a fair amount of her time in the session looking how to apply a drop shadow. She also learns how to apply styles (she knew already how to create them), but was able to change the style and apply it to different objects. For the task, she had trouble finding how to change the elephant logo from gray to red, and is not able to solve the problem before the end of the study. In the second study, she figures how to use the layers such that they can she could place various animals that she imported into Photoshop behind various trees in a forest she was working on. For the task on the second image, she comes closer to solving this problem, but she has some problems with some of the settings, which I point out and she is able to set the elephant to red. She decides to follow a tutorial for this last session. By the end though, a step she follows doesn't work as it is described in the tutorial (for which I can't even figure out). In the last task, she is able to complete the task based on what she worked on before.

## **Participant Eight**

### **Artifact One: World of Warcraft (exp: one, pref: two)**

#### **Background**

- Online Casual Games, but little else
- Has friends that play video games

#### **Motivations**

- Interested in learning the game and showing her friends
- Entertainment

#### *Changes:*

At first, she was skeptical that it would be really entertaining, but as she played the games and interacted with her friends she was able to progress quite far and started enjoying it quite a bit.

#### **Expectations**

- She did not know what to think at first, and did not show preference towards the game, though did admit that she would like to try it because of her friends, but was worried that she would not be able to learn it.

#### *Changes:*

- She found out that she was able to actually play the game well, even with some earlier obstacles to overcome.

#### **Features**

- Joining guilds, friending others

#### **Story**

This participant had very little experience with games, and did not rank the game high in terms of preference between Photoshop, WoW, and the iPod Touch. Her first time in the game, she did not have much experience to rely on. She spent some time focusing on the visual aspects of the game. She selected her character because of her prettiness, but did not realize that in the context of the game, that her race of character was on the Horde side—essentially, the evil side. Her first time playing the game she struggled finding out what to do, even who to talk to and what characters to walk towards (thinking that anyone might kill her). She eventually figured out how to get quests, attack monsters, buy equipment, and how to turn in quests when they are completed. Her character died many times to where she almost got frustrated. Then, the second time she interviewed, she had progressed very far into the game. She had a lot of the basics down and had started to develop basic strategies like grouping quests in the same location together. Much of the difference was a result of her interaction with friends and



social support she received from them in respect of the game. There was a clear difference between the first and second time in both abilities and enjoyment in the game. By the last interview, she had made it past level 70. Since level 60 though, her friend had stopped playing with her. She had to level the next ten or so levels on her own. In the interview, she was working on a quest chain that she had started before the interview. She has no real difficulty getting through the quest (just annoyed that she has to go so far to accomplish the quest then come all the way back). For the task, she runs back to the main town and sells all the junk that she has collected, but she doesn't spend it on any equipment, because she argues that she already has some of the best equipment. After the interview, for about a month, she told me that she wasn't playing the game. After that month, she started playing with her friend and made it to level 80.

## **Artifact Two: iPod Touch (exp: one, pref: seven)**

### **Background**

- Had a Zune for about a month
- Also has a Verizon Dare phone that is able to play Mp3's.

### **Motivations**

- Her main motivation for the study coming was to explore what the iPod can do.

#### *Changes:*

- She found the device to be not very useful
- Typing is a problem
- Games that are free (what she downloaded predominantly) were boring.

### **Expectations**

- Not sure what to expect in terms of what came built into the phone.
- Would like it if she could use add-ons & customize it.
- Her friend had strong inclinations against Apple products and it was evident that she was affected by it, but she was curious

#### *Changes:*

- It seems that since the device was not working the way that would be ideal for her (mostly because of the keyboard) that her friends predispositions were coloring her sentiments towards the device more—it just wasn't worth the effort to learn it.

### **Story**

The participant came into the study optimistic about the device (in December she rated the iPod at the highest level of interest possible). Through use though, the expectations she had for the device were not reached by the device. She mentioned that it was too much of a hassle for her to use. In the first interview, is able to use it perfectly fine. She can connect to the internet, download apps, and change settings. In the task, she learned that she needed to download iTunes, to download new apps. But she had no problem setting them up. By the second session, she mentioned that she really didn't care to use the device at all, and that she hadn't used it much past the first week. Though, she did download several new apps. She mentioned that it was a hassle for two reasons, first of all the keyboard was very difficult for her to use (because she was used to being able to use her fingernails on her cell phone) and she didn't want to go to sites where she had to type in long messages or use passwords, limiting its usefulness. Secondly, she mentioned it was just easier to use laptops or available

desktops instead of the internet on this device largely because of the problem of typing. In the next session, I encourage her to setup her Umail account on the device (as opposed to logging on to the website every time), but she is unable to do this. In the last session, she mentioned only having used it once since the last session. She performs the task of downloading a new app, which she was able to do, but it didn't change her mind at all about the device.

## **Participant Nine**

### **Artifact One: World of Warcraft (exp: one, pref: six)**

#### **Background**

- Has played video games but never MMORPGs
- Traditionally played console/not PC games

#### **Motivations**

- Stress relief though sometimes adds stress
- Entertainment—thought it would be addicting & fun

#### *Changes:*

- Got confused from game instructions, then the game patch helped improve his understanding of the game.
- Got back into it a little near the end
- Finds it interesting, but finds it difficult to work into his lifestyle because it is a very *singular* experience and not share with his girlfriend.

#### **Expectations**

- Thought he would play the game a fair amount during the study
- Thought that most challenges would be able to be overcome.

#### *Changes:*

- Didn't put as much time into as he thought
- Because he couldn't find time between school, work, social, life, & others games

#### **Features**

- Hearthstoning, flying to other areas, mining

#### **Story**

This participant had no real problems using the interface. Conventions were a little different, but they were clearly things that he could pick up the basics on in about an hour's time. The interesting aspect was what he mentioned as working the gameplay into his everyday life. He understood the game, but did not feel that he gave himself enough time to get far into the game and to really get hooked into the game. He described how he only played the game when he was by himself and at home. In other situations, he never really had opportunities to play. In the second interview, he mentioned to me that he anticipated wanting to play a lot, but a confluence of factors led to that not happening. He mentioned that he would play when he brought his computer on campus. In the week before the

final session, he nearly gave up on the game. But his play picked up with the introduction of a new patch, which helped with his confusion over some quests. In the last interview, he took on quests that he just started to pick up again. Completed a few related quests in the area and was able to turn them in. Went back to town to see how much money he made and although he needed to buy new armor—couldn't find any he liked, so he just repaired the armor he had.

## **Artifact Two: iPod Touch (exp: two, pref: seven)**

### **Background**

- He owns a small, cheap MP3 player now
- Has played around for about twenty to thirty minutes with his sister's iPod Touch

### **Motivations**

- He wanted to have access to the web & Entertainment mobility
- Fills in time waiting/walking
- Get into his own little world.

#### *Changes:*

- No real changes, it did what he was expecting and what he needed.

### **Expectations**

- Thought he could use the scheduling feature
- Could add music, but that would be a time consuming process that he would need to give himself enough time to do (didn't do until later into the study).

#### *Changes:*

- No real changes, it did what he was expecting and what he needed.
- Scheduling was too time consuming and could be addressed using UMail and so it faded away during the study.

### **Story**

The participant seemed to have very basic expectations for the iPod touch, but those simple expectations could have a huge impact on his time waiting or going from place to place. He mentioned not wanting to listen to other people for example on the bus, and using the iPod he could escape into his own little world. The device allowed him to do what he wanted and seemed to be more effective on an entertainment standpoint than his current iPod. In the first interview, he looked at all the preloaded apps, and wanted to see if there was preloaded content (music, movies, etc.). He also realized that he need to download iTunes on his computer, simultaneously he also looked for any handy music that he could download to the device. In the second interview, he spends the session trying to setup the email account (per my request). He tried to do this before, but got an error message and left it for later. He tries to just mess with the settings, but eventually goes to IU Knowledge base. He also looked on Google. He finds a hidden setting he needed to do on his Umail account. Later he mentions that he felt that he really accomplished something by being able to figure this out mostly on his own (I pointed out one thing he missed). By the third interview, there isn't much more to

do that's genuinely new with the device itself. So he just explore the device and performs the task downloading a new app.

## **Participant Ten**

### **Artifact One: Photoshop (exp: three, pref: six)**

#### **Background**

- Has had experience with Paint before and has generally relied on the tools which are most familiar with from Paint.

#### **Motivations**

- Doesn't consider themselves a visual person
- Wants to be involved with game design and feels this could be a good experience.

#### *Change:*

- Needs to know how to use Photoshop for class work.

#### **Expectations**

- Sees Photoshop as a tool, only.
- Is confident in her ability to accomplish any goal that she sets for herself through Photoshop.
- If she doesn't know how to do something, she's confident she'll know where to look.

#### *Change:*

- None

#### **Features**

- Color changing (multiple ways), blur (smudge)

#### **Story**

She has had a lot of experience with the tools provided for image editing through Paint, such as copying and pasting layers over top of one another. Her first interview she seemed to have no problems with the interface of Photoshop. Early on, she relied on tools and techniques that were familiar through Paint. As she went on in her free exploration, she started to want to learn about a more effective way to change the color of the flowers she had in our picture—without simply using paint brushes and frequently changing colors. She learned about the Color Replacement Tool by Googling. This technique of relying on Google was a common strategy. She usually found what she needed within the first couple of entries. She used this again in the second interview to learn how to create buttons. Her confidence in her abilities is tied in her ability to find the answer to any question, or find a way to work around it. In the final interview, she worked on trying to understand the three dimensional capabilities of Photoshop. She thought that she could convert a canvas that she was working on into three dimensional.



There was no clear way in Photoshop to do this, so she looked on Google and found that Photoshop can work with three dimensional objects, but these objects had to be created in other software and imported into Photoshop. At first, she started to question whether the Photoshop version itself was wrong to be able to work with three dimensional, but she realized that she needed a three dimensional model to begin with. So she began working on tutorials for creating textures. She had no problems doing this from the step-by-step instructions. She has no real difficulty doing the task the last time.

## **Artifact Two: iPod Touch (exp: one, pref: five)**

### **Background**

- She has an iPod that is nearing its end of functionality
- it has color, but not video

### **Motivations**

- Interested in the technology, it sounds enjoyable
- Testing to see if she wants to get one
- Everyone is talking about it.

#### *Change:*

- Wasn't as interesting as she thought it would be.

### **Expectations**

- Expected it to be easy to use
- Expected Apple to have a very restrictive environment.

#### *Change:*

- None

### **Story**

She has experience with iPods and Apple. She seems to have preconceptions about Apple products and their restrictiveness before using the device. In the first interview, she explored all the apps that came with the device. When logging into the network, she finds it unclear based on Indiana University's settings how to connect to the device, but eventually able to figure out the network issue. She then looks into the app store and is able to successfully able to download a game to play on the device. She finally looked into the video capabilities of the device. It was at this point, that it became clear to her how restrictive the device was. She downloaded a random video to the computer desktop she was using, but wasn't able to add it to the device using iTunes. After reading online, she realizes that it wasn't the right format and she seemed very displeased that she could only use one particular format. In the second interview, she mentioned that she used it some in the first week, but after that first week she didn't really use it afterwards. In the interview, she demonstrated problems with email and was not able to set up UMail through Google. At the end of the study, we determined that she didn't have any interest in using the device on her own any more. So, we ended the study.

## **Participant Eleven**

### **Artifact One: iPod Touch (exp: two, pref: six)**

#### **Background**

- Has had experience with a variety of different MP3 devices
- Worked as a salesman of various mobile devices previously
- Has worked with the iPod Touch in short bursts before.

#### **Motivations**

- Entertainment
- Try it out to see if it's something that he could justify in buying

#### *Changes:*

- Actually found that it's a way for him to divert his children's attention when traveling.
- Interest really dropped off at the end
- Due to email setup problem & Music restriction problems

#### **Expectations**

- Was sure that he would be able to face mostly any situation the interface would thrust upon.
- New what the experience might be like and thought that there is a chance that it could be an effective part of his lifestyle.

#### *Changes:*

- Wasn't sure that what the iPod Touch offers is worth purchasing.
- Has fallen into a typical use with it.
- The lack of wireless access has made the iPod Touch less valuable than it could be.

#### **Features**

Movies, music, alarm

#### **Story**

This participant had a good deal of experience and had no problems with the interface. He was also able to easily interact with most aspects of the software, including joining the wireless network, connecting his email accounts and downloading apps. It was clear that there were also some real benefits that he was getting from incorporating the artifact into his lifestyle (including finding the apps enjoyable and handy to have with him), but he stated that these benefits were not enough to convince him to buy the artifact itself. This experience is having a

formative effect on the judgment that he has to make about how completely to integrate such an artifact. He is able to engage with it and solve problems, but at the same time remain detached enough from the artifact to evaluate its usefulness with respect to its cost. By the start of the third session, he mentioned having a few problems that started to go, which coincided with a fading interest in using the device. The first problem was setting up outgoing mail servers. He described going to UITS and they still couldn't help him get it set up. Also, he mentioned an incident where he had to reformat his hard drive, but had problems getting new music on the device because of iPod/iTunes restrictions. During the interview session, he demonstrated the setup problems he was having for iMail. During the task he tried to find a new email program that he could use, but realize all the apps he could download would be to alter the way the current mail programs displays mail.

## **Artifact Two: Photoshop (exp: three, pref: five)**

### **Background**

- Has experience with Photoshop through his work at the TCC where he worked on helping customers from Photoshop to plotter
- Had taken and undergraduate course in HCI in which he edited some pictures for it
- He also has seen his wife using Photoshop

### **Motivations**

- Wife uses Photoshop and he was hoping to help her in her business if he became proficient at it.
- He wants to edit photos like he did in class and with his wife.
- Wants to create things in Photoshop that look professional

#### *Changes:*

- Wife's process of using Photoshop tough to get involved with, because she relies on so many automated processes.
- Actually finds it difficult to stay motivated to use and learn Photoshop.

### **Expectations**

- Hasn't really done any editing before class: his editing ability is limited
- Expects to be able to be engaged with the software and to find it fun

#### *Changes:*

- Realizes how much work needs to go into learning photoshop before it starts to pay off.
- It isn't as engaging as he expected it to be.
- finds it difficult to find time & resources to make the progress he wants to make.
- Features
- Learns the smudge tool on his own

### **Story**

The participant came to Photoshop very optimistic about being able to learn and use it. He thought there would be a great opportunity in his life to use Photoshop. By the end of the study, he really didn't see how the software could be actually useful to him. He realized that he did not have any firm goals to learning the software, and that in part made it difficult for him to progress his knowledge

about how to use the software. In the first interview, he struggled to find some image to work on, but after some Google searches, was able to find inspiration for editing the image of a close-up shot of an eye, removing the cornea and replacing it with another separate image on a separate layer. He had issues with what he thought was a transparency in the new photo he is bringing in, when in fact the real problem had to do with the bottom layer being locked. He then moves onto the task of trying to work on an elephant image. He is able to import the elephant image after some effort, and starts working on creating images, but doesn't finish. He began by first drawing the circles, but ultimately found the circle tool to be much easier to use. In the second interview, he reveals that he hasn't worked on it as much as he thought he should or had hoped, and was starting to get frustrated, though he remained optimistic. In this interview, he was working on a tutorial to add a fire effect to text that he had been researching. He follows the steps, but gets frustrated at a few steps because of some ambiguities in the tutorial and he needs to figure them out on his own. At the end, it looked slightly different, but still looked like fire. He tried another fire tutorial. He struggled more with this tutorial because it was more complicated and it was not looking like the tutorial, but we ran out of time on the tutorial. In the task, he spent the entire time focusing on the circles and getting them right. He was able to get the shape of them right, but was not able to get the color exactly how they should look and he was unable to finish the image. By the last interview, he mentioned that learning Photoshop had not been enjoyable for him. He worked on a simple overlapping circle logo from a tutorial he had found. He was able to complete the tutorial without any real problems, though had to adjust colors and positions of circles a few times because they weren't looking quite right. For the task, he is able to import the elephant, create the circles (which he practiced) and create text that bends around the top of the circle (using text on a path as opposed to the text arc option), but isn't able to get the text at the bottom. He had gotten the closest he had to finishing the elephant image.

## Participant Twelve

### Artifact One: iPod Touch (exp: two, pref: seven)

#### Background

- Has had three to four MP3 Players in the past
- Has used his shuffle for listening to music
- Hasn't had much experiences with more *robust* mobile devices

#### Motivations

- Productivity tool
- Entertainment—game & podcasts
- Explore the interactivity of the iPod Touch

#### *Change:*

- His wife also has an iPhone and so the two are now able to communicate and interact with each other on the level of this technology

#### Expectations

- Expected to be able to download many applications and use the device to make life a great deal easier.

#### *Change:*

- He needed to temper his enthusiasm about the iPod Touch because of network constraints
- Found it as a way to have access to the internet around his wife, without offending her the same way a laptop could in terms of a lack of attention.

#### Story

He is a designer and wanted to use this experience as an opportunity to explore the interactivity of the iPod Touch. Interacting with the artifact was fairly easy with no major setbacks except for issues of connecting to the network at Indiana University. He needed to rely on a social network to fill him in on the trick (which required registering the device). He was able to figure this out by the second interview session. The more interesting dynamic comes from the way he is situating the device in his everyday life. He and his wife now both own similar smart mobile devices (both Apple products) and are able to work next to each other using their technology. It seems that in some ways there is this a slight reorganization of personal relationships through the use of this artifact (in a positive sense), but there was also some hype involved as the artifact does not always meet expectations in terms of its functionality and capabilities.

Nonetheless, it seems that to him the expandability of the apps of this device provide a wide array of possible uses not possible with many other artifacts currently available, let alone mobile artifacts. In the last session, he just found and installed an AT&T Uverse app to help him use the DVR system. There was not much use on the last interview.



## **Artifact Two: World of Warcraft (exp: one, pref: seven)**

### **Background**

- Had PC version of Warcraft (has a Mac now)
- Also had other PC Strategy games that he would play on local area networks sometimes
- Hasn't played games in years
- No real console gaming experience, no real online experience

### **Motivations**

- As a designer, he was interested in understanding the WoW Interface, Esp. the social element
- Had a long term goal of leveling up to level 80
- He admitted to being closed off to the game and focusing specifically on leveling at first, but this changed as he learned more about the game

#### *Changes:*

- Had a long term goal of making as many characters as he possibly could
- Realized that the game itself had changed through his use:
- It became more complex: the auction house really changed the way the game was for him, when he started using it
- The guild also seemed to change the game for him, because at first it was a very solitary experience for him.
- As for the group, he became motivated to help the guild that he was participating in.

### **Expectations**

- No real expectations when he started, just expected to play a game where you level up your character to level 80
- Wanted to get in & get out in shorts bursts of play

#### *Changes:*

- Realized that he must put more than just two hours per session (eventually said he needed to put in at least three hours per session—related to a lack of time to play the game).
- He realized that he had to force himself to stop playing or he'll keep playing longer than he intended.

### **Features**

- Predominantly using the bank and the auction house
- Picked up skills related to profession and player type

## Story

The participant was very eagerly anticipating playing World of Warcraft. He was interested in the game from a design standpoint and seeing what it is about World of Warcraft that is so interesting for software design. He quickly became immersed into the game and all the different aspects. His use and perception of the game had gone through many transformations. The first became when he started to incorporate social element of the game involving guilds around the second interview. Between the second and third interview, he started to learn about and use the auction house (related to the social element) and how selling things on the game became a mini-game in itself. In the first interview, his first foray into the game was based very much on trial and error. He knew that he needed to complete quests, but the low level mechanics of the game were a bit of a mystery. Without too much difficulty he was able to get through the basics through tutorial elements built into the game. He learns to loot animals and starts to learn a little bit about adding equipment items, but by the end of the session it still wasn't crystal clear. In the second interview, when we finally get into the game, he needs to do a lot of traveling to get back to an area he was questing in. Most of the interview session involved traveling to that area, so the player would tell stories about his play that he can remember as he search various items in his bags and quests in various areas he has visited. He completes one quest (that was awkward, because he wasn't sure what was going on before he was attacked and had fought off the attacker, without killing him—the character just submitted). When I introduce the task to him as collecting as much money as possible and buying the best piece of equipment, we have a debate saying that he can't buy anything. I ask why he wasn't using the auction house (which he knew about, but was consciously not using on principle), afterwards, he re-evaluated his position on the auction house. So, the session ended without much interaction with the game. By the next interview session, we met when the servers were down and we just talked the whole time. In the last interview, he mentioned while I introduced him to the auction house, he learned most of it on his own. The appeal to the auction house was largely from his prior experience on eBay and leveraging that experience into World of Warcraft.

## **Appendix E. Ability to Learn and Importance Towards Goals Question Analysis**

These tables record the responses participants gave with respect to their ability to use the artifact they are learning and how well they have been able to use the artifact to accomplish all of their important goals. Here are the exact questions asked.

1. How strongly would you rate your ability to use this device before using it? On a scale of one (lowest) to five (highest).
2. What is the likelihood that you will be able to use the device to accomplish all of your important goals? On a scale of one to five.

Reported values represent number given on a 5-point scale, but may represent the average of numbers given by participants if more than one number was given (e.g., between 3 and 4 is recorded as 3.5). Table shows all artifact over all sessions for every participant. Second group of rows represents differences between those values.

Table E1.

Reported Perceived Ability to Use Artifact and Usefulness of Artifact to Achieve Goals for Each Session

		Ses. 1	Ses. 1	Ses. 2	Ses. 2	Ses. 3	Ses. 3
	Artifact	Ability	Goals	Ability	Goals	Ability	Goals
P1	Photoshop	1.5	4	3	4	X	X
P1	X	X	X	X	X	X	X
P2	Photoshop	3	4	3.75	4	3.75	4
P2	WoW	4	4	4.5	4	4	4.25
P3	WoW	5	5	5	5	5	X
P3	Photoshop	3	4	4	3.5	3.75	4.25
P4	WoW	3	4	3.5	4	4	4
P4	Photoshop	3	4	3	4.5	3.5	4
P5	iPod	1	5	3	5	5	3
P5	WoW	4	5	2.5	1	X	X
P6	Photoshop	3.75	4.5	3.75	5	4	5
P6	WoW	3	2.5	3.25	4.5	3.5	4
P7	iPod	5	5	5	5	5	5
P7	Photoshop	5	X	3	X	3.5	3
P8	WoW	2	4	4	4	5	4
P8	iPod	0.5	4	3	4.5	3	X
P9	WoW	3	5	2	3	2	2.5
P9	iPod	5	5	5	5	5	4.5
P10	Photoshop	1.5	3.5	2	5	3.5	3
P10	iPod	4	5	5	5	X	X
P11	iPod	5	4	4	5	4	5
P11	Photoshop	2	5	2	2	2	3
P12	iPod	5	4.5	4	3	4	3.5
P12	WoW	4	4	4	4	3.5	4

		Percent Diff. of 1 and 2 Ability	Percent Diff. of 1 and 2 Goals	Percent Diff. of 2 and 3 Ability	Percent Diff. of 2 and 3 Goals	Percent Diff. of 1 and 3 Ability	Percent Diff. of 1 and 3 Goals
P1	Photoshop	0.5	0	X	X	X	X
P1	X	X	X	X	X	X	X
P2	Photoshop	0.2	0	0	0	0.2	0
P2	WoW	0.11111 1	0	0.111111	0.058823	0	0.058823
P3	WoW	0	0	0	X	0	X
P3	Photoshop	0.25	0.125	0.0625	0.176471	0.2	0.058823
P4	WoW	0.14285 7	0	0.125	0	0.25	0
P4	Photoshop	0	0.1111111	0.142857	0.111111	0.142857	0
P5	iPod	0.66666 7	0	0.4	0.4	0.8	0.4
P5	WoW	0.375	0.8	X	X	X	X
P6	Photoshop	0	0.1	0.0625	0	0.0625	0.1
P6	WoW	0.07692 3	0.4444444	0.071429	0.111111	0.142857	0.375
P7	iPod	0	0	0	0	0	0
P7	Photoshop	0.4	X	0.142857	X	0.3	X
P8	WoW	0.5	0	0.2	0	0.6	0
P8	iPod	0.83333 3	0.1111111	0	X	0.833333	X
P9	WoW	0.33333 3	0.4	0	0.166667	0.333333	0.5
P9	iPod	0	0	0	0.1	0	0.1
P10	Photoshop	0.25	0.3	0.428571	0.4	0.571429	0.142857
P10	iPod	0.2	0	X	X	X	X
P11	iPod	0.2	0.2	0	0	0.2	0.2
P11	Photoshop	0	0.6	0	0.333333	0	0.4
P12	iPod	0.2	0.3333333	0	0.142857	0.2	0.222222
P12	WoW	0	0	0.125	0	0.125	0
Avg.		0.22779	0.1602273	0.093591	0.117669	0.248065	0.150454

## **Appendix F. Photoshop Task Analysis**

In this appendix, the number of elements completed by participants in the Photoshop task is recorded. These elements include removing the whitespace of the elephant, changing the elephants color, getting the layering right on the image, adding properly formatted text, curving the text, and each of the three concentric circles. The second group of rows of this table shows the percentage of total elements completed and almost completed by each participant in each session. Finally, the last group shows the difference in percentage completed and almost completed between each individual's first session and their second session, second session and third session, and first session and third session. The average of the differences is given in the final row.

Table F1.

Number of Elements Completed and Almost Completed by Participants in the Photoshop Task

	Ses. 1 Completed	Almost Compl.	Session 2 Completed	Almost Compl.	Session 3 Completed	Almost Compl.
P2	4	0	4	4	5	3
P3	5	3	5	3	X	X
P4	4	3	4	3	5	2
P6	8	0	8	0	8	0
P7	1	0	3	1	2	4
P10	2	3	4	3	6	1
P11	2	1	2	0	3	1

	Ses. 1 Percent	Completed and Almost	Ses. 2 Percent	Completed and Almost	Ses. 3 Percent	Completed and Almost
P2	0.5	0.5	0.5	1	0.625	1
P3	0.625	1	0.625	1	X	X
P4	0.5	0.875	0.5	0.875	0.625	0.875
P6	1	1	1	1	1	1
P7	0.125	0.125	0.375	0.5	0.25	0.75
P10	0.25	0.625	0.5	0.875	0.75	0.875
P11	0.25	0.375	0.25	0.25	0.375	0.5

	% Diff. of 1 and 2 Compl.	% Diff. of 1 and 2 Compl. and Almost	% Diff. of 2 and 3 Compl.	% Diff. of 2 and 3 Compl. and Almost	% Diff. of 1 and 3 Compl.	% Diff. of 1 and 3 Compl. and Almost
P2	0	0.5	0.2	0	0.2	0.5
P3	0	0	X	X	X	X
P4	0	0	0.2	0	0.2	0
P6	0	0	0	0	0	0
P7	0.666667	0.75	-0.5	0.333333	0.5	0.833333
P10	0.5	0.285714	0.333333	0	0.666667	0.285714
P11	0	-0.5	0.333333	0.5	0.333333	0.25
Avg.	0.166667	0.147959	0.094444	0.138889	0.316667	0.311508

## **Appendix G. Curriculum Vita**

Curriculum Vita is listed beginning on the next page.



William N. Ryan  
471 Manor Road, Wexford, PA 15090  
812-457-8820  
wnryan@indiana.edu  
<http://www.williamryanonline.net>

---

#### Interests

---

##### *Use of Artifacts*

User Experience, Learning to Use Interactive Artifacts, Video Game Play, Social Media Use, Information Visualization

##### *Design Process*

Interaction Design Process and Techniques, Practice of Interactive Artifact Design, Education on Design of Interactive Artifacts

---

#### Education

---

*Indiana University, Bloomington, IN*

**Ph.D. in Informatics** **2011**

Dissertation: "Learning-in-use of Interactive Artifacts"

Advisor: Dr. Martin A. Siegel

Committee: Dr. Erik Stolterman, Dr. David Hakken, Elizabeth Boling, Dr. Yvonne Rogers

GPA: 4.000

*Indiana University, Bloomington, IN*

**M.S. in Human-Computer Interaction** **2006**

Thesis: "Barriers to entry: Designing player access in video games"

Advisor: Dr. Jeffrey Bardzell

GPA: 3.972

*University of Notre Dame, Notre Dame, IN*

**B.S. in Computer Science** **2004**

Areas of Concentration: Artificial Intelligence, Computer Graphics

Advisor: Dr. Matthias Scheutz

GPA: 3.367

---

#### Publications and Papers

---

##### **Book Chapters**

1. Castronova, E., Bell, M. W., Cummings, J. J., Emigh, W., Fatten, M., Mishler, N., Ross, T., Ryan, W., & Falk, M. Virtual world Economies: A Case Study of the Economics of Arden. (2009). In D. Heider (Ed.) *Living Virtually* (pp. 165-189). New York: Peter Lang Publishing, Inc.
  2. Castronova, E., Cummings, J., Emigh, W., Fatten, M., Mishler, N., & Ryan, W. (2007). What is a synthetic world? In F. von Borries, S. Walz, U. Brinkmann, M. Böttger, (Eds.). *Space Time Play* (pp. 174-
-

### **Journal Articles**

1. Castronova, E., Bell, M. W., Carlton, M., Cornell, R., Emigh, W., Falk, M., Fatten, M., LaFourest, P., Reynard, J., Robbins, S., Ross, T., Ryan, W., & Starks, R. (2009). A Test of the Law of Demand in a Virtual World: Exploring the Petri Dish Approach to Social Science. *International Journal of Gaming and Computer-Mediated Simulations*, 1(2), 1-16.
2. Castronova, E., Cummings, J., Emigh, W., Fatten, M., Mishler, N., Ross, T., & Ryan, W. (2009). Case study: The economics of Arden. In *Special Issue of Critical Studies in Media Communication*. 26(2), 165-179.

### **Conference Publications**

1. Ryan, W., Hazlewood, W. R., & Stolterman, E. (2010). Presenting evocative design as a method for divergent thought for interaction design. In *Proceedings of 7th International Conference on Design & Emotion 2010*. Chicago, IL.
  2. Ryan, W., & Siegel, M. A. (2009). Evaluating interactive entertainment using breakdown: Understanding embodied learning in video games. In *Proceedings of DiGRA 2009*. London, England. Available at DiGRA Digital Libraries.
  3. Jung, H., Stolterman, E., Ryan, W., Stroman, T., & Siegel, M. (2008). Toward a framework for ecology of artifacts: How are artifacts interconnected surrounding a personal life? In *Proceedings of 5th Nordic Conference on Human-Computer Interaction*. 201-210. Lund, Sweden.
  4. Ryan, W., Hazlewood, W. R., & Makice, K. (2008). Twitterspace: Co-development through Twitter to enhance community awareness. In *Proceedings of Participatory Design Conference 2008*, 230-233, Bloomington, IN.
  5. Bardzell, J., Bardzell, S., Birchler, C., & Ryan, W. (2007). Double Dribble: Illusionism, mixed reality, and the sports fan experience. In *Proceedings of International Conference on Advances in Computers for Entertainment Technology*. 216-219. Salzburg, Austria.
  6. Bardzell, J., Bardzell, S., Briggs, C., Makice, K., Ryan, W., & Weldon, M. (2006). Machinima prototyping: An approach to evaluation. In *Proceedings of 4th Nordic Conference on Human-Computer Interaction*. 433-436. Oslo, Norway.
  7. Brunette, K., Eisenstadt, M., Pukinskis, E., & Ryan, W. (2005). Meeteetse: social well-being through place attachment. In *Extended Abstracts of Conference on Human Factors in Computing Systems*. 2065-2069. Portland, OR.
-

---

### **Peer Reviewed Posters**

1. Ryan, W., & Siegel, M. (2010). Learning-in-use of interactive artifacts: A longitudinal study analyzing the learning experience. In *Proceedings of 7th International Conference on Design & Emotion 2010*. Chicago, IL.
2. Ryan, W., Stolterman, E., Siegel, M., Jung, H., Stroman, T., Hazlewood, W. R. (2009). Device ecology mapper: A tool for studying users' ecosystems of interactive artifacts. In *Extended Abstracts of Conference on Human Factors in Computing Systems*, 4327-4332, Boston, MA.
3. Bardzell, S., Bardzell, J., & Ryan, W. (2006). Double Dribble: Mixed reality game design for sports informatics. In *5th International Conference on Entertainment Computing – ICEC*. London, England.

### **Peer-reviewed, Non-archived Publications**

#### *Panel*

1. Castronova, E., Cummings, J., Emigh, W., Fatten, M., Mishler, N., & Ryan, W. (2007). Understanding Synthetic Economies Through Their Construction. In *2007 Annual Meeting of the Academy of Management Panel on Beyond Play: Replicating, Mirroring, and Constituting 'Reality' Through Online Games*. Philadelphia, PA.

#### *Presentation*

2. Ryan, W., & Bardzell, J. (2007). Using Player Breakdown as a Lens for Understanding the Development of Literacy in Video Games. In *Games, Learning, and Society*. Madison, WI.

#### *Poster*

3. Ryan, W., & Stewart, J. (2011). Using Many Eyes to Interact with and Explore Data. Presented at 2011 Edward C. Moore Symposium on Excellence in Teaching. Indianapolis, IN.

#### *Workshop*

4. Ryan, W. (2006). Barriers to entry: Designing player access in video games. In *DIS 2006 Workshop On the Process of Game Design*. State College, PA.

### **Non-Publication Workshops**

1. Ryan, W. (2010). In *Design & Emotion Workshop On the Unknown Variable X: Evaluating Experiences*. Chicago. IL.

### **Invited Talks**

1. Ryan, W. (2009). Explorations in sense-making: Interaction Design and technology through a phenomenological perspective. Presented to IIT Institute of Design. Chicago, IL.
-

- 
2. Ryan, W. (2006). Moving Beyond the Game: The Use of Modding in Machinima. In *Perform.Media*. Bloomington, IN.

### Unpublished Reports

1. Ryan, W., Siegel, M. A., Stolterman, E. (2011). Learning-in-use: An experiential perspective on learning how to use interactive artifacts.
2. Stolterman, E., Ryan, W., Jung, H., Thompson, T., Siegel, M., & Wiltse, H. (2010). Ecologies of interactive artifacts: A challenge for HCI research and practice.
3. Hazlewood, W. R., Ryan, W., & Makice, K. (2009). Twitterspace: Evaluation of a set of community ambient displays.
4. Bardzell, J., Ryan, W., & Bardzell, S. (2006). Radical game play: The confrontation between machinima platforms and filmmakers.
5. Ryan, W. (2006). Deconstructing the coaching metaphor of fantasy football interfaces.
6. Bardzell, J., Bardzell, S., & Ryan, W. (2006). Virtual events in metaverse worlds: The intersection of interfaces, leisure, commerce, and persistent groups.
7. Bardzell, J., Bardzell, S., & Ryan, W. (2006). The video game tutorial: Narrative, HCI, and virtual learning.

---

### Grant Activity

<i>Teaching</i>	<b>2011</b>
-----------------	-------------

Stewart, J., & Ryan, W. (2011). Making Learning Fun: Enhancing Introduction to Informatics Using Instructive Media. *IUPUI CTL Curricular Enhancement Committee*. Internal. \$5000. (Proposal in Progress).

---

### Awards & Competitions

Nominated for AI of the Year	<b>2010</b>
------------------------------	-------------

Undergraduate Student Mentorship Position \$1000 Award to work with undergraduate to produce original research	<b>2009-2010</b>
---	------------------

“Interact” Artwork ( <a href="http://www.williamryanonline.net/interact/dart.swf">http://www.williamryanonline.net/interact/dart.swf</a> )	<b>2006</b>
---	-------------

Exhibitions:  
DART Exhibit  
33 Collective Gallery Exhibit

Interface Programmer for “Guardians of Kelthas” game project ( <a href="http://www.kelthas.com">http://www.kelthas.com</a> )	<b>2005-2006</b>
---	------------------

Competitions:

IDEASFEST 2005: Best Game, People's Choice

Awards

FuturePlay 2005: Competition Finalist

Slamdance 2006: Gamemaker Competition Finalist

SIGCHI 2005 Student Competition Finalist

**2005**

"Meeteetse: social well-being through place attachment"

Undergraduate Dean's List at the University of Notre Dame

**2002-2004**

---

Service

*School Service*

- Undergraduate Program Committee Member 2010-2011
- Informatics Undergraduate Curriculum Committee Member 2010-2011

*Reviewer of papers and posters*

- Interacting with Computers Journal 2011
- IEEE International Conference on Serious Games and Applications for Health 2011
- IASDR 2011
- CHI 2008-2011
- CSCW 2011
- Design and Emotion 2010
- ACE 2008
- Sandbox Symposium 2007
- Virtual Reality Journal special issue on "VR in the e-Society," 2006

*Student Volunteer*

- PDC 2008
- Informatics Goes Global: Methods at a Crossing, 2006

*Community*

- Member of the North Catholic High School Technology Committee for assisting school to develop technology plan 2005, 2008-2009

---

Teaching Experience

*Indiana University Purdue University Indianapolis, Indianapolis, IN*

**Visiting Lecturer****2010-2011**

Course:

I270 "Introduction to Human-Computer Interaction: Principles and Practice" (FA 10 &amp; SP 11, Sophomore)

I101 "Introduction to Informatics" (FA 10 &amp; SP 11, Freshman) co-taught with Jennifer Stewart

Various activities:

writing syllabus and creating course structure from scratch;  
generating labs, lectures, discussions, and activities; writing and  
administrating midterm examinations, projects, quizzes, and  
assignments.

---

*Indiana University Purdue University Indianapolis,  
Indianapolis, IN*

**(no title)****2011**

Course:

I581 "Health Information Standards and Terms" (SP 11, Graduate,  
for Dr. J. T. Finnell)

Various activities:

Managed grading of weekly assignments, assisted with in class  
administrative needs, assisted Distance Education coordinator in  
certain aspects of online section of this class.

---

*Indiana University, Bloomington, IN*

**Assistant Instructor****2004-2010**

Courses:

I300 "Human-Computer Interaction" (SP 09 & SP 10, Advanced  
Undergrad, for Dr. Martin A. Siegel)I101 "Introduction to Informatics" (FA 07-SP 10, Freshman, for  
Matthew Hottell and Nina Onesti)I604 "Human-Computer Interaction Theory" (FA 09, Graduate, for  
Dr. Erik Stolterman)I310 "Multimedia Arts & Technology" (FA 05, Advanced  
Undergrad, for Dr. Jeffrey Bardzell)"Music Information Representation, Search, and Retrieval" (FA 04,  
Graduate, for Dr. Christopher Raphael)

Various activities:

lecturing on course topics including design theory, new media  
theory, and interaction design; generating and collecting minute  
papers at the end of class; recording class attendance; assist  
students during in-class assignments; organizing and grading labs;  
grading assignments and tests; brainstorm activities.

---

---

**Instructor****2008-2009**

Course:

I300 “Human-Computer Interaction” (SU 08 & 09, Advanced Undergrad)

Various activities:

writing syllabus and creating course structure from scratch with the input of other HCI/d faculty; organizing course both for students who would continue on to graduate school and also those who will go onto other disciplines; generating lectures, discussions, and design problem; generating media examples including Project Runway episode as well as several TED conference talks; organizing design activities such as: experience prototyping for users with cognitive impairments, installation that teaches kids at a children’s museum about design, expanding the brand of Facebook creating a Facebook for families, and design problem designed to help students detach from their first design by disallowing it.

---

**Mentorship****2009-2011**

Students:

David Poindexter (2010-2011) IUPUI

Ohn’Jay Walker (2009, 2010) IUB

Joseph Miller (2009, 2010) IUB

Jaclyn Duket (2010) IUB

Michael Osborne (2010) IUB

Various activities:

guiding students on a problem of interest; organizing activities to help direct them in deciding their approach to the problem; managed student activities and hours; created project management documents such as timelines, lists of deliverables, and lists of goals. In Spring 2010, I was paired with another Ph.D. student William R. Hazlewood to work with a larger research team.

---

*University of Notre Dame, Notre Dame, IN***Teaching Assistant****2002-2003**

Courses:

“Combinatorial & Sequential Logic Design” (SP 03, Freshman, for Dr. Patrick J. Flynn)

“Data Structures” (FA 02, Sophomore, for Dr. Jesus A. Izaguirre)

“Introduction to Informatics” (SP 02, Freshman, for Dr. Matthias Scheutz)

---

Various activities:  
grading group project and individual assignments; updated course website; wrote online quizzes; presented a tutorial on a technology of interest.

---

## Research Experience

---

*Indiana University, Bloomington, IN*

### **Research Rotation**

**2006-2009**

Courses: (includes how long I continued to work with group on that project after initial semester.

for Dr. Erik Stolterman (FA 07-SP 09, Ecology of Artifacts Research Group)

helping conceptualize, describe, and write research proposal around ecology of interactive artifacts; leading research study to create tool to aid people for collecting ecology data

for Dr. Edward Castronova (FA 06-SP 07, Arden Research Group)

contributed to design of monetary and fiscal tools for controlling money flow in Arden; designed survey for measuring effects of well-being before and after play in online world

for Dr. Sasha Barab (FA 06-FA 07, Quest Atlantis Research Group)

contributed to conceptual development of transactive play spaces for students to engage with outside of class time; developed some graphical elements for Quest Atlantis.

---

### **Research Assistant**

**2005-2007**

for Dr. Shaowen Bardzell (FA 06-SU 07, Entertainment Computing Research Group)

Projects:

“Visual analysis of culture in Second Life”

coding profile images according to predefined visual categories;  
constructed simple statistical measures for analysis

“Classroom space design in Second Life”

prototyping 3D Indoor soccer field for sports information technology; pulling data through SportsML format into Second Life

“Instrument for measuring affective response of media”

designing task flow for application and its implementation in Flash



for Dr. Jeffrey Bardzell (SU 05-SP 06, Entertainment Computing Research Group)

Projects:

“The Virtual Event Aesthetic”

attending virtual events in MMOGs; performing ethnography to describe event, people, and location

“Narratology, Video Game Tutorials, and Their Implications for Design”

helping develop coding schema for understanding narratological aspects of video game tutorials; playing through tutorials, breaking them down according to coding schema

“Amateur Video Game Study”

helping develop a coding schema for developing amateur Flash video games on <http://www.newgrounds.com>;  
playing through games, breaking them down according to coding schema

---

#### Related Experience

---

*Information in Place, Inc., Bloomington, IN*

**Designer (Contract)**

**2006-2007**

Various Activities:

researching topic area of hazardous materials;  
developing design document for a serious game for Hazmat training; creating documents to aid in the technical construction of serious game; helping to coordinate mission based training with design of game; helping to situate the game into a course for Hazmat training

---

*Sony Corporation of America, Mt. Pleasant, PA*

**Production Systems Intern**

**2003**

Various Activities:

developing two web applications used for “Kaizen” improvements in production methods and for tracking the training of line employees for the Mt. Pleasant location; overseeing all aspects of those projects from Requirements Gathering, Database Design, Application Design, Testing, Documentation, and Training of Users

---

---

*Fiserv, Inc., Pittsburgh, PA*

**Intern**

**2001**

Various Activities:

Assisting development of Standard Bank & Trust,  
Northside Bank Websites; troubleshooting website  
for cross-browser compatibility

---

*Dome Designs, Notre Dame, IN*

**Manager & Developer**

**2000-2004**

Various Activities:

Developing websites for Asian Globalization  
Conference, Fusion Literary Website, Notre Dame  
Review, and Student Government; managing school  
year of 2004 with net profits for the first time in its  
history

---

*North Catholic High School, Pittsburgh, PA*

**Website Developer (Volunteer)**

**2004**

Various Activities:

Redeveloping website based on user needs and  
desires; developing main site, as well as news,  
calendar, and contact list applications from scratch

---

## SKILLS

**Methodologies:** Phenomenology, Ethnography, Qualitative  
Methods, Content Analysis, Survey Methods, Experimental  
Methods, Data Visualization, Semiotics, Usability Evaluation,  
Agent-based Modeling

**Programming Languages:** C/C++, C#, VB.NET, Java & J#, Lisp,  
Scheme, MIPS Assembly, Eiffel

**Web-Related:** PHP, Haxe, XML, Actionscript, LSL, ASP,  
ASP.NET, DHTML, Javascript, VBScript, CSS

**Databases:** MySQL, Access Database, SQL Server, Oracle, Lotus  
Notes

**Programs:** Flash, Photoshop, Fireworks, Dreamweaver, Acrobat,

---

Visual Studio .NET

**3D Modeling:** Second Life, Maya

**Platforms:** .NET Framework, OpenGL, DirectX, MFC, Windows  
Socket API, NetLogo

---

## Course Work

---

### Human-Computer Interaction Design

HCI Seminar I & II Grad (2006-07) Prototype Design and Techniques Grad (2005)	HCI Design I & II Grad (2004-05) Usability & Evaluation Methods Grad (2004)
---	---

### Social Science

Cognitive Approach to Media Grad (2008) Experimental Methods in Cognitive Science Grad (2007) Pedagogy & Professionalism in Informatics Grad (2007) Social Informatics Seminar Grad (2007) Virtual Ethnography (Ind. Study) Grad (2006)	Intro to Research & Statistics Grad (2006) Games & Gossip (Modeling Emergent Behavior) Grad (2005) Ethnography Seminar (8 weeks) Grad (2004) Intro to Informatics (8 weeks) Grad (2004) Growth of the American Nation (2000)
---	--

### Humanities

Philosophy of Cognitive & Information Science Grad (2007) New Media Art Seminar Grad (2005) New Media & Interactivity Grad (2005) Beginning Irish I & II (2003-04) Aesthetics & Philosophy of Art (2002)	Sacramental Theology (2002) Intro to Philosophy (2001) Foundations of Theology (2001) Renaissance Literature Seminar (2001) Beginning French I & II (2000)
--	--

### Computer Science & Engineering

Visual Analytics Grad (2008) Behavior Based Robotics (2004) Biometrics (2004) Advanced Databases (2004) Artificial Intelligence (2003) Computer Graphics (2003) Database Concepts (2003) Algorithms (2003)	Theory of Computing (2003) Compilers (2003) Computer Architecture I & II (2002-03) Data Structures (2002) Operating Systems (2002) Logic Design (2002) Functional Programming (2001) Programming with C++ (2001)
---	---

### Mathematics

Intro to Numerical Methods (2003) Differential Equations (2003) Probability Theory (2002)	Linear Algebra (2002) Discrete Mathematics (2001) Calculus I, II, & III (2000-01)
---	---

---

**Science & Engineering**

Complex Systems Grad (2006) Intro to Electrical Networks (2001) General Physics I & II (2001)	Intro to Engineering I & II (2000-01) General Chemistry I & II (2000-2001)
---	---

---

**Self-Directed Course Work**

<b>Technical/Design</b>	<b>Theory</b>
Video Game Foundations Direct X Graphics Programming 3D Modeling in Maya Intro to Network Programming	Great Ideas of Philosophy (Great Courses Series) Great Ideas of Psychology (Great Courses Series) Great Minds of the Western Intellectual Tradition (Great Courses Series) Theories of Human Development (Great Courses Series) Understanding the Brain (Great Courses Series) How to Listen to and Understand Great Music (Great Courses Series)