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Effects Of Interdisciplinary Designers Reflecting-In-Action During Design

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**EFFECTS OF INTERDISCIPLINARY DESIGNERS REFLECTING-IN-ACTION
DURING DESIGN**

by

JOHN BAAKI

DISSERTATION

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

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2014

MAJOR: INSTRUCTIONAL TECHNOLOGY

Approved by:

Advisor

Date

DEDICATION

My dissertation is dedicated to Julie Baaki. My wife, my friend, my voice of reason, my cheerleader, my formatting queen, and my biggest supporter. This journey has not always been the smoothest, but you never left my side. For that, I am ever grateful. I would never have made it without you. That I know. I thank you. I love you.

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TABLE OF CONTENTS

Dedication.....	ii
Acknowledgements.....	iii
List of Tables.....	vi
Chapter 1: Introduction.....	1
Chapter 2: Literature Review.....	9
Chapter 3: Methodology.....	31
Chapter 4: Results.....	49
Chapter 5: Discussion and Conclusion.....	99
Appendix A: Letter of Consent.....	124
Appendix B: Participant Informed Consent Form.....	126
Appendix C: Interview Protocol.....	130
Appendix D: Participant Reflection Journal Weekly Themes.....	131
Appendix E: Design Project Milestone Events.....	132
Appendix F: Interview Meeting Agenda.....	133
Appendix G: Participant GD1 Reflection Journals and Interview Meetings.....	134
Appendix H: Participant GD2 Reflection Journals and Interview Meetings.....	167
Appendix I: Participant E3 Reflection Journals and Interview Meetings.....	183
Appendix J: Participant ID4 Reflection Journals and Interview Meetings.....	203
Appendix K: Participant GD5 Reflection Journals and Interview Meetings.....	216
Appendix L: Participant ID6 Reflection Journals and Interview Meetings.....	222
Appendix M: Participant ID7 Reflection Journals and Interview Meetings.....	239
Appendix N: Participant A8 Reflection Journals and Interview Meetings.....	257

Appendix O: Working Categories and Themes.....	267
References.....	320
Abstract.....	326
Autobiographical Statement.....	328

LIST OF TABLES

Table 3.1: Summary of Participants.....	32
Table 3.2: Summary of Participant Milestones and Kickoff and Interview Meetings.....	33
Table 3.3: Summary of Participants' Weekly Reflection Journals.....	36
Table 3.4: Summary of Participant Artifacts for Each Milestone.....	37
Table 3.5: Description of Each Design Project's Non-routine, Non-procedural Makeup...	40
Table 3.6: Methodology Data Sources and Methods.....	43
Table 4.1: Summary of Themes Under Each Research Question.....	50
Table 5.1: Themes Involving Information are Highlighted.....	105

CHAPTER 1

INTRODUCTION

Background

Working in a design thinking space (Cross, 2011), designers from different design fields, in the midst of the natural consequences of an ill-structured problem (Guindon, 1990); interact with a situation by having a reflective conversation with it. Designers are reflective participants in the design process (Scott, Shurville, Maclean, & Chong, 2007; Valkenburg & Dorst, 1998). The process is more reflection than evaluation. Evaluating does not capture what is actually happening when designers reflect on the strengths and weaknesses of the design while it is in progress. During the design process, it is not evaluating the content of a design solution, but rather it is evaluating actions in, what Schön (1983) describes as a reflective conversation with the situation (Valkenburg & Dorst, 1998).

To understand designers interacting with design episodes and having a reflective conversation with the situation, design thinking literature points to reflective practice ideas (Adams, Turns, & Atman, 2003; Atman, Cardella, Turns, & Adams, 2005; Atman, Chimka, Bursic, & Nachtmann, 1999; Ball, Onarheim, & Christensen, 2010; Cross, 2011; Goel & Grafman, 2000; Guindon, 1990; Scott et al., 2007; Valkenburg & Dorst, 1998), especially to reflection-in-action (Schön, 1983; Schön, 1988). The idea of reflection-in-action is that unique and uncertain situations are understood through attempts to change it, and changed through the attempt to understand it (Schön, 1983; Schön, 1988).

Reflection-in-action is best appreciated within the context of design activity. There are four aspects to a design activity: (a) designer, (b) process, (c) content, and (d) context. Of the

four aspects, designer is the most straightforward. Process is looking at design in two different ways: (a) rational problem solving and (b) reflective practice (Brown, 2009; Cross, 2011; Dorst, 2008; Schön, 1983). Content involves complex and uncertain design problems and the emerging solutions (Dorst, 2008; Schön, 1983). In general, a designer works in a particular context. A specific aspect of context is how designers draw from a repertoire of precedents inside and outside of the project (Brown, 2009; Cross, 2011; Dorst, 2008; Guindon, 1990; Schön, 1983).

Across design fields such as architecture, engineering, graphic design, and instructional design, evaluative processes while a design is developing and not yet complete take on a number of forms (Derelöv, 2008; Green, 2000; Kerr, 1983; Kirschner, Carr, & van Merriënboer, 2002; Klimczak & Wedman, 1997; Paton, 2011; Pieters & Bergman, 1995; Rowland, 1992; Spitas, 2011; Thurston & Nogel, 2001; Valkenburg & Dorst, 1998; Williams, South, Yancher, Wilson, & Allen; 2011). In engineering, the term evaluating can be confusing as it generally refers to evaluating a design idea or principle, not the evaluation of actions (Valkenburg and Dorst, 1998). In architecture, engineering, graphic design, and instructional design, designers evaluate a developing design project in a range of ways: formally or informally; following traditional scientific roles or intuition. The evaluative process may differ, but designers make judgments of the strengths and weaknesses of the design product or process while operating in a space of complexity and uncertainty. In many aspects, designers' evaluative processes present elements of reflection-in-action.

Statement of the Opportunity

Within the design thinking research, there are two ways to look at the design process: (a) rational problem solving and (b) reflective practice (Brown, 2009; Cross, 2011; Dorst, 2008; Schön, 1983). In reflective practice, the design thinking literature replaces evaluation with

reflection. Designers have a reflective conversation with a design situation where the situation talks back and the designer responds to the back talk (Cross, 2011; Schön, 1983).

If designers are conducting evaluative processes in a number of forms, then where can designers turn to better understand reflection in the midst of complex, uncertain, and ill-structured problems? Designers can turn to reflective practice. Schön (1983) proclaims, "...all occupations engaged in converting actual to preferred situations are concerned with design," (p. 77). Designers (architects, engineers, and software systems) have been dealing with open and complex problems for years, and designing disciplines have developed practice to do this (Dorst, 2011).

Purpose of Study

Facing uncertain, complex, and continually changing conditions, designers are looking to understand evaluation in action (Williams et al., 2011). The purpose of my interdisciplinary research was to study reflection-in-action regarding three aspects of design activity. This study addressed:

1. What is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete?
2. What effect does reflection-in-action have on keeping a design project moving forward toward implementation?
3. What impact does the design's problem-solution relationship have on the reflection-in-action process?
4. What impact does a designer drawing from a repertoire of precedents inside and outside the project have on the reflection-in-action process?

Theoretical Perspective

My research was guided by critical theory. For critical theorists like Max Horkheimer, Herbert Marcuse, Theodor Adorno, and, more recently, Jurgen Habermas, reflection or critical reflection is emancipatory (Reynolds, 1998). Different from the problem solving process, critical reflection examines both historically and contextually social and political notions, which are taken for granted (Reynolds, 1998). Critical theory questions traditional views of objectivity, questions what others maintain as obvious, and uncovers the obscure (Gibson, 1986; Reynolds, 1998).

Although the term used may differ, authors categorize three different levels of reflectivity within critical theory: (1) technical, (2) practical or consensual, and (3) critical (Hindmarsh, 1993; Reynolds, 1998). Practical or consensual reflectivity aligns well with Schön's reflection-in-action where a professional continuously interprets, takes action, reflects, and makes adjustments (Hindmarsh, 1993; Reynolds, 1998). Elements of reflection-in-action that are well represented within practical reflectivity include discovering values and assumptions within episodes, taking stock in the effects of context, and committing to an ultimate purpose and goal.

Epistemology

Constructionism, where people construct meaning while they engage with the world they are interpreting (Crotty, 1998), informs practical reflectivity as a level within critical theory. Design worlds are consistent with a constructionist view (Schön, 1988). Drawing from constructionists like Papert and Goodman, designers not only construct objects in their design worlds, but also construct objects through closely interrelated courses of action like cognition, perception, and notation (Schön, 1988).

Reflection-in-action is based on a constructionist perspective of human thought processes and perceptions (Valkenburg & Dorst, 1998). As designers, focused on ill-structured problems, interact with design episodes by having a reflective conversation with the situation, they construct a worldview based on their experiences (Valkenburg & Dorst, 1998).

Definition of Terms

The following is the definition of the terms used within the context of the study.

Design Thinking. As a space rather than a process, design thinking is abductive (Cross, 2011; Dorst, 2011). In abductive reasoning, a designer shifts and transfers thoughts between the required purpose or function and the appropriate forms for an object to satisfy the purpose (Cross, 2011). In essence, designers move back and forth between an analysis space (required purpose or function) and synthesis space (appropriate forms for an object to satisfy the purpose). The core challenge of design thinking is, in parallel, creating a complex object, service, or system and making it work (Dorst, 2011). Designers come up with the “what” and “how” and then test both in conjunction (Dorst, 2011, p. 5). Within a design space, designers need to tolerate uncertainty, interact with external representations (sketches, models, and other materials), rely on intuition, and take stock and reflect on the what and how (Cross, 2011).

Reflection-in-action. As a specific type of reflective practice (how professionals think in practice), reflection-in-action emphasizes that unique and uncertain situations are understood through attempts to change them, and changed through the attempts to understand the situations (Schön, 1983). Reflection-in-action helps designers deal well with situations of uncertainty, instability, uniqueness, and conflicted values, which are inherent in ill-structured problems (Schön, 1983).

Ill-structured problems. In the complex world of design, designers may face deviations in the design process that are not due to bad design or performance breakdown, but rather due to a natural consequence of ill-structuredness of problems in early design stages (Guindon, 1990). Ill-structured problems make design problems particularly difficult because ill-structured problems are: (a) incomplete and have ambiguous goals; (b) have no predetermined solution path; (c) have inconsistent relationships among concepts, rules and principles; (d) and require an integration of multiple knowledge domains (Guindon, 1990; Jonassen, 1997; van Merriënboer & Kirschner, 2007).

Interaction with episodes. The design process is episodic which has strong implications for reflection from three perspectives: (a) designers move to and fro between exploration and reflection, (b) designers take stock of a design situation, and (c) designers participate in an episode that takes a life of its own (Cross, 2011). Designers treat each design episode as unique (Schön, 1988). Designers build up knowledge in a cumulative way, develop knowledge in one design episode, and carry it over to the next episode. Episodes can be complex and have lives of their own, which may foil a project and create new meaning (Schön, 1983).

Reflective conversation. When a design episode talks back and a designer responds to the back talk, a designer has a reflective conversation with the design episode (Schön, 1983). In an episode's back talk, a designer can discover a whole new idea, which may result in a shift in a designer's stance. A designer shifts from what if to do something with the episode, and a designer's stance changes from exploration to commitment (Schön, 1983).

Frame experiment. When designers are stuck in a problematic situation, a designer constructs a new frame where a designer selects boundaries, selects particular things and relations for attention, and imposes on the situation a coherence that guides moves (Schön, 1983;

Schön, 1988). In the midst of the design process, a designer poses a problem frame, explores its implications in design moves, and then investigates solution possibilities. In frame experiments, reflection is not separated from doing, and implementation is built into inquiry so the design project may keep moving forward (Cross, 2011).

Problem-solution relationship. In a design space, the complex design problem and emerging design solution develop together (Cross, 2011; Dorst, 2008). Design problems are amongst the most complex as they are embedded in context and change over time (Jonassen, 2000). Designers revise problem understanding in the context of developing or revising emerging solution elements (Adams et al., 2003). Designers engage in a conversation across problem and solution spaces where solution spaces are not yet fully developed (Schön, 1983).

Repertoire of precedents. Designers draw on a repertoire of precedents, inside and outside design projects, which help give coherence, practicability, and alternative form to a concept (Cross, 2011; Dorst, 2008; Schön, 1983). A repertoire of precedents may be as ambiguous as remembered images and recollection of other objects and as specific as interests in aircraft design, space rockets, science fiction, comic strips, and organic evolution (Cross, 2011). A repertoire of precedents can evolve through shared experiences with a cross-disciplinary team of designers, engineers, and marketers (Brown, 2009). As a source for inspiration and idea generation, a repertoire of precedents may be gathered from every possible source (Brown, 2009; Dorst, 2011).

Assumptions of Study

As noted earlier in the Schön quote, occupations that are engaged in moving real situations to desired situations are concerned with design. It could then be argued that many occupations have some type of design aspect. In order to efficiently and effectively address my

four research questions, I limited the category of designers that are studied. My goal was to take an interdisciplinary approach to the study. Therefore, I studied designers across professional fields of architecture, engineering, instructional design, and graphic design. Except for graphic design, more research has been conducted in these fields than in professional design fields such as computer software and interaction, furniture, and textile design (Cross, 2011).

Summary

Within design thinking research, reflective practice is a way to look at the design process. In reflective practice, the design thinking literature replaces evaluation with reflection. Designers have a reflective conversation with a design situation, interact with design episodes, construct frame experiments, wrestle with the problem-solution relationship, and draw on a repertoire of precedents.

As designers are conducting evaluative processes in a number of forms, where can designers turn to better understand reflection in the midst of complex, uncertain, and ill-structured problems? Designers can turn to reflective practice. Architects, engineers, and software systems designers have dealt with open and complex problems for years. In these fields, designers have developed practice to do this (Dorst, 2011).

Guided by four research questions, my study carefully looked at designers who facing uncertain, complex, and continuing changing conditions interact with design episodes by having a reflective conversation with the situation. As designers look to informal reflection methods, designers can turn to reflective practice to better understand reflection in the midst of ill-structured problems. My study examined how reflection helps designers improve a design project and keep it moving forward toward implementation.

CHAPTER 2

LITERATURE REVIEW

The purpose of my literature review was to provide a coherent examination of the literature between current trends in the evaluation processes across design fields and reflection-in-action within a design thinking space. My literature review critically examines research methods used, investigates the practical and scholarly significance of the research, and synthesizes the literature into four closely interrelated themes (Boote & Beile, 2005). These four themes are: (a) reflection aligned with evaluation processes across design fields, (b) the natural consequences of ill-structured problems, (c) interaction with episodes, and (d) reflective conversation with a situation.

Reflection Aligned with Evaluation Processes Across Design Fields

Across design fields including engineering, architecture, instructional design, and human-centered design such as graphic design, designers' ability to rapidly evaluate design during the design process is important to increase design productivity (Brown, 2009; Christensen & Hansen, 2010; Conley, 2004; Green, 2000; Williams et al., 2011; Yeomans, Bouchlaghem, & El-Hamalawi, 2006). Evaluation is part of what designers do. Evaluation is different than other design tasks because evaluation runs through all design tasks (Derelöv, 2008; Williams et al., 2011). However, when asked to describe inquiry methods, designers talk about experience, trial and error, intuition, and just working through (Schön, 1983). In the design fields pertinent to this study; architecture, engineering, graphic design, and instructional design; designers evaluate a developing design project in a range of ways: formally or informally; following traditional scientific roles or intuition.

Phrases like “thinking on your feet,” “keeping your wits about you,” and “learning by doing” suggest not only that designers think by doing but can think about doing something while doing it (Schön, 1983, p. 54). Reflection-in-action emphasizes that unique and uncertain situations are understood through attempts to change them, and changed through the attempts to understand the situation (Schön, 1983). For a designer, reflection may vary in five distinct ways: (a) designers reflect and make judgments on what they tacitly know about their practice, (b) designers reflect on strategies and theories that are embedded in behavior patterns, (c) designers reflect on the feelings for a situation that leads to taking on an action, (d) designers reflect on how a problem has been framed, and (e) designers reflect on the role that they have taken (Schön, 1983). The evaluation processes used across design fields align with these variations in reflection.

Designers reflect and make judgments on what they tacitly know about their practice. Traditionally, in instructional design, formative evaluation is making judgments of the strengths and weaknesses of a design while the design is developing. Tessmer (1993) suggests that many instructional designers approach formative evaluation as craft or art rather than science since decisions are based more on judgments than scientific evidence. This leads to evaluation activities that are more informal than formal (Williams et al., 2011). In the engineering design field, Green (2000) discovered that how humans judge is significant to evaluation activities. In his study of mechanical engineers, he noted that his subjects performed evaluation activities by judging between and selecting from a range of design options (Green, 2000).

Across the four design fields included in my study, reflecting and making judgments on what designers tacitly know means that designers rely on experience and intuition. Engineers

across industries strengthen engineering evaluation by verifying the reliability and feasibility of solutions at an early stage of development (Derelöv, 2008). Using observations and case studies, Derelöv (2008) concluded that engineers accomplish solution verification in intuitive and subjective ways that rely on designers' collective knowledge and experience instead of methods or tools. Similarly, surveying 10 subjects working within industrial design engineering and using an abstraction-to-detail design paradigm, Spitas (2011) concluded engineers' exploration of a design space is driven by designer intuition and experience. Designers influence design activity based on their perceptions, facts, opinions, and judgments (Spitas, 2011). Keeping with this reliance on experience and intuition, in instructional design, designers use personal experiences, frames of reference, templates, design principles, and context knowledge to consider alternative solutions during the design process (Kirschner et al., 2002; Pieters & Bergman, 1995; Rowland, 1992).

Even though human-centered design like graphic design has a small body of literature due to its limited tradition, human-centered designers follow a structure where they reflect on and compare experiences that result in new insights about designers' practice (Conley, 2004). What designers tacitly know helps designers understand what is happening and what could happen. Responding to an experimental integrated project-based studio, architectural students postulated and reflected on different design proposals that helped designers understand the design situation and the design potential (Shannon & Radford, 2010).

Even though in the literature, virtually no studies directly address evaluation by instructional designers, there is evidence that evaluation is not always formal (Williams et al., 2011). Although evaluative activities were important, instructional designers, interviewed in a study, did not refer to the word evaluation as the evaluation activities became tacit activities that

were performed everyday by designers without much thought (Williams et al., 2011). Across the four design fields in my study, when involved in evaluation activities, researchers sustain a view that designers reflect and make judgments on what they tacitly know about their practice.

Designers reflect on strategies and theories that are embedded in behavior patterns.

Across design fields, designers come to solutions by way of analysis and synthesis and convergent and divergent relationships (Asasoglu, Gur & Erol, 2010; Brown, 2009; Conley, 2004; Cross, 2011). In an architectural design studio setting, architectural students' behavior was not merely reciting back architectural theories and noting the strengths of building materials (Asasoglu et al., 2010). Expected to fully understand an architectural problem and figure out a solution, student behavior consisted of observing, reflecting, discovering, and speculating (Asasoglu et al., 2010). Embedded in these behaviors are strategies of analysis and synthesis and convergent and divergent relationships.

Prototyping is a design strategy that creates reflective opportunities (Brown, 2009; Christensen & Hansen, 2010; Cross, 2011; Pieters & Bergman, 1995). Aligned with theoretical techniques, architectural prototyping (process of designing, building, and evaluating architectural prototypes) is a feasible additional design and evaluation technique (Christensen & Hansen, 2010). In an ethnographical and focus group study, architects used architectural prototyping as a strategy to explore architectural designs, learn about new architectural tactics, and assess the limitations and benefits of emerging technologies (Christensen & Hansen, 2010). Pieters and Bergman (1995) suggested that instructional designers who focus on prototyping as a solution path found themselves evolving from a general systems approach to an intuitive and reflective approach.

In early phases of engineering design, engineers' behavior can be much different than end phases of design. In early phases, designers' knowledge is low and freedom of how to solve tasks is high while in the end phases, engineering designers' knowledge of the problem is high and design freedom becomes limited (Derelöv, 2008). This can affect the final results and success of the design process (Derelöv, 2008; Green, 2000).

What is a possible implication of designers reflecting on strategies and theories that are embedded in behavior patterns? Rowland (1992) notes that expert instructional designers have a tendency to think of solutions first and then test the solutions. Although instructional designers may ask what are other possibilities or what would happen if this were tried instead of that, expert instructional designers also will use principles to come to solutions (Rowland, 1992). The implication is that designers maintain a balance of rationality and intuition and a balance of technical proficiency and creativity (Rowland, 1992).

Designers reflect on the feelings for a situation that leads to taking on an action. A designer's world is complex, complicated, and always changing (Brown, 2009; Cross, 2011; Guindon, 1990; Schön, 1983; Williams et al., 2011). Across the four identified design fields; in practice; designers evaluate, elaborate on the most promising concepts, refine concepts, and then take action to produce a final detailed design (Aasaoglu et al., 2010; Brown, 2009; Conley, 2004; Kirschner et al., 2002; Spitas, 2010; Williams et al., 2011; Yeomans et al., 2006). Reflecting on a situation and then taking action can result in reduced project time, reduced costs, greater design coordination, and better quality designs (Williams et al., 2011; Yeoman et al., 2006). When unique design situations are full of uncertainty, evaluating does not capture what is actually happening when designers reflect on the strengths and weaknesses of a design and then take action. In instructional design, for example, formal evaluation processes focus on static versions

of products and programs whereas quality design calls for continual reflection on how a designer responds to changing complexities in a dynamic situation (Williams et al., 2011).

Designers reflect on how a problem has been framed. Across the architectural, engineering, instructional design, and graphic design fields, problem framing is prevalent even though the actual framing process may differ from one field to another. In architecture, experimenting with solutions as soon as a design problem is conceived is called “primary generator” and is used to narrow down the range of possible solutions to a problem (Asasoglu et al., 2010, p. 3539). Directly referencing Schön’s reflective practice principles, architects frame problem situations and then reflect on them (Asasoglu et al., 2010).

In practice, instructional designers’ designs are highly solution driven and context sensitive which means solutions are gained by means of an iterative and integrated process (Kirchner et al., 2002). Expert instructional designers frame a problem by decreasing the problem space with potential solutions which then allows designers to explore problems and interpret them as ill-defined, and design intuitively and reflectively by looking at alternative solutions in tandem (Kirchner et al., 2002; Pieters & Bergman, 1995). Observing four expert designers in a talk aloud approach, expert designers thought of solutions immediately but did not commit until the problem was framed by a deeper understanding of the problem through an in-depth analysis of the problem and its context (Rowland, 1992). In the study, all four designers came up with different solutions that were correlated not only to personal designer experiences but also to the designers’ frames of reference (Rowland, 1992).

Both engineering and graphic design have their own challenging approaches to framing. In engineering design, it can be challenging to determine when framing actually occurs. Engineering design problems are complex at many levels and therefore it is difficult to isolate

analysis, exploration of a design space, evaluation activities, and the designation of ideas for further processing (Spitas, 2011). In human-centered design, which includes graphic design, designers approach framing by structuring a problem's criteria then exploring alternatives, which lead to a more considered design (Conley, 2004).

Designers reflect on the role that they have taken. In practice, even though designers sketch and diagram design problems, designers struggle in describing how decisions are made about alternative courses of action (Cross, 2011; Kerr, 1983). In the fields of art and architecture, designers need encouragement to be reflective in their actions, more aware of how they are proceeding, and more aware of their own thoughts, reactions, and decisions (Kerr, 1983). In a case study that looked at architectural students' response to an experimental integrated project-based studio, students participated in planned iteration where students looked at the same technologies and issues several times (Shannon & Radford, 2010). The purpose of this planned iteration was to promote student learning and understanding. The authors concluded that design is a cyclical process of reflective practice that includes: (a) architectural design students understanding a design situation and potential by reflecting on design proposals and (b) students self-reflecting on the reflective design process (Shannon & Radford, 2010).

Across design fields including engineering, architecture, instructional design, and graphic design, designers participate in evaluation activities in a range of ways: formally or informally; following traditional scientific roles or intuition. The literature supports Schön's reflection-in-action where unique and uncertain situations are understood through attempts to change them, and changed through the attempts to understand the situation (Schön, 1983). The literature across the four design fields pertinent to my study also supports designers' evaluation processes aligned with Schön's five distinct variations in reflection.

The Natural Consequences of Ill-structured Problems

In a study that used verbal protocols of three professionals designing a software system, Guindon (1990) concluded that the deviations from the designers' top-down approach were not due to bad design habits or a breakdown in performance, but rather, "a natural consequence of the ill-structuredness of problems in the early stage of design," (p. 307). Designers face the fact that design is an ill-structured problem (Cross, 2011; Guindon, 1990; Maher, Poon & Boulanger, 1996). When reviewing the design literature regarding the natural consequences of ill-structured problems, it is practical to: (a) understand how authors define ill-structured problems, (b) recognize that design is an ill-structured problem, and (c) grasp what happens in the ill-structured world of design.

Definition of ill-structured problems. In the instructional design field, Jonassen is a definitive voice regarding ill-structured problems. His definition includes the makeup of ill-structured problems and how designers deal with ill-structured problems. The composition of ill-structured problems includes problems that: (a) are situated and emerge from context, (b) do not specify well one or more aspects of the problem situation, (c) present unclear and ill-defined descriptions, (d) do not provide information to solve the problem, (e) are emergent dilemmas found in everyday practice, and (f) may have multiple solutions, multiple solution paths, or no solution at all (Jonassen, 1997). Since complex problems are dynamic, when the complexity of the problem increases, the difficulty to process components of the problem increases (Jonassen, 2000). Therefore, designers must deal with: (a) an uncertainty about which concepts, rules, and principles are necessary for the solution; (b) defining the problem and then figuring out information and skills needed to solve it; (c) no straightforward means to determine action; (d)

their own personal opinion and belief about the problem; and (e) making judgments about the problem and then defending those judgments (Jonassen, 1997).

In a study of three professionals designing software systems, Guindon (1990) concluded that ill-structured problems make design difficult. Similar to Jonassen, Guindon defines ill-structured problems as ambiguous and incomplete specifications of goals that have no predetermined solution path. She adds to the over-arching definition by contending that ill-structured problems require the integration of multiple knowledge domains (Guindon, 1990).

Design is an ill-structured problem. Design problems are ill-defined and designers are “ill-behaved” problem solvers (Cross, 2011, p. 147) as ill-structured problem solving is a design process and not a systematic search for problem solutions (Jonassen, 1997; Maher et al., 1996). In practice, design problems are uncertain and among the most complex and ill-structured problems that designers will encounter (Cross, 2011; Jonassen, 2000; Schön, 1983). As an ill-defined problem, design involves reflection, surprise, and unpredictability (Adams et al., 2003).

Since there are often no predetermined solution paths, design problems have ill-defined goals, ill-defined evaluation criteria, and emerging surprises (Ball et al., 2010; Guindon, 1990; Schön, 1983). Reflection-in-action centers on the experience of surprises (Schön, 1983). Designers reflect on the “misfit” that they unintentionally create (Schön, 1983, p.56). In other words, designers take stock in the unintended but inevitable surprises that will occur during design. As a result of no predetermined solution paths, designers must allow for goals and plans to change during design (Guindon, 1990). Ill-defined design tasks mean that designers need to uncover a deeper understanding of requirements during the solution development process (Ball et al., 2010).

As an ill-structured problem, design has constraints and without constraints design does not happen (Brown, 2009). Guindon (1990) contends that the science of design should be concerned with how the design process best suits the constraints of the environment. In a study concerning software development designers using breadth-first versus depth-first design approaches, constraints were used to limit or inform the design space and used as an evaluative process to determine the best solution from a range of options (Ball et al., 2010). A solution's features and constraints become new criteria that results in redefining the problem space, which then generates a new design space (Maher et al., 1996).

What happens in the ill-structured world of design. A designer's ability to design is dependent on coping with uncertainty (Cross, 2011). Ambiguity is essential to a design process as it allows designers to move around independently (Cross, 2011). However, complexity results in consequences that were not intended and in situations of complexity and uncertainty, a designer can have a problem finding the problem (Schön, 1983). In the ill-structured world of design, designers structure the problem, advance partial solutions, trigger reflection-in-action, and develop the problem-solution relationship.

From verbal protocols of three professionals designing a software system, problems had poorly designed goals and there were no well-defined criteria to evaluate solutions therefore designers used problem structuring (Guindon, 1990). In problem structuring, designers discovered missing information like problem goals and evaluation criteria and then used the information to define a problem space (Guindon, 1990). In the study, a natural consequence of ill-structured problems was that designers wanted to immediately fix software system bugs (Guindon, 1990). This meant that designers received the unplanned information (system bugs), refocused their attention, and ultimately modified their design process.

Designers receive design additions and infer new design requirements throughout design solution development (Guindon, 1990). Designers immediately develop partial solutions that correspond to inferred requirements and constraints and then evaluate the consistency, correctness, and completeness of a solution (Guindon, 1990). Guindon (1990) contends that it is advantageous for a designer to evaluate immediately how an inferred constraint impacts a solution. The idea of opportunistic solution development is to have designers take advantage of solution opportunities even if following those deviate from a structured design process (Guindon, 1990). In an ideal world, designers would document design process and artifacts as if they are produced in a systematic fashion (Guindon, 1990).

In a different study looking at software development designers, design in an ill-structured world was a top-down and structured process, which took on opportunistic processing that helped circumvent design stalemates or knowledge deficits, and capitalized on opportunities that emerged (Ball et al., 2010). The authors concluded that expert designers begin with a top-down breadth approach and then switch to a depth approach when problem complexity and design uncertainty surface (Ball et al., 2010). The depth approach allows designers to gain confidence in exploration of partial solutions.

In a study of engineering students designing a playground, surprises in an ill-structured design world triggered reflection-in-action because surprises interrupted the flow of a practiced design process (Adams et al., 2003). When the design process became unpredictable, designers engaged in a reflective conversation with the materials, which meant designers developed a deep understanding of the design problem (Adams et al., 2003). In complex and ambiguous situations, the authors conclude that problem-setting is as important as problem-solving which means

designers list design factors, gather information, and spend time in problem-setting activities (Adams et al., 2003).

The idea of “couple iterations” is the interaction of figuring out the problem and determining a solution (Adams et al., 2003, p. 287). In a problem-solution relationship, designers gather information on a just-in-time basis, qualify and quantify problem requirements by describing how solutions function, and evaluate solutions while clarifying evaluation commitments from multiple perspectives (Adams et al., 2003). The challenge of complex and ambiguous design tasks is designers cannot gather information unless designers understand the problem but designers cannot understand the problem without gathering information (Adam et al., 2003; Schön, 1983). Schön’s reflection-in-action fills this gap where new requirements emerge during development of solutions which cannot be determined or followed up on until portions of the system are designed (Adams et al., 2003).

The problem-solution relationship exists because ill-structured problems rarely have a single, best solution (Jonassen, 1997). Ill-structured problems have several solutions where each solution offers advantages and disadvantages to different designers in different situations in a context for application (Jonassen, 1997). Designers structure the problem by figuring out what the artifact will be that satisfies the ill-defined requirement (Jonassen, 2000). Since criteria for the acceptable solution are not obvious, designers construct personalized systems to evaluate their products (Jonassen, 2000).

Designers confront the reality that design is an ill-structured problem. In practice, design problems are some of the most complex and ill-structured problems that designers will encounter. In the design process, designers must handle uncertainty and ambiguity. In dealing with the natural consequences of ill-structured problems, the literature presents designers

structuring problems, advancing partial solutions, triggering reflection-in-action, and developing the problem-solution relationship.

Interaction with Episodes

As designers interact with external representations, design becomes episodic in that designers move to and fro between design areas, take stock in the situation, and become immersed in a situation that has a life of its own (Cross, 2011). Through action with an episode, designers shape the episode and make themselves a part of it (Schön, 1983). Depending on the specific situation and the amount of designer reflection, episodes of reflection-in-action may vary in speed and length (Schön, 1983) with some episodes as short as one or two minutes (Goel & Grafman, 2000). Schön (1983) calls the zone of time where action can still make a difference to a situation the “action-present” (p. 62). This can be minutes, hours, days, weeks, or months (Schön, 1983). Interacting with episodes means that designers reframe the problem, develop a problem-solution relationship, and manage the fact that a situation can have a life of its own.

From a high level perspective, when designers ask why, designers see an opportunity to reframe a problem, redefine constraints, and be open to more innovative solutions (Brown, 2009; Dorst, 2012). At the moment of reframing, a designer is not sure that the solution has been discovered nor is the designer sure that the new problem can be solved, but the reframing lends itself to a method of inquiry where the designer gains confidence (Schön, 1983). What is happening is designers participate in problem structuring.

Comparing two architects designing a lab space, Goel and Grafman (2000) concluded the interaction with episodes occur in a design phase level. First there is problem structuring where the necessary prerequisite for solutions to ill-structured problems generate information missing from the problem scenario so the problem space can be identified (Goel & Grafman, 2000). This

then leads to the problem solving phases where designers: (a) generate preliminary designs and explore ideas; (b) refine, elaborate, and develop ideas; and (c) detail specific final form of ideas (Goel, 1995; Goel & Grafman, 2000). Preliminary design is creative, ill-structured problem solving where alternatives are generated and explored (Goel & Grafman, 2000). Designers reframe or transform laterally (Goel & Grafman, 2000) as they move from one idea to a slightly different idea rather than embarking on a more detailed version of the same idea. The refining and detailing phases (vertical transformations) are more constrained and structured where commitments are made to a solution and spread through the problem space (Goel & Grafman, 2000). Lateral and vertical transformations (generating designs to refining ideas to detailing final forms) have a role in moving a design project forward toward implementation.

Using protocols to study nine experienced industrial engineers, Dorst and Cross (2001) concluded that defining and framing a design problem is key to creativity. Using different strategies to approach a design assignment, designers define and frame based on the design environment, resources, capabilities, and perception of the task (Dorst & Cross, 2001). Designers in essence look at the problem and solution together, rather than problem first and solution second.

Creative design is developing and refining together both formulation of problem and ideas for a solution (Dorst, 2012; Dorst & Cross, 2001). “Co-evolution” is the constant iteration of analysis, synthesis, and evaluation between problem and solution spaces (Dorst & Cross, 2001, p. 434). As designers develop partial solutions, designers realize the opportunities for solution development (Cross, 2011; Goel & Grafman, 2001). In studies, expert design behavior shows that designers move quickly to early solution conjectures and these conjectures are used to explore and define the problems-solution relationship (Cross, 2011).

In the problem-solution relationship, designers evaluate moves to frame in three ways: (a) how desirable the consequences are, (b) by conformity or violation of the implications set up by earlier moves, and (c) the appreciation of new problems or potentials that have been created (Schön, 1983). In the “creative event” or interaction with a design episode, a chunk of information is formed from the very beginning that then helps vision a core solution idea (Dorst & Cross, 2001, p. 434). A solution idea changes a designer’s view of the problem so the designer redefines the problem and checks if this fits the earlier solution. If it doesn’t, then the designer modifies the initial solution (Dorst & Cross, 2001).

When designers move through the cycle of visioning the solution idea, redefining the problem, and then modifying an initial solution, designers may realize that the situation has a life of its own. Designers work through the problem-solution relationship and recognize that they contribute to the relationship. But, designers also see that the situation has a life of its own, which may foil their project and provide new meaning (Schön, 1983). Surprises can be the source of situations having their own life. Surprises have a pivotal role in moving designers to framing and reframing (Dorst & Cross, 2001). Surprises in problem-solution relationships drive the creativity in design (Dorst & Cross, 2001). For example, in the midst of designing a customer service representative training, an instructional designer may have to deal with changing information. This change or surprise in new information may move the instructional designer to a new design frame where she reflects again on the problem-solution relationship.

Through action with an episode, designers form the episode and make themselves part of the situation. In problem framing, designers identify a problem-solution relationship (Dorst & Cross, 2001). When designers interact with episodes, designers reframe the problem, develop a problem-solution relationship, and manage the fact that a situation can have a life of its own.

Studies of expert and outstanding designers show that an ability to frame is crucial to high-level performance in creative design (Dorst & Cross, 2001).

Reflective Conversation with a Situation

Having a reflective conversation with a situation is at the crux of reflection-in-action. Even though designers usually are unable to express what they know and have difficulty putting their special skills and understanding into words, skilled designers do treat each design situation as an “unique universe of one,” (Schön, 1998, p. 181). When designers have a reflective conversation with a situation, they are reflecting-in-action.

The process of a reflective conversation with a situation has moving parts. A frame experiment occurs when a designer is in a problematic situation, which he cannot make into a manageable problem (Schön, 1983). Reflecting on what is in front of the designer and drawing on prior understanding (repertoire of precedents), designers carry out a frame experiment that helps to create a new understanding of the situation and change the situation (Schön, 1983). This then helps keep a design project moving forward toward implementation. A reflective conversation with a situation means a designer participates in a frame experiment, relies on and builds up a repertoire of precedents, and continues to keep the design project moving forward.

Participate in a frame experiment. The experiment of reframing is a reflective conversation with a situation, and successful reframing of a problematic situation results in a continuation of the reflective conversation (Schön, 1983). A designer’s materials are always talking back to him, which results in reflecting on unanticipated problems and opportunities (Cross, 2011; Schön, 1983). When the situation talks back, the designer interacts with materials and made artifacts, appreciates the context under which the artifacts are made, reframes the situation, and then again appreciates the situation (Schön, 1983; Schön, 1988). In the reflective

conversation, the designer's action to reframe the problem results in new discoveries which result in new reflection-in-action where the unique and uncertain situation is understood through attempts to change it and changed through attempts to understand it (Schön, 1983).

When complexity results in consequences that were not intended, a designer forms new understandings and then makes new moves where the situation talks back and a designer responds to the back-talk (Schön, 1983). Designers respond to the back-talk by drawing partial solutions which aid a designer's thinking process (Cross, 2011). Designers choose features of a problem that they will deal with and note areas of a solution space where they will explore (frame) (Cross, 2011). Designers reflect on their course of action (i.e. the progress of the solution), monitor, and modify the solution (Cross, 2011). However, as a designer shapes the situation to his frame, he stays open to the back-talk which may mean more uncertainty and confusion (Schön, 1983).

Studying two engineering teams designing robots that dump balls, Valkenberg and Dorst (1998) confirmed a direct approach to participating in a frame experiment. In the reflective conversation with the situation, designers named relevant factors in the situation, framed the problem in a specific way, made the move toward a solution, and then reflected on the moves (Valkenberg & Dorst, 1998). Framing is very important as it is the space where moving toward a solution and reflecting on the moves happens. Two interesting outcomes from this study were that the team that won the robot competition spent more time reflecting (21% versus 8%) than the team that lost, and the team that won reflected mostly at the beginning whereas the losing team did all its reflection at the end (Valkenberg & Dorst, 1998).

Designers formulate a design problem that needs to be solved. To do this, designers frame a problematic design situation, set boundaries, select things that need a designers'

attention, and make the situation coherent so there is guidance in moves (Schön, 1988). Reflective conversations are conducted with situations by designers participating in frame experiments and then evaluating the experiments by: (a) whether the designer can solve the problem that has been set, (b) whether the designer values what he gets when he solves it, (c) whether they achieve in the frame a coherence of artifact or idea, (d) whether there is a congruence with fundamental values and theories, and (e) whether inquiry can keep moving (Schön, 1983).

Rely on and build up a repertoire of precedents. Designers draw on a repertoire of precedents, which help give coherence, practicability, and alternative form to a concept (Cross, 2011; Dorst, 2008; Schön, 1983). Inside or outside of the project, a repertoire of precedents may be as ambiguous as remembered images and recollection of other objects and as specific as interests in aircraft design, space rockets, science fiction, comic strips, and organic evolution (Cross, 2011). As a source for inspiration and idea generation, a repertoire of precedents may be gathered from every possible source (Brown, 2009; Dorst, 2011).

The relationship between a repertoire of precedents and a frame experiment is one of *give* and *take*. Designers *give* to reframing by drawing on a repertoire of precedents (Schön, 1983). The *take* occurs when each new experience in reflection-in-action adds to the repertoire. Reflection-in-action does not create general principles but contributes to a designer's repertoire of precedents (Schön, 1983).

A repertoire of precedents includes a designer's whole experience outside and inside the project that is accessible to a designer for understanding an action (Schön, 1983). Drawing from outside of the project, a repertoire of precedents is seeing an unfamiliar situation as a familiar one (Schön, 1983). From inside a project, a repertoire of precedents can come from the

understanding of the situation in front of the designer. Through on-the-spot experiments from drawing, sketching, and modeling, designers construct new problems and models not from theories, but from the repertoire of familiar examples and themes (Schön, 1983). When a designer draws from a repertoire of precedents inside a project, a designer can note the effects of earlier moves on later moves (Schön, 1983).

An example of a designer drawing from a repertoire of precedents outside of the project at hand is Philippe Starck and his design of the Juicy Salif lemon squeezer. Ideas can come from anywhere as Starck was about to eat a piece of baby squid skewered on his fork and then realized that it was the solution to his lemon squeezer problem (Lloyd & Snelders, 2003). Drawing from science fiction, cartoons, and evolutionary theory, Starck participated in frame experiments where he sketched, interpreted, and applied the form of a baby squid to the problem of squeezing lemons. Reflecting-in-action, Starck ultimately solved the main problem by then delving into the Juicy Salif's sub-problems – exact dimensions, what material to use, and how to efficiently get juice out of the lemon (Lloyd & Snelders, 2003).

In a case study of two designers, Roy (1993) presents designers using a repertoire of precedents to transfer ideas and technology from one application to another application. Designer James Dyson developed an idea for a ball-shaped wheel on a wheelbarrow from his engineering experience where he learned about balloon tires (Roy, 1993). In designing a folding bicycle, designer Mark Sanders turned to other folding devices because what existed among folding bicycles did not satisfy him (Roy, 1993). Needing objects that had joints and that easily disconnected, Sanders looked to baby buggies and seat belt clasps (Roy, 1993). In both case studies, each designer immersed himself in frame experiments and looked to his repertoire of precedents for ideas that could offer a solution. What happened was “visual brainstorming”

where the two designers cultivated as many ideas as possible to clarify vague ideas and move forward with the designs (Roy, 1993, p. 436). The designers early on, went to their repertoire of precedents, which was knowledge of a process, certain materials, or admired and favorite products and processes (Roy, 1993).

Keep the design project moving forward. When the moving parts (frame experimenting and a repertoire of precedents) of a reflective conversation with a situation are in action, *what if* turns to decisions that are binding, *what can* and *what might* happen turn to *what should* or *must* happen, exploration becomes commitment, and possibility moves to imperatives (Schön, 1983). A design project is not open-ended and ongoing. It has a beginning, middle, and end. Designers may not like deadlines but deadlines can be a designer's most creative constraint (Brown, 2009). Frame experimenting means seeking opportunities to move forward, pushing along what seems as promising ways, evaluating what has been achieved, and building toward implementation (Cross, 2011; Schön, 1983).

When designers have a reflective conversation with a situation, they are reflecting-in-action. Designers participate in frame experiments so they may gain a clearer understanding of the situation and then change the situation. Participating in frame experimenting allows designers to draw upon and build up a repertoire of precedents and continues to keep the design project moving forward toward implementation.

Summary

The purpose of my literature review was to provide a clear and coherent examination of the literature related to a connection between current trends in the evaluation processes of designers across design fields and reflection-in-action within a design thinking space. My literature review synthesized the literature into four closely interrelated themes. Supporting my

four research questions, these four themes are: (a) reflection aligned with evaluation processes across design fields, (b) the natural consequences of ill-structured problems, (c) designer interaction with episodes, and (d) reflective conversation with a situation.

In regards to the first theme, evaluation processes used across design fields align with five variations in reflection. For a designer, reflection may vary in five distinct ways: (a) designers reflect and make judgments on what they tacitly know about their practice, (b) designers reflect on strategies and theories that are embedded in behavior patterns, (c) designers reflect on the feelings for a situation that leads to taking on an action, (d) designers reflect on how a problem has been framed, and (e) designers reflect on the role that they have taken (Schön, 1983).

For the natural consequences of ill-structured problems, Jonassen (1997) and Guindon (1990) define ill-structured problems as ambiguous and incomplete specifications of goals that have no predetermined solution path. Guindon (1990) adds to the over-arching definition by contending that ill-structured problems require the integration of multiple knowledge domains. In practice, design problems are uncertain and among the most complex and ill-structured problems that designers will encounter (Cross, 2011; Jonassen, 2000; Schön, 1983). As a result, a designer's ability to design is dependent on coping with uncertainty (Cross, 2011). In the ill-structured world of design, designers structure the problem, advance partial solutions, trigger reflection-in-action, and develop the problem-solution relationship.

Regarding the third theme, designers interact with episodes. As designers interact with external representations, design becomes episodic in that designers move to and fro between design areas, take stock in the situation, and become immersed in a situation that has a life of its own (Cross, 2011; Schön, 1983). Interacting with episodes means that designers reframe the

problem, develop a problem-solution relationship, and manage the fact that a situation can have a life of its own.

Finally, the core of reflection-in-action is designers having a reflective conversation with a situation. As presented in the literature, the process of a reflective conversation with a situation has moving parts. When a designer is in a problematic situation, which he cannot make into a manageable problem, a frame experience occurs (Schön, 1983). Reflecting on what is in front of the designer and drawing on prior understanding (repertoire of precedents), designers carry out a frame experiment that helps to create a new understanding of the situation and change the situation (Schön, 1983). This then helps keep a design project moving forward toward implementation. In sum, when designers have a reflective conversation, they participate in a frame experiment, rely on and build up a repertoire of precedents, and continue to keep the design project moving forward.

CHAPTER 3

METHODOLOGY

This phenomenological research design used an interactive methodology and included multiple data collection methods. The purpose of the qualitative design was to study reflection-in-action regarding three aspects of design activity. The methodology section is organized as follows: participants, setting, data collection methods, data collection procedures and timeline, trustworthiness, and data analysis procedures.

Participants

I obtained a purposeful convenience sample from four design fields: (a) architecture, (b) engineering, (c) graphic design, and (d) instructional design. In all, 28 designers were invited to participate and eight designers met the criteria, agreed to participate and, subsequently, received permission from their organizations to participate. Three participants were graphic designers, three participants were instructional designers, one participant was an engineer, and one participant was an architect.

I used criterion sampling to obtain my participants. Participants: (a) were involved in a short-term project that lasted between 37 to 87 days (average length was 64 days), (b) had at least 5 years of design experience (c), were individually responsible for at least 75% of the design work, and (d) were engaged in a non-routine, non-procedural design project. Engaged in a non-routine, non-procedural design projects was selected as a criterion because the idea of reflection-in-action is that unique and uncertain situations are understood through attempts to change it, and changed through the attempt to understand it (Schön, 1983; Schön, 1988). A non-routine design was one that lacked a well-formed approach to a solution (Snider, Culley, & Dekoninck, 2013). Maintaining the process of most phenomenological studies, I engaged eight

participants for a relatively long period of time (37-87 days) (Rudestam & Newton, 2007). Table 3.1 provides a summary of the eight participants.

Table 3.1

Summary of Participants

Participant	Design Field	Design Experience	Length of Design Project	Design Project Description
GD1	Graphic	6 years	73 days	Design a website for a Midwest health system.
GD2	Graphic	6 years	71 days	Design a website homepage for a Midwest private college.
E3	Engineering	5 years	65 days	Development of engine calibration to 80% calibration for a major international car manufacturer.
ID4	Instructional	20 years	39 days	Facilitate car dealership DiSC Behavior training for an international car manufacturer.
GD5	Graphic	14 years	37 days	Design a website homepage and interior page for a Midwest law firm.
ID6	Instructional	5 years	87 days	Design anti-bullying training using social media for a Midwest girls' organization winter camp.
ID7	Instructional	8 years	81 days	Design phase 2 of National Health Care Reform training for customer service representatives at a large Midwest healthcare provider.
A8	Architecture	18 years	58 days	Design roof system development for six individual U.S. Post Offices across the United States.

Setting

My study took place at each participant's workplace (where each participant does his/her design work). Except for participant ID4 who is self-employed and spends the majority of his time traveling to car dealerships across the country, all participants worked in an office setting. Each participant and I agreed on a project timeline, which included three to four key design

project milestone events. After each milestone date, I met with each participant at his or her place of work (where they did their design work) or via the phone. Including an initial study kickoff meeting, I met with each participant two to four times. Due to her pregnancy, I only met with participant GD5 twice.

Table 3.2

Summary of Participant Milestones and Kickoff and Interview Meetings

Participant	Milestone Events [projected (completed)]	Kickoff and Interview Meetings
GD1	<ol style="list-style-type: none"> 1. Complete homepage design [10/2/13 (10/17/13)] 2. Complete interior page design [10/25/13 (10/25/13)] 3. Receive approval on designs [11/15/13 (11/15/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (9/19/13) 2. Interview meeting (10/4/13) 3. Interview meeting (10/25/13) 4. Interview meeting (11/18/13)
GD2	<ol style="list-style-type: none"> 1. Design wireframe [11/4/13 (11/4/13)] 2. Start homepage design [11/15/13 (12/8/13)] 3. Complete homepage design [12/2/13 (12/15/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (9/23/13) 2. Interview meeting (11/7/13) 3. Interview meeting (11/25/13) 4. Interview meeting (12/18/13)
E3	<ol style="list-style-type: none"> 1. Trip prep [10/11/13 (10/11/13)] 2. Knock diagnostics [10/30/13 (11/6/13)] 3. 80% calibration [11/11/13 (11/18/13)] 4. 80% calibration to next application [12/1/13 (12/1/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (9/28/13) 2. Interview meeting (10/16/13) 3. Interview meeting (11/2/13) 4. Interview meeting (11/20/13)
ID4	<ol style="list-style-type: none"> 1. Dealership training [11/26/13 (11/26/13)] 2. Dealership training [12/20/13 (12/18/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (9/29/13) 2. Interview meeting (12/6/13) 3. Interview meeting (12/20/13)
GD5	<ol style="list-style-type: none"> 1. First homepage design [11/4/13 (11/4/13)] 2. Second homepage and first interior design [11/15/13 (11/18/13)] 3. Final homepage and interior design [11/25/13 (11/26/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (9/29/13) 2. Interview meeting (11/26/13)

ID6	<ol style="list-style-type: none"> 1. Complete content outline [11/15/13 (11/15/13)] 2. Complete design document [11/25/13 (11/25/13)] 3. Complete instructional design [12/16/13 (12/16/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (10/4/13) 2. Interview meeting (11/15/13) 3. Interview meeting (12/6/13) 4. Interview meeting (12/20/13)
ID7	<ol style="list-style-type: none"> 1. Complete nine individual business units [11/1/13 (11/5/13)] 2. Push all training to trainers [11/15/13 (11/15/13)] 3. Clean up phase 2 instruction [12/6/13 (12/31/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (10/7/13) 2. Interview meeting (11/4/13) 3. Interview meeting (11/19/13) 4. Interview meeting (12/10/13)
A8	<ol style="list-style-type: none"> 1. Complete talking to all sites [11/30/13 (12/13/13)] 2. Half way point to complete developments [12/15/13 (12/15/13)] 3. Complete design developments [12/31/13 (12/31/13)] 	<ol style="list-style-type: none"> 1. Kickoff meeting (11/9/13) 2. Interview meeting (12/6/13) 3. Interview meeting (12/18/13) 4. Interview meeting (1/7/14)

In order to gain access to these workplaces, I informed organization gatekeepers and participants about my study so gatekeepers and participants could assess the costs and the risks that participation will pose, both for themselves and the organization (Lincoln & Guba, 1985). I provided a letter (see Appendix A for an example) that addressed why the organization and participant should sponsor the study, what is in it for the organization and participant, in what ways will I use the information collected, and how I will protect the organization and participants from any harm (Lincoln & Guba, 1985).

Even though relevant gatekeepers provided consent, I received full informed consent from each participant (Lincoln & Guba, 1985). I formally obtained fully informed consent through a Behavioral Research Informed Consent sheet (see Appendix B) that appropriately described the study's purpose. Since this was an emergent study, I could not predict all the risks involved when I had my first meeting with each participant. Therefore, each participant had the option to withdraw from the study at any time (Lincoln & Guba, 1985).

Prior to the initial meeting with each participant, I prepared the informed consent sheet (appendix B) which included the following information: (a) my name, address, phone number and email address; (b) a brief and sufficient description of the study; (c) my intent to preserve confidentiality and anonymity; (d) my process to prevent raw or developed data from being linked to a specific participant; (e) my means to limit access to coded data; (f) a participant's right to withdraw from the study at anytime; (g) the steps a participant takes to withdraw; and (h) notice that participation is entirely voluntary (Lincoln & Guba, 1985). I provided each participant an informed consent sheet, which they signed and kept a copy for reference.

Data Collection Methods

I collected data using multiple techniques that directly use human sources (interviews, and participant reflective journals) and nonhuman sources (design project timeline and project artifact analysis). In addition, I maintained a field journal.

Interviews. I conducted unstructured interviews (see Appendix C for an interview protocol). After determining if the participant had met the milestone and after having the participant describe and/or show what had been designed to that point, I asked participants to clarify and elaborate on specific weekly journal reflections. The unstructured interview allowed participants to define and structure the situation, and to introduce what he/she considered as relevant instead of relying on my view of relevance (Lincoln & Guba, 1985).

Participant reflective journal. Participants kept an electronic reflective journal. To keep the journal focused, participants reflected on a variety of reflection-in-action themes that I provided (see Appendix D for weekly themes). Each week, seven of the eight participants completed a reflective journal using a Google Drive document that we created together. Each

participant had his/her own Google Drive document. Participant ID7 was not comfortable using a Google Drive document. Instead, she used a word document to complete her weekly journal.

Although the number of weeks (see Table 3.3) a participant reflected varied due to the length of each participant's design project, each participant reflected on every journal reflection theme presented in Appendix D. Weekly reflection journal themes were adjusted based on the number of weeks a participant would reflect. For example, due to her pregnancy, participant GD5 reflected three different times (November 2, 9, and 23). She reflected on all nine reflection themes.

Table 3.3

Summary of Participants' Weekly Reflection Journals

Participant	Number of weeks participant reflected
GD1	9 weeks
GD2	9 weeks
E3	10 weeks
ID4	8 weeks
GD5	3 weeks
ID6	10 weeks
ID7	10 weeks
A8	8 weeks

Design project timeline. My second research question was: What effect does reflection-in-action have on keeping a design project moving forward toward implementation? In the initial kickoff meeting, the participant and I agreed on key design project milestone events (Table 3.2). We included these milestone events on a timeline document (see Appendix E). During milestone event meetings, a participant and I referenced the design project timeline.

Project artifact analysis. As an external representation, design is constructed in public so other people can read and comment on it (Cross, 2011). Designers draw, sketch, and model as

a means of thinking out loud and as a process of criticism and discovery. During milestone event meetings, a participant and I discussed external representations at that point. Participants GD1, GD2, GD5, ID6, and ID7 shared actual artifacts during our interview meeting. Due to the confidentiality of the artifacts, E3 and A8 were not able to share artifacts. As discussed in chapters 4 and 5, Participant ID4 was unique as his design artifact was each day of the two-day training session. Table 3.4 presents milestone artifacts.

Table 3.4

Summary of Participant Artifacts for Each Milestone

Participant	Artifact for each milestone
GD1	Milestone – Complete homepage design 1. Homepage design that maintained current layout of current website 2. Homepage design that broke from the layout of current website
	Milestone – Complete interior page design 1. Homepage design 2. Careers page design 3. News page design 4. Locations page design
	Milestone – Receive approval on designs Completed main page design for each main section
GD2	Milestone – Design wireframe Homepage wireframe
	Milestone – Start homepage design Homepage design
	Milestone – Complete homepage design Completed homepage design
E3	Milestone – Trip prep Test vehicle set up with calibrations
	Milestone – Knock diagnostics Test vehicle set up with calibrations
	Milestone – 80% calibration Excel file with a list of values and variables
	Milestone – 80% calibration to next application Software containing the calibration

ID4	Milestone – Dealership training #1 1. Day 1 of the two-day training session 2. Day 2 of the two-day training session
	Milestone – Dealership training #2 1. Day 1 of the two-day training session 2. Day 2 of the two-day training session
GD5	Milestone – First homepage design Homepage design
	Milestone – Second homepage and first interior design 1. Second homepage design 2. Interior page design
	Milestone – Final homepage and interior design 1. Final homepage design 2. Final interior page design
ID6	Milestone – Complete content outline 1. 10-page content outline 2. One page problem statement document 3. Learning outcomes document
	Milestone – Complete design document First draft of a design document
	Milestone – Complete instructional design 1. Design document 2. Specification of training team members’ responsibilities 3. One page handout for Twitter training 4. Welcome package to initiate collaboration 5. Communication schedule
ID7	Milestone – Complete nine individual business units 1. Trainer guide 2. Trainee guide
	Milestone – Push all training to trainers 1. Trainer guide with 9 units for individual business unit 2. Trainee guide with 9 units for individual business unit 3. Trainer guide with 4 units for large business unit 4. Trainee guide with 4 units for large business unit
	Milestone – Clean up phase 2 instruction Excel file that is a log with updates to trainer and trainee guides
A8	Milestone – Complete talking to all sites Field information (drawings, sketch details, and photos)
	Milestone – Halfway point to complete developments Field study for each site that includes (drawings, sketch details, photo, and test results)
	Milestone – Complete design developments Design development report for each site

Field journal. I kept a handwritten field journal that included three forms of notes: (a) log of day-to-day activities, (b) personal log, and (c) methodological log (Lincoln & Guba, 1985). The log of day-to-day activities was a calendar of appointments that included weekly journal due dates for each participant and upcoming scheduled interview meetings. The personal log was my diary which included my reflections about what I was thinking in relations to what was happening with the study, a record of questions that I needed to follow up and discuss with participants and a place to vent my frustrations (Lincoln & Guba, 1985). I kept a methodological log to record notes from each interview meeting and methodological decisions that I made as the study design process emerged.

Data Collection Procedures and Timelines

With each participant, I began my research relationship with a kickoff meeting. During this meeting, the agenda consisted of: (a) validating that the participant met the selection criteria, (b) reviewing the informed consent sheet, (c) understanding the design project, (d) establishing milestone events, and (e) describing the participant's responsibility for a reflective journal.

Participants were involved in a short-term project that lasted an average of 64 days, had at least five years of design experience, were individually responsible for at least 75% of the design work, and were engaged in a non-routine, non-procedural design project. All participants met all four criteria. For each participant, Table 3.5 provides a brief description to the non-routine, non-procedural makeup of the design project.

Table 3.5

Description of Each Design Project's Non-routine, Non-procedural Makeup

Participant	Description of the design project's non-routine, non-procedural makeup
GD1	To begin, no constraints were provided. Create a great user experience with only what GD1 already knew.
GD2	First time GD2 designed a college website.
E3	First design project as a calibration specialist.
ID4	Due to varying DiSC results, each day of training at each dealership was different.
GD5	Design a law firm website with a younger feel.
ID6	First design project as the lead instructional designer. First time using Twitter.
ID7	Designing CSR training for National Healthcare Reform training which was ever-evolving.
A8	Never visited a site in person. Relied on information from on-site consultants.

Once I validated that the participant satisfied the selection criteria, I verbally reviewed the informed consent sheet with the participant and answered any questions he/she had. I had the participant sign the informed consent and provided them with a copy. I reiterated that, at any time, the participant could contact me via phone or email.

I asked the participant to describe the design project. I inquired what will be the final design product or process and what external representations (drawings, sketches, models, and/or process flows) were expected along the way. At this point, the participant and I established the design project milestone events (Table 3.2). We tentatively scheduled the interview meetings within three to five days following each milestone event.

To conclude the kickoff meeting, I described a participant's responsibility to complete a weekly journal using a Google Drive document. At the end of each week, a participant journalized on a reflection-in-action theme assigned by me. Except for participant ID7 who used a Word document, all participants completed reflection journals using the Google Drive document. Each participant had his/her own Google Drive document and the participant and I

were the only two sharing the Google Drive document. The reflection journal was cumulative. Each week, a participant added a journal entry.

Within 48 hours of the kickoff meeting, I followed up with an email to the participant. I provided the participant a Design Project Milestone Events sheet (see Appendix E for example) which included: (a) milestone events and (b) weekly reflective journal due dates.

Following the Design Project Milestone Events sheet, approximately one week prior to a milestone event, I contacted a participant via email to schedule a 30-60 minute interview meeting. Although I conducted unstructured interviews, I used an interview protocol.

The agenda of an interview meeting (see Appendix F) had three interrelated items: (a) a review of the design project timeline (why or why not the participant accomplished the milestone events), (b) a collaborative analysis of external representations (what had been designed thus far), and (c) an unstructured interview. The interview protocol helped pace the interview and ensured that the meeting was productive (Lincoln & Guba, 1985). As the interview meeting moved along, questions became more specific especially as we reviewed the design project timeline, analyzed external representations of the design project, and had participants clarify and elaborate on journal reflections. When concluding the interview, I summarized what I believed the participant had said. This method had advantages as it allowed the participant to react to the validity of my conclusions, provided an opportunity for the participant to add new information to my conclusions, and put the participant on record (Lincoln & Guba, 1985). I ended the interview with a thank you, a request to contact me via phone or email if the participant thought of anything more to add, and a look ahead to the next milestone event date.

To maintain trust with each participant, I took only handwritten notes during interviews. Immediately following each interview meeting, I reviewed my notes in order to jog my memory

of what was said. This allowed me to elaborate on the interview notes and compare the interview notes to the timeline and external representation. My comments and notes were marked as JB to distinguish them from a participant's responses. Closely looking at the interrelation of the three items from an interview meeting, I began triangulation of the data. Once I reconstructed the interview meeting via a Word document, I sent a summary document to the participant to review and check that the interview meeting summary was accurate.

After approval by the Wayne State University Investigational Review Board, I began my data collection on September 19, 2013 and concluded my data collection on January 7, 2014. Since I studied eight different designers working on relatively short design projects (average of 64 days), I attempted to stagger the design projects. Participant A8 was the last participant to begin a design project, starting on November 9, 2013.

Trustworthiness

I established trustworthiness using four criteria: (a) credibility, (b) transferability, (c) dependability, and (d) confirmability (Lincoln & Guba, 1985). I used the same means to verify dependability and confirmability. The following explains how I met the trustworthiness criterion for each.

Credibility. I used four techniques to confirm credibility: (a) prolonged engagement, (b) persistent observation, (c) triangulation, and (d) member checks. Each is discussed below.

Prolonged engagement. Since design projects lasted, on average, 64 days and since I interviewed each participant two to four times, I had the opportunity to understand each participant's design project context. In addition, my period of prolonged engagement allowed me to build trust with each participant. This resulted in demonstrating that I would not use a participant's confidence against him or her, that I would honor a participant's anonymity, that I

ensured no hidden agendas surfaced, and that I included a participant in the inquiry process (Lincoln & Guba, 1985).

Persistent observation. Over the life of the design project, I met with each participant two to four times and received a weekly journal from seven of the eight participants over an eight to 10 week span. Participant GD5 reflected on all journal themes three times over 23 day span. I constantly engaged in emerging salient factors and then had the opportunity to explore these factors in more detail.

Triangulation. I analyzed my four research questions from multiple perspectives using sources triangulation and methodological triangulation (See Table 3.6). I met sources triangulation by connecting with eight designers in four different design fields (architecture, engineering, graphic design, and instructional design). I satisfied methodological triangulation by using different data collection methods (unstructured interviews, participant reflective journals, design project timeline, and project artifact analysis) that are closely interrelated.

Table 3.6

Methodology Data Sources and Methods

Research Question	Data Source	Collection Method	Analysis Method
What is the impact of reflection-in-action on evaluation processes while a design is in progress and not yet complete?	1 architect 1 engineer 3 instructional designers 3 graphic designers Me as researcher	1. Interviews 2. Participant reflective journal 3. Project artifact analysis 4. My reflective journal	<u>Constant Comparative Method</u> 1. Compare information units applicable to categories 2. Integrate the properties of categories 3. Set limits on categories

What effect does reflection-in-action have on keeping a design project moving forward toward implementation?	1 architect 1 engineer 3 instructional designers 3 graphic designers Me as researcher	1. Interviews 2. Participant reflective journal 3. Project artifact analysis 4. Design project timeline 5. My reflective journal	<u>Constant Comparative Method</u> 1. Compare information units applicable to categories 2. Integrate the properties of categories 3. Set limits on categories
What impact does the design's problem-solution relationship have on the reflection-in-action process?	1 architect 1 engineer 3 instructional designers 3 graphic designers Me as researcher	1. Interviews 2. Participant reflective journal 3. Project artifact analysis 4. My reflective journal	<u>Constant Comparative Method</u> 1. Compare information units applicable to categories 2. Integrate the properties of categories 3. Set limits on categories
What impact does a designer drawing from a repertoire of precedents inside and outside of the project have on the reflection-in-action process?	1 architect 1 engineer 3 instructional designers 3 graphic designers Me as researcher	1. Interview 2. Participant reflective journal 3. Project artifact analysis 4. My reflective journal	<u>Constant Comparative Method</u> 1. Compare information units applicable to categories 2. Integrate the properties of categories 3. Set limits on categories

Member checks. For each interview meeting, I performed two member checks: (a) at the conclusion of the interview and (b) after I had reconstructed the interview. At the conclusion of each interview, I summarized what was said and allowed the participant to validate the discussion, correct any errors, and provide additional information. After I had reviewed the interview data and reconstructed the interview via a Word document, I sent a participant an interview meeting summary document via email and requested that the participant check the document for accuracy.

Transferability. By providing a “thick description”, I enabled others interested in making a transfer to attain their own conclusion about whether or not transfer is a possibility

(Lincoln & Guba, 1985, p. 316). Using a purposeful sample of eight designers from four design fields assisted in providing a wide range of information that I included in my thick description.

Dependability and confirmability. My field journal was my reflective journal. As needed, I recorded a variety of information about myself and about the study's methods. My field journal had three separate parts. I kept a schedule of upcoming weekly reflection journal and interview meeting due dates and recorded notes during interview meetings. I maintained a personal diary which was a release for personal tension and anxieties, a means to reflect on what was happening in regards to my values and interests, and a place to speculate on evolving insights (Lincoln & Guba, 1985). Finally, my field journal included a methodological log where I tracked methodological decisions and my reasoning behind the decisions.

Data Analysis Procedures

I used constant comparison to analyze my data. As I continuously collected data via reflection journals and interview meetings, I simultaneously processed the data (Lincoln & Guba, 1985). The following describes how I used the constant comparison method.

Compare information units applicable to categories. After each journal reflection and interview meeting, I reflected on a participant's responses by making notes on the journal reflection and interview meeting summary (for an example see, Appendix G, page 135, line 12). Once a participant had completed all reflection journals and all interview meetings, I placed all of a participant's reflection journals and interview meeting summaries in one document in chronological order (Appendices G – N).

After all participants had completed their reflection journals and interview meetings, I compared coded information units. A unit was a small chunk of information that I interpreted without additional information except for an understanding of the context (Lincoln & Guba,

1985). Units came from interviews and participant reflection journals. When I found a unit, I copied the unit from either a reflection journal or interview meeting summary and placed it in a working categories Word document (Appendix O). I coded each information unit by: (a) the participant, (b) the data collection event (specific reflection journal or specific interview meeting), and (c) line reference (Lincoln & Guba, 1985). For example, information unit code GD1WJ3(168) meant participant GD1, week three journal (WJ3), and line 168 in the Participant GD1 Reflection Journals and Interview Meetings document (Appendix G).

I placed units in one of four categories. Categories were the four research questions. This began as a straightforward process as I took the first coded information unit and placed it under one of the four research questions. With each successive coded information unit, I compared the unit with previous units and placed under one of the research questions. As I analyzed more and more data, themes began to develop under each research question. If a unit did not fit in a theme under a research question nor seemed to establish a new theme, I placed the coded unit in a miscellaneous theme under a research question (Lincoln & Guba, 1985).

Constantly analyzing data, once a category contained six to eight information units (Lincoln & Guba, 1985), I started reflecting on a category's themes including a title, rules, and definitions. I reviewed each unit in a category theme to ensure that it still fit in the theme. Through continuous analysis, simultaneous processing, and reflection, I moved my judgments of "look-alikeness" and "feel-alikeness" to category themes (Lincoln & Guba, 1985, p. 342).

Integrate the properties of categories. As my data collection continued, I shifted from comparing units with other category units and started comparing units with the properties of the category (Lincoln & Guba, 1985). If a unit did not fit with a category's rules and definitions, then I looked to: (a) ensure that the information unit was one chunk, (b) un-assign but not discard

the unit, (c) construct a new category, (d) create a category theme, or (e) redefine the category. Integrating the properties of categories helped surface relationships between categories. My later data collection work brought out a category's properties, filled gaps in a category, and made sense of inconsistencies within categories (Lincoln & Guba, 1985).

Once I had established categories, category themes, and units within the themes (Appendix O), I reviewed the working categories Word document with another person adept in qualitative data analysis and reflection-in-action. Equipped with the working categories Word document and each participant's reflection journal and interview summaries (Appendices G – N), my data analysis assistant helped with bringing out categories' properties, filling gaps in categories, and making sense of inconsistencies within categories. After she reviewed the categories, category themes, and information units, we met again to discuss her reflections. At this point, we agreed on the categories, category themes, and information units within category themes.

Set limits on categories. My categorization goal was to establish categories that are internally homogeneous and externally heterogeneous (Lincoln & Guba, 1985). By constantly collecting and processing data, as described above, my later data collection efforts did not result in new categories. At this point, I used four criteria to determine that it was time to stop collecting and analyzing data (Guba & Lincoln, 1985). Had I exhausted all my data sources without recycling back to the participants? Were my categories saturated where collecting additional data turned out small increments of information as compared to earlier data collection and analysis? Did I sense an integration of categories? Had new information stopped contributing to the emerging category themes? In order to ensure that my criteria were met, the

data analysis assistant and I reviewed all categories again to ensure that I had not overlooked or missed anything.

Summary

My phenomenological research design studied reflection-in-action regarding three aspects of design activity. The qualitative approach used a purposive convenience sample of eight participants and took place in each participant's work setting. I used five data collection methods: (a) interviews (b) participant reflective journals, (c) design project timeline, (d) project artifact analysis, and (e) my field journal. Through January 7, 2014, I collected data, and I established trustworthiness through credibility, transferability, dependability, and confirmability. I used a constant comparison method to compare information units applicable to categories, integrate properties of categories, and set limits on categories.

CHAPTER 4

RESULTS

This phenomenological research design used an interactive methodology and multiple data collection methods to study reflection-in-action. The purpose of my interdisciplinary research was to study reflection-in-action regarding three aspects of design activity. This study addressed:

1. What is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete?
2. What effect does reflection-in-action have on keeping a design project moving forward toward implementation?
3. What impact does the design's problem-solution relationship have on the reflection-in-action process?
4. What impact does a designer drawing from a repertoire of precedents inside and outside the project have on the reflection-in-action process?

The eight study participants came from four design fields: (a) architecture, (b) engineering, (c) graphic design, and (d) instructional design. Three participants were graphic designers, three participants were instructional designers, one participant was an engineer, and one participant was an architect.

Using criterion sampling, participants: (a) were involved in a short-term project that lasted between 37 to 87 days (average length was 64 days), (b) had at least 5 years of design experience (c), were individually responsible for at least 75% of the design work, and (d) were engaged in a non-routine, non-procedural design project (Table 3.1). In regards to non-routine,

non-procedural design projects, participants engaged in designs projects that lacked well-formed approaches to solutions (Snider, Culley, & Dekoninck, 2013) (Table 3.5).

Maintaining the process of most phenomenological studies, I engaged eight participants for a relatively long period of time (average of 64 days) (Rudestam & Newton, 2007). As a result, under each of the four research questions, themes emerged as I constantly engaged in developing salient factors and then had the opportunity to explore these factors in more detail.

This chapter provides the qualitative results for the four research questions. The chapter is organized by research questions. Under each research question, I provide support for themes that emerged from the participant reflection journals and interview meetings. Table 4.1 summarizes the themes that emerged under each research question

Table 4.1

Summary of Themes Under Each Research Question

Research Question	Themes
What is the impact of reflection-in-action on evaluation processes while a design is in progress and not yet complete?	<ol style="list-style-type: none"> 1. Participants' reflection-in-action aligned with the definition of reflection-in-action. 2. When participants reflected-in-action, they took stock in and reacted to external representations, which were rich in context, information, and constraints. 3. Participants reflected-in-action knowing the purpose and reality of the design project. 4. During design, participants looked to and relied on information while they reflected-in-action. 5. Participants reflected-in-action not realizing that they were reflecting-in-action.

<p>What effect does reflection-in-action have on keeping a design project moving forward toward implementation?</p>	<ol style="list-style-type: none"> 1. Participants interacted with information and a lack of information, which kept the design project moving forward. 2. Participants moved the project forward knowing that design opportunities and improvements still existed. 3. Participants moved the design forward toward implementation by turning “what ifs” to design decisions. 4. As reflection-in-action moved the design project forward, participants managed uncertainty.
<p>What impact does the design’s problem-solution relationship have on the reflection-in-action process?</p>	<ol style="list-style-type: none"> 1. Through receiving and gathering information and working with constraints, participants better understood the problem-solution relationship. 2. As participants reflected-in-action, opportunities emerged from the problem-solution relationship. 3. As participants reflected-in-action, problems were uncovered from the problem-solution relationship.
<p>What impact does a designer drawing from a repertoire of precedents inside and outside of the project have on the reflection-in-action process?</p>	<ol style="list-style-type: none"> 1. Participants drew from anything and everything. 2. Drawing from outside of the design validated design direction, guided the design, and provided “what ifs”. 3. Drawing from inside the design informed what could and could not be done, supported the design purpose, and guided the design. 4. Drawing on participants’ experience provided design context and made uncertainty more certain.

Research Question #1

Research question #1 was: what is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete? Five themes emerged under research question #1:

1. Participants’ reflection-in-action made an impact on the design project.
2. When participants reflected-in-action, they took stock in and reacted to external representations, which were rich in context, information, and constraints.

3. Participants reflected-in-action knowing the purpose and reality of the design project.
4. During design, participants looked to and relied on information while they reflected-in-action.
5. Participants reflected-in-action not realizing that they were reflecting-in-action.

Participants' reflection-in-action aligned with the definition of reflection-in-action.

For this study, reflection-in-action meant that participants engaged in unique and uncertain situations. Participants understood unique and uncertain situations through attempts to change them, and changed through the attempt to understand them (Schön, 1983; Schön, 1988). There were multiple clear examples of participants' reflection-in-action aligning with what it means to reflect-in-action. In turn, this reflection-in-action had an impact on the design project.

As GD1 progressed with her design project and began working with a website developer, she took stock in unique situations, reflected on the situation, and then made changes. In one design episode, GD1 changed the shape of the search form fields and buttons in order to ensure that the shapes would be consistent across all browsers and assist in development (Appendix G, page 151, line 168). As GD1 explained, "It changed the visual affect but with some tweaking it looked fine and will help the developer save lots of time too," (Appendix G, page 151, line 168).

In a similar episode, GD1 explained:

Second, the developer showed me how the find a doctor section was coming along and we both noticed how weird the results list looked when it included doctors without images, so we decided to make a generic 'no photo' image to replace the gaps and keep consistency in the layout. It was nice because we decided, I made the image and it was executed. There was no consultation with the client or a PM. We just knew it would be something easy to do that would solve a problem we discovered. (Appendix G, page 151, line 175)

In both episodes, reflecting-in-action impacted the design project. By reflecting-in-action at that moment and making a change prior to the build, GD1 helped the efficiency of the

website's build and helped avoid problems (browser and Find a Doctor section layout inconsistencies) surfacing later in the build.

GD5 faced a unique situation where she needed to give a law firm website a younger feel. GD5 designed an approach that could work but was troubled by what color band she should use (Appendix K, page 219, line 29). GD5 explained, "Typically, what I will do is make duplicates of the same thing," (Appendix K, page 219, line 30). In this design episode, GD5 had four versions and she played one version off another version. "I turn them on and off so it is a quick peek-a-boo," contended GD5 (Appendix K, page 219, line 32). She continued, "It is literally a process of elimination," (Appendix K, page 219, line 33).

For GD5, all four versions were viable solutions. As GD5 understood where she was going with the younger feel website design, she took stock in the color bands and reflected on which one worked best with the rest of the homepage design comp.

E3 had a specific complex and uncertain situation which was the essence of reflection-in-action. As he explained:

A unique and uncertain situation has been trying to develop an SPI calibration for my engine. SPI is stochastic preignition, a phenomenon in turbo engines. I have to develop a calibration that will detect when SPI occurs and react to it appropriately. SPI is a fairly new phenomenon and it's not completely understood how or why it occurs. The current thought is that oil droplets enter the combustion chamber and spontaneously combust under the immense pressure and temperatures that occur during turbocharged conditions. The thing about trying to calibrate a detection algorithm for SPI is that you need to get an SPI event. These events don't occur regularly, and there is even question as to the mechanism that causes SPI. Thus, I have to try to induce SPI without knowing exactly how to do that. So as I try different speed/load, temperature, spark timing, etc. conditions, I am gaining better understanding as to how SPI occurs in an engine. And while I try to get SPI to occur several times on an engine, SPI is damaging to the engine, so I don't want to overdo it. So to reiterate, I am trying to induce SPI, which I don't know exactly how to induce it because I don't completely understand the phenomena. Then I am trying to induce enough SPI events so I have a good dataset with which to characterize an SPI event and then hopefully gain enough understanding that I can keep the engine from

having an SPI event occur at all, as opposed to just waiting for it to happen and reacting to it. (Appendix I, page 191, line 86)

E3 took stock in the situation by trying to understand the unique and uncertain situation of SPI by trying to induce SPI (change the unique and uncertain situation) and by inducing SPI attempt to understand how to keep an engine from having an SPI event. E3 impacted his calibration as he was proactive. As he concluded in trying to induce a SPI event, "...hopefully gain enough understanding that I can keep the engine from having an SPI vent occur at all, as opposed to just waiting for it to happen and reacting to it," (Appendix I, page 191, line 86).

For E3, a design frame was a day's worth of driving, testing, and reflecting-in-action. He noted, "In vehicle, I can change things on the fly and see how it responds to change. I have this ability," (Appendix I, page 188, line 50). While driving in a car set up with a combination of calibrations, E3 further described that often he sees something, grabs data, analyzes it, and then makes changes for the next day (Appendix I, page 188, line 51).

While facilitating DiSC Behavior workshops at car dealerships, ID4 often found himself making changes for the next day and on the fly during a workshop. ID4 always reflected-in-action. ID4 pointed out, "The design will need to be furthered altered, 'on the fly' during the training event to assure the intent of the design achieves desired results," (Appendix J, page 204, line 20). In one workshop, ID4 faced a unique situation as two of the three leadership participants left the workshop. ID4 took stock in the situation and changed from facilitation to a coaching session. This change had real impact as the one remaining participant, who had been quiet and reserved, opened up and provided insightful feedback. About throwing the book (leader guide) out (Appendix J, page 208, line 73) ID4 revealed, "The tone of the room changed. It was powerful and he really got into it," (Appendix J, page 208, line 71).

In another workshop, ID4 was faced with a physical setting change to a smaller room. ID4 understood the situation, threw out the playbook again, and designed an intimate highly engaging session. He concluded, “I am not sure if it would have been as engaging with a larger room. It was like people sitting around the kitchen table and talking,” (Appendix J, page 211, line 124). In both unique and uncertain situations, ID4 changed potentially disastrous workshops into intimate and engaging sessions.

Like ID4, ID7 often found it necessary to reflect-in-action on the fly as she designed National Healthcare Reform training for customer service representatives. After frustration in designing, “disjointed, confusing, training materials” (Appendix M, page 242, line 38), ID7 reflected-in-action:

As I drove home that night, I realized my folly. I was starting with the M and B job functions not the CSR job functions. I determined that CSRs needed to know four basic things. The next morning, I made a very general design document that identified four main tasks, and several sub tasks. (Appendix M, page 243, line 39)

ID7 reflected-in-action and realized that what she had designed was disjointed and confusing. Her design frame informed a new design frame where she better understood that she was starting with M and B job functions and not the CSR job function. She made changes focusing on the four things that a CSR needs to know. Moving to a new design frame impacted the design.

Unlike ID4 and ID7, ID6 had time and space to pilot how Twitter could be used in her design. This provided an opportunity to reflect-in-action on the impact of the number of tweets that are sent. ID6 explained:

To really work through this idea, I decided to ‘pilot’ this idea on a friend of mine. I mentioned that I am working on a project and something that I was trying to figure out is how many tweets are too many or too little. I asked my friend if she would be interested

in helping me out with something that would provide insight as to how my design should move forward. (Appendix L, page 226, line 37)

ID6 continued:

I didn't tell her anything about the design or what I was doing just that it involved tweeting. At the start of the next day I sent a motivational tweet (if you will) to my friend. It said "Be Inspired, Be Inspiring". I checked and my friend retweeted the tweet I sent out. About an hour later I sent out another tweet on motivation, this time I attached a picture with a motivation quote. In this situation not only did my friend retweet what I sent, I noticed that other 'twitter' participants retweeted the information as well. So I continued this throughout the day collecting information from my friend's tweet. At the end of the day I sent a total of 5 tweets to my friend. So I asked a couple of questions about what it felt like to get the tweets all day, did she feel pressured to respond etc. I learned that she did not feel pressured to respond and in fact she felt it was like a little motivator throughout the day. At least from this little pilot, I have an idea of one person's perspective on tweets. I am not sure how all the campers will feel, but at least I know that I will start with 5 tweets, watch the twitter feed throughout the day and then send additional supportive or scaffolding tweets as necessary. (Appendix L, page 226, line 39)

Through her pilot, ID6 created a design frame where ID6 gathered information and made a reasoned judgment on how five tweets might work. This reflection-in-action directly impacted the actual design.

GD2 used information from a project manager and his own interactions with a college's current website to understand the unique and uncertain situation. He then used this understanding to change the problem by redefining the underlying marketing message of the website. In turn, this was a catalyst for providing a different set of constraints for the design problem. GD2 illustrated:

In this instance the 'design problem' is that the college's homepage has no real hierarchy on its page, further it is not speaking to its target audience, instead it seems more focused on its own achievements rather than its prospectives. Furthermore, the site looks dated, but this was only half of the problem. After speaking with the PM I came to understand that the college is a smaller, less overwhelmingly bureaucratic school. But instead of playing on this strength, they seem more focused on fabricating a reality where they are bigger. This begs the question, Why, in a time when colleges are seen as big and fairly freedom-starve restrictive machines would a college want to fit in to the normal college

scene? The new thing is to be small, focused, independent and passionate. This will get applications from prospectives that would fit best at their college. (Appendix H, page 169, line 23)

Participants impacted their design projects by reflecting-in-action. Multiple times participants' reflection-in-action aligned with what it means to reflect-in-action - understand unique and uncertain situations through attempts to change them, and change through the attempt to understand them (Schön, 1983; Schön, 1988).

When participants reflected-in-action, they took stock in and reacted to external representations, which were rich in context, information, and constraints. What participants produced at each milestone is summarized in Table 3.4. Throughout a design project, a participant took stock in and reacted to an external representation. The external representation was a partial solution and was rich in context, information, and constraints. Rich external representations are rooted in authentic situations (real-life, informative, and engaging) and are represented so that they allow for reflection-in-action (Huybrechts, Schoffelen, Schepers, & Braspenning, 2012).

Plain and simple, E3 could not produce a cup of calibration. However, this did not keep E3 from taking stock in and reacting to external representations. E3 explained:

So a cal (short for calibration) ends up being a series of tables and values essentially. Some tables are two-dimensional, other tables are three-dimensional. So a two-dimensional table can be plotted and it would be a line. And even if I can't think of a fundamental engineering reason for why the line should have some sort of form (linear, exponential, parabolic, etc.), I always tend to want to have the calibration take some sort of form because I assume an engine operates according to a set of physical laws even if I don't know what laws they are. The same goes for three-dimensional tables. But instead of being plotted as a line, these are plotted as a surface. And I literally say, "oh that is ugly". (Appendix I, page 186, line 32)

E3 described that a spreadsheet visualizes calibration, "just like a design or painting,"

(Appendix I, page 189, line 74). For E3, visuals delivered necessary information faster and kept the design project moving forward. E3 elaborated:

The saying that pictures are worth a thousand words is very true. But honestly in the technical realm, sketches are more clear and deliver the necessary information faster. Don't get me wrong, some verbiage is needed to convey thoughts, but for the most part, a sketch goes a much longer way. (Appendix I, page 198, line 186)

Like E3, A8 interacted with visuals such as drawings and photographs. In order to double-check the drawings and photographs, A8 took stock in written work. Together written words and drawings provided rich context, information, and constraints for the six post offices roof designs. A8 explained:

I like to work the written word and drawings together. Flipping back and forth between the two. I feel this allows for the best complete design. It is a double check. If something is drawn then it must also be described in the specification. Describing the product and how that product should be installed. (Appendix N, page 264, line 100)

ID4's external representations were not typical instructional design representations like a design document, facilitator guide, or participant guide. ID4's external representations were what was happening in the workshop. The results of DiSC behavioral evaluations at each dealership provided the richness in context, information, and constraints. During a workshop, ID4 was always reflecting-in-action. "I think for me, I am constantly taking the pulse of the group," (Appendix J, page 212, line 128). ID4 continued, "I watch their body language. I am always watching for it," (Appendix J, page 212, line 130). Watching workshop participants' body language was how ID4 understood unique situations. With this understanding, ID4 made changes on the fly which impacted the workshop participants' experience.

Working within the 140-character constraint of Twitter and with her unfamiliarity and uncertainty with using Twitter for the instructional design, ID6 used a website that allowed her to type a few potential training tweets and then took stock in what the tweets would look like on a

cell phone. ID6 concluded, “I think it was helpful to do this as it reminded me that even 140 characters can look long on a small screened cell phone,” (Appendix L, page 232, line 104).

In order to react to the context of the girls’ winter camp, ID6 *sketched* what a tweet would look like on a mock iPhone. This validated the constraint of a 140-character tweet and provided information regarding what should be the length of the instructional tweets.

ID6 interacted with a variety of external representations (Appendix L, page 234, line 158) that served as the structure for her instructional design solutions. When reflecting-in-action, ID6 used a note feature on her iPhone. In order to reflect-in-action on message design challenges, she *sketched* the tweets on a mock iPhone screen. To take stock in a pilot that provided insight in how people would respond to instructional tweets, ID6 mapped out the responses. Finally, ID6 used a mind map/decision tree visual to represent her design document.

With the ever-changing National Healthcare Reform information, ID7 constantly found herself taking stock in the information that she had at the moment. “I needed to see things. I needed to label it. I needed to see it in different colors,” (Appendix M, page 250, line 143). ID7 added, “I was able to see visually what I had to do,” (Appendix M, page 250, line 144).

When ID7 reflected-in-action on an external representation, she understood the situation and with more information she changed the instructional design. This provided structure to partial solutions that developed into 11 instructional design units (Appendix M, page 250, line 145).

Participants took stock in and reacted to external representations. External representations were rich in context, information, and constraints. Reflecting-in-action on what they saw, participants interacted with rich external representations and designed partial solutions.

Participants reflected-in-action knowing the purpose and reality of the design project. For participants, their design projects had a beginning, middle, and end. As they reflected-in-action, they took stock in the purpose and reality of the design project. For example, knowing the time constraints was one example of participants having a good grasp of their design reality.

E3 made it clear that he prefers to react to visuals. However, time constraints and deadlines meant that he cannot take a lot of time reacting to external representations. “It is more a preference thing. I like to take a minute then get back to reality,” (Appendix I, page 201, line 225).

For E3, the design project reality was that his calibration was a partial solution. He understood that the calibration would be refined for later model years. This did not halt reflection-in-action. The reality of the time constraint for this model year did not kill exploration of opportunities for later model years (Appendix I, page 199, line 198). In discussing a trip to Colorado to test altitude development, E3 commented:

...the vehicle/vehicles that I need to continue my own development work will be on the trip, so I need to go, just to get in-vehicle time. The trip also provides valuable real driving time in the vehicle as opposed to just driving on a track. And this is where you discover many problems and opportunities. (Appendix I, page 185, line 19).

E3 always designed with purpose in mind. He noted, “At the end of the day, that (car) is the product. Final external product is the car,” (Appendix I, page 185, line 48).

In designing a new look and feel to a large health system website, GD1 embraced purpose and reality and allowed them to drive her reflection-in-action. She commented:

Reality doesn't scare me or stop me from being creative. In fact, I tend to do better with more information, goals, and restraints of the build/technology because anyone can be creative without limits, but when tested by fire (in this case reality) the real problem

solving and creativity comes out. If I'm included in the process, all the better. (Appendix G, page 140, line 56)

As the design project progressed, GD1 found herself satisfying the purpose (an impactful user experience) and reality (launching the site). This came to a head when the client wanted GD1 to adjust the color and style of buttons. After taking stock in the buttons, GD1 understood what the client was requesting and then, "...switched the button text from white to the buttons color and the button's color to a light grey," (Appendix G, page 151, line 170). GD1 first concluded that this satisfied the user experience as, "...the user can still tell they are buttons," (Appendix G, page 151, line 170). Second, GD1's solution kept the design project moving forward. "Changing only the colors also meant that I didn't have to change as much in all the designs created before the one the client requested it on. So a lot of time was saved," (Appendix G, page 151, line 170).

Just like the car will be produced, the healthcare system website will launch, ID4's workshops happened. ID4 designed with a sense of inevitability that his DiSC behavior workshops would occur. "The most important thing for me is what is real and what will make a difference," (Appendix J, page 209, line 82).

ID7's reality was constant evolving information related to National Healthcare Reform. She summarized, "Our difficulty lay in that we were trying to hit a moving target. Information was constantly changing, thus the demands of the work groups constantly changed," (Appendix M, page 248, line 101). As the constant information changes became an instructional design problem, the way ID7 reflected-in-action adjusted. ID7 explained, "I am not sure how much I tried to understand situations by trying to change them, as much as I just constantly tried to adapt

to the changes that were dictated by the constantly evolving information,” (Appendix M, page 248, line 102).

GD2 simply put the reality of his design project, “Designers are just not designing,” (Appendix H, page 180, line 176). In order to engage in the design, GD2 had to deal with the realities of assets and what he had access to and what he did not have access to. For GD2, reflection-in-action was affected by a lack of approved imagery from the college. Instead of reflecting-in-action on the constraints of specific images, GD2 had to take stock in a design that had to accommodate unknown images. GD2 summed up the reality of this situation. “As long as they (client) are happy, I am happy. They have a solution,” (Appendix H, page 181, line 197).

ID6 reflected-in-action on the reality of what could happen with Twitter. She took stock in that girls at the winter camp may not tweet, may go in the wrong direction with tweets, or experience unforeseen tweet situations. Knowing that the purpose of her bullying prevention instructional design is to use Twitter, ID6 reflected-in-action on using follow-up tweets to solve the reality of what could occur. She noted, “It is sort of like a decision tree. If they are going in the wrong direction then this, or if no one is tweeting go this way,” (Appendix L, page 233, line 131).

ID6 was not the only participant who reflected-in-action on the reality of what could happen. In Phase 1 of National Healthcare Reform, ID7, after consultation with work groups, posted answers to questions from trainers in a log on SharePoint. She further explained, “We then had to have sort of a Phase 1b training, where the trainers went out to the line areas and rolled out additional information of CSRs (approximately 1 hour). We will probably do that again,” (Appendix M, page 250, line 147).

As participants reflected-in-action, they took stock in the purpose and reality of the design project. At times, the reality was the here and now, and at other times, reality was what could happen for a new model year, during a girls' winter camp, and in the middle of CSR training.

During design, participants looked to and relied on information while they reflected-in-action. Information fed participants' judgment which impacted how participants took stock in the design project. Oftentimes, participants relied on their judgment to fill information gaps or anticipate problems that rose due to a lack of information.

GD1 began her design project with little information and little direction. For her, it was just design. As GD1 progressed with the design project, she began to understand how the chosen content management system (Drupal) worked and how it was a constraint to designing a user-centric website. GD1 commented, "First, Drupal is not user friendly. I say this because it's very structure require that all pages are unique or it adds numbers to the page's URL and may affect the actual structure of the site," (Appendix G, page 152, line 173). GD1 took stock in what she was designing and made changes based on her continuing understanding of Drupal. When she made changes, she validated that the changes would work based on information on how Drupal works.

When reflecting-in-action on his roof design developments, A8 relied on a constant supply of information. Information fed changes to initial designs and then more information resulted in changes to the final design. A8 reflected:

Initial design solutions consisting of wind, energy comparisons, membrane selection and, climate zone are made and reviewed with the owner. After approval of these partial design solutions, field gathered information will be reviewed. Based on this information and the initial design solutions we begin to build our final design. Each perimeter edge,

drainage component, equipment and projection will be looked at. Details will be designed on our initial design recommendations. (Appendix N, page 259, line 18)

ID4 gathered information in the moment and responded to it instantly. His partial solutions were closely tied to information he gathered during the two days of training. Understanding which days dealership leaders would attend a workshop was critical in making changes to a specific day's workshop. ID4 explained how he relied on this information, "For example, if some leaders can only come on day 2, a partial solution for day 2 would involve reviewing salient points from day 1 before beginning new material on day 2," Appendix J, page 206, line 33).

ID6 had to reflect-in-action on information she received about when and when not campers would be allowed to tweet. ID6 reflected:

We found out recently that the COO is somewhat old school and only wants campers to be able to tweet during certain times of the day. The important point about this is that she does not want the campers to be able to tweet in the evening. This is quite a problem because the research we have looked at indicates that most 14-18 year olds tweet in the evenings. Most of our tweets will go out during the day, but this was designed this way thinking that campers would possibly go back and tweet about our earlier tweets once the day settles down and they are laying in bed. (Appendix L, page 235, line 165)

For the bullying prevention training, ID6 drew on research regarding young women tweeting and how tweeting can be used as an educational tool. In this case, information helped ID6 reflect-in-action on an anticipated problem with the instructional design.

Information fed participants' judgment. When reflecting-in-action participants looked to and relied on their judgment to fill information gaps or anticipate problems that rose due to a lack of information. For E3 it was the former as test data was an ongoing part of his design process. "So whenever I make an updated calibration, I literally compare it to a previous calibration. I do this both as a check that I made the intended changes but also as a sense check

that what I am doing now is correct based on the new information,” (Appendix I, page 187, line 38).

ID7 often found it hard to find information. Her reflection-in-action often revolved around trying to pin down and absorb information that was constantly shifting. She concluded, “I don’t want to come in late in the game and have to play catch up. It is too difficult to learn new material and design and develop under such tight timeframes,” (Appendix L, page 255, line 212).

Participants reflected-in-action not realizing that they were reflecting-in-action.

Participants reflected-in-action quite naturally. On occasions, participants did not realize they were reflecting in action until I pointed it out. To them, it was just them designing. When asked to elaborate on how he stepped back and took stock in design situations, A8 replied, “I don’t think that I ever sit and have a formal process,” (Appendix N, page 266, line 133). He continued, “I subconsciously do what we are talking about,” (Appendix N, page 266, line 134). A8 summed up naturally reflecting-in-action, “It is part of the process. I don’t think about the process. I do the process,” (Appendix N, page 266, line 136).

In ID4’s first interview meeting, he agreed that that no two dealership facilitations will ever be the same and was humbled by my suggestion that his reflection-in-action makes all the difference. “They aren’t (dealership facilitations being the same), but that may be giving it (reflection-in-action) too much glory,” (Appendix N, page 209, line 85).

Although in interview meetings ID7 and I discussed how she constantly reflected-in-action as she received information, the immediacy of designing with a constant influx of information made her, at times, feel taking stock in and reacting to her design did not happen. In her final journal reflection, she reflected:

Everything happened so fast that I never really took stock of the situation until everything

was completed. Between 10/14 and 11/8, I had to design, develop, conduct a T3, revise materials based on SME feedback (poor timing with the SME feedback; but I didn't have time for a SME review before the T3), advise trainers of the revisions, and send the materials to Reprographics for printing. And, don't forget that I was designing for two different audiences: one that required 1.5 **days** of training and one that required 2.5 **hours** of training. Thank goodness we were able to leverage a couple of units between the different audiences. (Appendix M, page 255, line 210)

Research Question #2

Research question #2 was: what effect does reflection-in-action have on keeping a design project moving forward toward implementation? Four themes emerged under research question #2:

1. Participants interacted with information and a lack of information which kept the design project moving forward.
2. Participants moved the project forward knowing that design opportunities and improvements still existed.
3. Participants moved the design forward toward implementation by turning "what ifs" to design decisions.
4. As reflection-in-action moved the design project forward, participants managed uncertainty.

Participants interacted with information and a lack of information which kept the design project moving forward. Participants designed with a purpose. Their design projects had a beginning, middle, and end. Participants reflected-in-action and kept the project moving forward knowing that they would implement the design project. Information and, at times, a lack of information fed participants' reflection-in-action.

Early in the design, GD1 designed a color guide and researched other websites in order to develop data that would be relevant for the design problems that she faced. At times, GD1 used

her experience to see what information was missing and leveraged her judgments to fill in information gaps. GD1 clarified in her first interview meeting:

If I am not given the right information and do not know what I am designing for, then I will make my best guess as to the goals to fill in the blanks, so I can continue to process and do my job. Ideally, I would be briefed on the project and kept in the loop on changes. Unfortunately, this doesn't always happen. (Appendix G, page 147, line 146)

Interestingly, GD1 began with no information and no direction. Her marching orders were: Just design! Since the client was unwilling to articulate what the client wanted, GD1 reacted to her own questions and partial solutions and kept the design moving forward. GD1 summed it up, “It was a situation where it kept falling back on to design. It was hard for project managers to keep it moving as everything fell back to design,” (Appendix G, page 162, line 278).

Two months into the design project, GD1 was interacting with a lack of information and moving the project forward. As she explained:

Another issue was that the navigation for the specialties section was never finished while I was designing it. I knew the real site would have many levels, but since they weren't available, I made some up and developed a style and plan for how the different levels in the navigation would look and function. That extra forethought combined with making a style guide for the developers to follow has come in handy for build, because the developers weren't stopped by another thing needing to be done. (Appendix G, page 165, line 327)

However, the lack of information did have consequences. Missing information was not a neutral situation. It affected the design. In reflecting on the struggles to get information, GD1 confessed, “This really zaps the drive and creativity out because there is more energy and time spent trying to get information that will help the design,” (Appendix G, page x, line 68).

In the end, GD1 interacted with an information hierarchy. To move the project forward, she interacted with the order she received information and the order she reflected on the

information. GD1 explained, “As you evaluate, the circle becomes smaller where you consider smaller things like better colors and different ways to play with things,” (Appendix G, page 105, line 107).

Similarly, GD2 admitted that a lack of information affected the design. In the third interview meeting, GD2 confessed, “My drive for the project is dead,” (Appendix H, page 179, line 161). After GD2 completed wireframes on November 4, with client approval of the wireframes, GD2 planned to start the design comp on November 15. Because the client would not provide feedback until early December, GD2 did not begin the design comp until the week of December 8. A lack of information stalled the project for about one month. However, once the client approved the wireframe, GD2 completed the homepage design comp in one week.

GD5 summarized what all participants noted, “The more information the better,” (Appendix K, page 220, line 50). She continued, “It helps with seeing what they (client) want to call out. You have a great situation,” (Appendix K, page 220, line 51). GD5 had a great situation as she had two important pieces of information that kept the homepage and interior page design comps moving forward. First, GD5 knew that the website redesign had to be, “...one that targets a slightly younger audience,” (Appendix K, page 219, line 23). Second, GD5 had the freedom to alter the client’s logo. GD5 was designing with information which helped her come up with a simple and clean design approach (Appendix K, page 219, line 24).

For E3, interacting with information became complex and intertwined. E3 interacted with 20 calibrators who contributed to the one calibration. E3 explained, “If I don’t get them a mini solution, then they get stuck with their calibration,” (Appendix I, page 193, line 104). E3’s calibration interacted with a large network of calibration points. Small adjustments were made and fed partial solutions back out to the network to move along the overall calibration. E3

summed it up, “You just can’t try things out. I am dependent on other calibrations,” (Appendix I, page 193, line 106).

E3 looked to quality information to move the calibration towards 80%. E3 described a visual of turnings knobs and pushing buttons to explain how he designs a foundation. “I get a better understanding of the response,” (Appendix I, page 193, line 110). E3 gained quality information when he drove the car and actually saw or felt the change. He stated, “I try to do things so I have a better understanding of what is going on,” (Appendix I, page 193, line 112).

E3 also limited his information gathering to design a partial solution for a select portion of his calibration table. This was important to move the 80% calibration to completion. E3 explained:

I spoke previously about adjusting knock thresholds in select speed-load zones where false knock was occurring. I did not revisit the whole calibration table in that case, I simply went with a partial solution of select portions of the table. This again was to mitigate risk. Also, the problem of false-knock occurs during a specific 0-60mph maneuver. Most customers would not experience this problem, thus a partial solution was developed to satisfy a problem that occurs during a portion of a driving experience. (Appendix I, page 190, line 82)

A8’s unique situation was that he was not in the field. He had to reflect on information that he received and had to wait for the field consultants. “They are my eyes,” (Appendix N, page 263, line 85). In order to keep the design development moving forward, A8 compensated for missing pieces of information. He explained:

I think the solutions have been developing nicely. We are getting to the point where we need to keep things moving forward. So as we wait for answers from the field I need to make the decisions that I can to keep each project advancing. Sometimes that means leaving holes in my design and other times I'm making assumptions based on experiences. I will fill in the missing pieces at the end and hopefully we won't have major changes. (Appendix N, page 263, line 95)

A8 was able to compensate for missing information by relying on his experience.

Without his experience, A8 could miss a trouble spot, which could stall the design development. “It is all experience with post offices and the trouble spots,” (Appendix N, page 262, line 69).

ID6 also had to compensate for information holes in order to advance. She discovered that the information from the girls’ organization did not provide solutions.

This week as I have been going through the bullying content provided by the organization I noticed many holes. In most cases, the information just touches upon bullying and does not really offer solutions or ways for girls to get out of bullying situations. Or even how to move past a situation when you have been bullied. So in this case I have started looking at how other non-profits or schools addressed the major issue of bullying for young girls ages 14-18. (Appendix L, page 225, line 29)

ID7 did not have a problem with a lack of information. Her unique situation was that she was interacting with too much information. With all the National Healthcare Reform information that ID7 received, she was forced to manipulate the information in order to act on the information. For ID7, it was not just getting the information, but how she interacted with the information that kept the design moving forward. ID7 described it as follows:

I was originally given a “design document” that was developed by one of the work group members. This design document listed about 15 general topics that would be developed into units of information for our NHR course. As I continued to go to meetings, we ended up going through lists of hundreds of items that different workgroups wanted trained. Some of these items would be listed several times with slightly different wording because they were submitted by different workgroups. In order to gain some kind of understanding of what actually needed to be included in training, I went through the lists highlighting items related to various topics with different colors. For example, all topics related to Enrollment were highlighted in yellow, topics related to Underwriting in orange, topics related to Contract Maintenance in blue, etc. (Appendix M, page 248, line 104)

Reflecting-in-action, ID7 understood what information she needed and what information she did not need. ID7 then made changes to units that would be applicable for the customer service representatives. “By putting this kind of structure around my problem, I changed the design. I now had a design that included 11 different unit of information,” (Appendix M, page

248, line 105). To get to 11 different units, ID7 manipulated the information that she used and did not use. She concluded, “Some of these units were not identified in the initial design document that I started with; other units were deleted because the workgroups could not provide the necessary information by the date we needed,” (Appendix M, page 248, line 105)

Information, a lack of information, and even too much information fed participants’ reflection-in-action. By interacting with information, filling in information holes, and manipulating information, participants reflected-in-action and kept the project moving forward toward implementation.

Participants moved the project forward knowing that design opportunities and improvements still existed. All participants met their final milestone even though some interim milestones were missed. The reality of the design projects meant that each project had an end date. The end date came with participants knowing that design opportunities and improvements still existed.

E3 designed his calibration for the new model year. E3 explained that he had to try to satisfy two different means that opposed one another. More performance and a pleasant drive are two different calibrations, but an engine has only one calibration. E3 admitted you cannot have both so an “unhappy medium” resulted (Appendix I, page 188, line 58). E3 elaborated:

Design is not perfect. It has to be good. So you can only polish the rock so far before you have to move on to other things. And I always have to keep the customer in mind. I don’t get paid to perfect my calibration development skills, I get paid to release a calibration that will please and add value to the customer. So it is not necessary to have a perfect calibration, it just needs to be perfect for the customer. (Appendix I, page 186, line 30)

For E3, it was not merely satisfying for an “unhappy medium”. His focus was to complete the calibration for the immediate model year release knowing that this year’s

calibration release was an opportunity for later model releases. E3 distinguished this as a mini-calibration versus a whole calibration.

So as a calibrator I am responsible for a certain portion of the calibration. Out of say 20,000 variables, I am responsible for about 1,000 of them. Many times when a problem is experienced, I will make a mini-calibration (some subset of those 1,000 variables) and send it to whoever is experiencing the problem. I might later include this mini-cal into a later release of my whole cal, but many times this mini-cal might just be used by the intended party so they can do their testing or bypass whatever issue they saw. This is another example of a partial solution. The mini-cal is just a way to bypass an immediate problem while trying to solve a bigger problem or develop something bigger. The mini-cal can be considered a “fix for now”, until I can develop something better in the future. (Appendix I, page 190, line 84)

GD1 never stopped taking stock in unique and uncertain situations. GD1 did not receive information regarding the health network’s specialties section until the last month of the design project. GD1 summed it up, “Looking back, I think that the project’s design turned out pretty good. There are things I would have done differently, and things that I wouldn’t have, but based on time constraints, weird communication/differing goals, the client...it turned out pretty good,” (Appendix G, page 185, line 330).

GD2, who dealt with the client taking over a month to approve his college website redesign wire frame, still produced a homepage design comp within the budgeted hours and required time frame. GD2 was not pleased and summarized the design as “utilitarian,” (Appendix H, page 182, line 212). “I am not happy with what I have designed. All the rushing and no decisions making, sometimes it is not a homerun,” (Appendix H, page 181, line 194).

Even though GD5 had freedom to alter the law firm’s logo, GD5 had to acquiesce to the client’s request for a less heavy font. By taking stock in the homepage design comp, GD5 concluded, “It (less heavy font) was not as strong so I made the font larger,” (Appendix K, page 220, line 62). GD5 noted that if she had not increased the font, she would have had to change

other items on the homepage design comp. “It was the best solution I came up for the revision. I like it better the other way but it is the best solution,” (Appendix K, page 220, line 64).

Of all the participants, ID4 and ID6 appeared to be most satisfied with the design project at the final milestone. When asked if the instructional design was the best possible design or if it was just good enough, ID6 replied, “It is really. I think that it is a great design,” (Appendix L, page 237, line 188). In her final reflection journal, ID6 noted that improvements could come in the future. “I am at the point though where I have to say enough is enough and I cannot make any additional changes to the design,” (Appendix L, page 237, line 174). She concluded, “Instead, what I do is write notes down for future projects as lessons learned that can be included into similar projects,” (Appendix L, page 237, line 174).

ID7 launched Phase 2 training knowing that there would be opportunities for further training in Phase 3. She bluntly stated, “If decisions and documentation are not completed by 10/22, the topics will have to wait until Phase 3. By Wednesday (10/23) morning, I will start crossing topics off the ‘design document,’” (Appendix M, page 241, line 17). As ID7 took stock in the fact that all information for Phase 2 would not be available on January 1, 2014, she understood that the information to date would define Phase 2. The crossed off topics would become opportunities for Phase 3.

Participants met design project deadlines. They moved design projects forward knowing that improvements and opportunities existed. This did not take away from the design projects. Rather, it showed that participants designed for reality. Their design projects had a beginning, middle, and maybe most importantly, an end.

Participants moved the design forward toward implementation by turning “what ifs” to design decisions. When a reflective conversation with a situation is in action, *what if* turns to decisions that are binding, *what can* and *what might* happen turn to *what should* or *must* happen, exploration becomes commitment, and possibility moves to imperatives (Schön, 1983). In order to meet the end date, participants made design decisions and commitments. There came a point when participants had to move forward.

ID6 moved forward when her “what ifs” and design exploration received feedback from the research team. ID6 explored when she would send instructional tweets (Appendix L, page 231, line 98) and how she would train girls who did not know how to tweet (Appendix L, page 231, line 100). Knowing that ID6 needed approval from the design team, she ensured design decisions were timely so she could keep the instructional design moving forward (Appendix L, page 234, line 148).

Interestingly, while ID6 interacted with very clear design decisions, for ID7, the line when “what ifs” turned to decisions and exploration turned to design commitment was a bit blurry. ID7 noted, “Our biggest ‘what ifs’ relate to changing information,” (Appendix M, page 252, line 160). With National Healthcare Reform information constantly coming in, ID7 has little time for consideration. Design decisions were made so training materials could be completed as quickly and efficiently as possible (Appendix M, page 252, line 161).

E3 always interacted with “what if” moments. E3 explained how he reflected-in-action:

Several times during the calibration process there are “what if” moments. In my experience, someone comes to me with a problem my calibration is causing them. My calibration is already set at this point, so now it becomes, “what if” we change it slightly, what will happen. Well in these instances, I first brainstorm what potential problems can be caused from altering my calibration. Then I change my calibration and test it and see if those potential problems prove true. (Appendix I, page 195, line 122)

In a reflection journal, E3 continued to explain how the “what ifs” then moved to design decisions. “If they do (problems prove true), then an alternate path has to be explored. If the possible problems don’t prove true AND I see a benefit to the change, then I commit to the change and move forward with the new calibration I just made,” (Appendix I, page 195, line 124). It was E3’s reflection-in-action that drove the design decisions and moved the calibration forward toward 80% calibration.

For both GD1 and GD2, “what ifs” were visually represented through sketches. GD1 used sketching and wire framing to map out an execution plan (Appendix G, page 161, line 269). In regards to moving sketches to execution, GD1 explained, “The more tight the deadline, the more imperative it becomes for a plan (sketching and wire framing) to be the most simplistic and easiest to execute, to ensure successful completion,” (Appendix G, page 161, line 269). Although sketching took place for only 10-15 minutes, GD2 used sketches as the foundation for early decisions. He sketched, “...and then got the design going,” (Appendix H, page 180, line 171).

There came a stage for GD1 when “what ifs” became a hindrance and a potential threat to the actual development of the website. In the seventh of nine reflection journals, GD1 wrote, “‘What ifs’ in this stage is my least favorite thing to hear because we should be past the ideation and planning to the execution portion of the design for the desktop version,” (Appendix G, page 159, line 257). There came a time when website execution had to start.

A8 confirmed this thought when he clearly stated, “There are times that you have to make decisions and keep the project moving,” (Appendix N, page 261, line 55). For A8, “what ifs” represented when he was outside of his experience and needed to go to colleagues for information and advice (Appendix N, page 264, line 96). Gaining information then allowed A8 to make design decisions and commitments.

Like ID4's reflection-in-action, moving "what ifs" to design decisions occurred in real-time in the midst of workshops. ID4 explained:

An excellent "what if" example occurred the second time I conducted the training for the non-manager session, based on what didn't work too well in the first session. The design calls for participants to break into groups and be assigned a particular DiSC style (i.e. "D"). Within their group they are to discuss how the "D" could adapt their style to the 5 key attributes customers desire from their dealership experience. (The five key attributes have been introduced prior to the group breakout activity). I found that the groups had too many things to ponder to be successful with the activity. (Appendix J, page 214, line 170)

ID4 continued:

So, I decided to "explore" different routes to make the learning point (how can each style adapt to the 5 customer attributes) in a different way than the design called for. My exploration ultimately led to a design commitment that registers better with participants, doesn't leave them confused and makes the point. As one large group, we now review the 5 customer attributes more thoroughly, irrespective of the DiSC styles. Once participants understand the 5 attributes, we explore one at a time, having them think about how a given DiSC style might adapt their behaviors to the specific attribute. I make sure everyone understands how that style can meet the customer needs, before moving on to the next attribute and how the DiSC styles can play into meeting that attribute. (Appendix J, page 214, line 171)

In order for participants to move design projects toward end dates, design exploration became design commitment. Participants reflected on feedback of others, changing information, problems not proving true, sketching, and real-time interaction. For all, there was a point when participants had to make design decisions.

As reflection-in-action moved the design project forward, participants managed uncertainty. A designer's ability to design is dependent on coping with uncertainty (Cross, 2011). In both reflection journals and interview meetings, four participants shared how they coped with uncertainty. Participants had strategies in place to manage uncertainty.

In early design spaces, ID6 looked to the Arab Springs model for how people, using social media, can come together for change. ID6 noted that she looked to the Arab Springs

literature, but could find very little. She had self-doubt that it could work (Appendix L, page 229, line 64). ID6 confessed, “I am still moving forward in some uncertainty. This is okay as I am forced to grow,” (Appendix L, page 229, line 65).

ID6 chose a design-based research approach to advance the instructional design. Since ID6 would be able to see actual tweets, she would be able to revise the instructional design on the fly (Appendix L, page 229, line 71). The design-based research approach helped ID6 manage her uncertainty. “I have to walk through uncertainty and design-based research means that I do not have to have the answers right away,” Appendix L, page, 229, line 72).

From ID7’s first reflection journal, she shared her uncertainty in the instructional design. She reflected, “The clock is ticking for Phase 2 of NHR training. I’m getting more nervous by the minute...I’m just designing as fast as I can and revising my design as more information becomes available,” (Appendix M, page 240, line 7). ID7 continued in an interview meeting, “It is very frustrating way to work. I am trying to hit deadlines, but I don’t know all the information. I keep pushing the design forward,” (Appendix M, page 245, line 73).

The way ID7 designed partial solutions accommodated this uncertainty. ID7 used a SharePoint repository to provide answers to trainers’ questions, designed a separate revisions list for instructional materials, and moved materials to Phase 3 training. In response to the affects of President Obama’s November 2013 announcement concerning National Healthcare Reform, ID7 wrote, “We’re probably going to pass out an addendum that we can just add to this phase of training and make major changes in Phase 3,” (Appendix M, page 251, line 150).

E3 was comfortable managing uncertainty. He explained, “There was not ever enough uncertainty that I just threw my hands up. There was enough certainty to keep going,” (Appendix I, page 196, lines 150 -151). In order to keep the 80% calibration on track, E3 had no other

choice. He concluded, “In the calibration world, there is not an option to throw your hands up,” (Appendix I, page 196, line 151).

GD1 leveraged the help of her supervisor to manage the uncertainty that stemmed from specialties changed late in the game, little to no design direction, lack of information, and a lack of leadership. GD1 wrote, “With so many people commenting and no one knowing what was happening, I got stressed fast. Luckily, I had my supervisor to work through/with...,” (Appendix G, page 141, line 61). Like E3, GD1 kept moving forward. “I personally cannot stop. This is where creativity really comes out,” (Appendix G, page 146, line 128).

Participants took to heart that design has a beginning, middle, and end. Through reflection-in-action, participants kept their design projects moving forward toward implementation. As a result, participants interacted with information and a lack of information, moved projects forward knowing that design opportunities and improvements still existed, turned “what ifs” to design decisions, and managed uncertainty.

Research Question #3

Research question #3 was: what impact does the design’s problem-solution relationship have on the reflection-in-action process? Three themes emerged under research question #3:

1. Through receiving and gathering information and working with constraints, participants better understood the problem-solution relationship.
2. As participants reflected-in-action, opportunities emerged from the problem-solution relationship.
3. As participants reflected-in-action, problems were uncovered from the problem-solution relationship.

Through receiving and gathering information and working with constraints, participants better understood the problem-solution relationship. In a design space, the complex design problem and emerging design solution develop together (Cross, 2011; Dorst, 2008). Designers revise problem understanding in the context of developing or revising emerging solution elements (Adams et al., 2003). Revising problem understanding occurred as participants received and gathered information and worked with constraints. GD1 summed it up, “...all problems or questions lead to solutions/answers. The quality of those solutions is based on the information received/gathered, understanding of the project, its goals and constraints...” (Appendix G, page 135, line 11).

With a just design mandate, GD1 had no choice but to interact with a developing problem-solution relationship. Stakeholders did not know the problem or the solution. Stakeholders did not articulate what they wanted until they could react to potential solutions (Appendix G, page 144, line 81). Early partial solutions were necessary to gather information (what stakeholders wanted). GD1 could not productively reflect-in-action until this happened. Reflecting on this, GD1 wished she knew the constraints and knew the build plan from the start (Appendix G, page 143, lines 77-80). “I could have come up with other design styles and ideas based on what we have. Meaning I could be just as inventive/creative, but also have everything sized right for the current site,” (Appendix G, page 143, lines 77-80). GD1 continued with this reflection, “Wish we could have designed for reality first...Think we would be further ahead with the project if we had,” (Appendix G, page 143, lines 77-80).

GD2 described his opportunity for solution development as “high” (Appendix H, page 175, line 100). GD2 had access to a project manager’s notes and a recorded audience-message-action meeting. This information shaped GD2’s understanding of the problem and drove

solutions. Focusing, “on those ‘omg’ moments clients expressed,” (Appendix H, page 175, line 100), GD2 moved in a specific direction with his homepage design.

To develop the problem-solution relationship, GD2 thrived on constraints. “So much easier. Now, I am designing,” (Appendix H, page 180, line 180). GD2 further explained, “Typographically, when I don’t have constraints I have to be general. It has to fit everything,” (Appendix H, page 180, line 182).

GD2 wanted to have the college homepage to be a big campus image with text overlay. In order for this to occur, GD2 needed a constraint – what would be the acceptable specific image(s). For GD2, the image was not a thought in the wire frame space, but developed in the design comp space as GD2 came up with solutions for redesign that focused on the students (Appendix H, page 180, line 184). Since the client would not commit to an image, GD2 had to design text boxes. Instead of text on blue sky, text was placed in boxes. GD2 concluded that since he did not have a specific image, he had to be more general with the design so it fit all possible images (Appendix H, page 181, line 186). Referencing the diluted design due to the lack of imagery constraints, GD2 noted, “Designers work best when they have constraints,” (Appendix H, page 181, line 187).

E3 actively adjusted calibration thresholds to discover what may be part of the problem. Thresholds helped filter out the different ways a problem can occur (Appendix I, page 188, line 61). E3 attacked the problem-solution in layers. He sought information to help avoid problems and look for the best solution. “I know the problem from a broad level. I have to get to the details to see what is causing the problem,” (Appendix I, page 188, line 61).

Through discovery (gathering data), E3 always kept an eye on how partial solutions may have caused other problems. This was E3 using partial solutions to define the problem. “So

potential solutions better define the problem because of trial and error. You try something to fix the problem, if it does not fix it, or cause some other problem, the original problem becomes better defined,” (Appendix I, page 184, line 16).

ID6 designed scaffold tweets as solutions to potential problems that may or may not have occurred. Her problem-solution co-evolution would happen during the actual camp when girls tweeted. If campers did not tweet, ID6 had a tweet to reengage them. If campers’ tweets went the wrong way (not focused on preventing bullying), ID6 designed a scaffold tweet to put campers back on track (Appendix L, page 235, line 160). Through her reflection-in-action, she designed scaffold tweets that were ready when the tweet problems evolved during the camp.

ID7 wrestled with the problem-solution relationship as she reflected-in-action in the midst of information constantly coming in and the constraint that Phase 2 had to be completed by December 31, 2013. Taking stock in National Healthcare Reform information that was missing helped ID7 better understand the problem. ID7 reflected in a weekly journal:

On Thursday, the workgroup lead called a meeting and listed all the topics that Business Readiness identified for Phase 2 training. We all went through the hundreds of sub-topics (similar to a learning objective level of information) to determine what information we had, what we didn’t have, when did we think we could get, who was responsible for making these decisions, can we push this to Phase 3, or is it essential to train by Phase 2. At least now we know what we don’t know. (Appendix M, page 241, line 20)

Reminiscent of ID7, ID4 dealt with rapid change and built adaptability and durability into the design (Appendix J, page 204, line 16). For ID4’s DiSC dealership training, the basic structure of the problem was known, but it changed with every dealership and ID4 was forced to be nimble enough to adapt to those changes as he did not truly understand the problem until he was at a dealership (Appendix J, page 204, line 17). There was problem-solution co-evolution

here. As the dealership facilitator, ID4 needed to come up with solutions as he saw different problems at different dealerships.

For participants, complex design problems and emerging design solutions developed together. During reflection-in-action, participants revised and confirmed problem understanding while designing and revising emerging solutions. The quality of solutions was based on design constraints and information received and gathered.

As participants reflected-in-action, opportunities emerged from the problem-solution relationship. When designers look at problems from different perspectives, they are able to discover design opportunities (Dorst, 2012). As participants interacted with the problem-solution relationships, participants discovered design opportunities. These opportunities had both an immediate impact and future impact possibilities.

As GD1 received more information, the problem-solution relationship began to spark design opportunities. GD1 clearly stated that when she received information, “I can think of six different ways to do what you want,” (Appendix G, page 145, line 110). When designing the careers section of the health system website, GD1 reflected on her interaction with the project managers. While taking stock in an early landing page design, GD1 realized that, “...there wasn’t a ‘right 100%’ direction,” (Appendix G, page 152, line 177). This was exciting and refreshing in two ways. First, design opportunities resulted in solid options. Second, GD1 kept the careers section design moving forward (Appendix G, page 153, line 178). GD1 commented, “Each solution represented different issues or needs the user may have or different approaches,” (Appendix G, page 152, line 177).

Even late in the design project, GD1 continued to find opportunities as she interacted with the problem-solution relationship. GD1 was very focused on anticipating problems. She

developed a style guide for developers because she saw the potential for problems during the actual build (post-design). As the problem-solution relationship was nearing its end, an opportunity emerged (developer style guide) that would impact post-design.

As the problem-solution co-evolved, E3 consistently referenced opportunities. E3 explained that with an engine for 2014, he does the best he can as E3 has to have calibration ready for the 2014 model year. As time goes on, he can improve the car and make it better (Appendix I, page 188, line 54). “These are opportunities to make it better,” (Appendix I, page 188, line 55).

Interestingly, any given opportunity contained new or additional risks within the potential solution. E3 had to balance the gains versus the risks. E3 wrote in his week 6 journal:

Opportunities are a bit of a joke around the office because opportunities are just a politically correct way to say problem. But true opportunities do exist. Sometimes however there is hesitation to seize new opportunities because of the old “if it’s not broken don’t fix it.” For example, the old way to enable cam phaser movement based off of engine RPM worked. But there was an opportunity to calibrate that function differently (and better). But because the software change was not implemented properly, a problem was actually created! But true opportunities do make themselves available in general when brand new programs are being developed. This current project I’m working on however does not really lend itself to new opportunities. There are certainly calibrations that were developed before I came on the project that have the opportunity to be improved, but because of time and the averse culture to risk, those opportunities cannot be realized. (Appendix I, page 194, line 120)

At each dealership, ID4 had to manage the uncertainty of the problem-solution relationship. Drawing from his knowledge of the DiSC material and his experience as a dealership facilitator, ID4 saw emerging opportunities as the problem became defined in each workshop setting (Appendix J, page 213, line 151). As long as ID4 held true to the DiSC material, he had opportunities to go in different directions. ID4 wrote, “Opportunities for solution development are abundant. Every group has a different complexion, environment,

interest level, size, manager make-up, experience with DiSC, and varying needs, so solutions have to be crafted, on-the-spot to best overcome obstacles presented in each setting,” (Appendix J, page 210, line 108).

A constraint of ID6’s instructional design was that social media had to be used in the bully prevention design. The design project did not specify which social media platform. In the midst of the problem-solution relationship, was this a problem or opportunity? ID6 saw it as an opportunity rather than a problem (Appendix L, page 228, line 59). She noted, “Twitter was actually the runner-up. In my research, Instagram was number one and Twitter was second. I thought it would be better to use Twitter since the organization already had Twitter,” (Appendix L, page 228, lines 60-61)

Using terminology of his field, GD2 described interacting with a problem-solution relationship as questions that lead to layers that help define the problem through the natural consequences of the layers (Appendix H, page 170, line 29). Opportunities helped define layers and draw out layers. GD2 faced an outdated college website. As solutions emerged, another problem layer emerged – the site did not have a cohesive message. GD2 began to design a solution around a transparent, student-focused design. A technical problem layer emerged – the website is not mobile friendly. GD2 now faced opportunities. He designed a website that is smart for the phone, told student stories, and presented a student-first approach (Appendix H, page 170, line 30).

GD5 had a unique opportunity. Usually considered hands-off for a graphic designer, GD5 was able to play with the law firm’s logo. If she could not tweak the logo, “I would have had to do a different design because the old logo was stacked,” (Appendix K, page 220, line 57). The

opportunity to update the logo better defined that problem that the current website was outdated and did not appeal to a younger audience (Appendix K, page 220, line 59).

Throughout the design projects, participants interacted with the problem-solution relationship. As described, in their reflection-in-action, participants discovered design opportunities. These design opportunities had immediate impact and, in some cases, had impact on future designs.

As participants reflected-in-action, problems were uncovered from the problem-solution relationship. Just as participants discovered design opportunities from the problem-solution relationship, participants uncovered problems. As participants reflected-in-action more and more, they uncovered problems, which led to coming up with more solutions (Appendix G, page 155, line 223).

GD1 started her design project with little direction. It was just design. As she worked the problem-solution relationship, GD1 came up against technical constraints that came about because of what GD1 was designing. As a result, GD1 had to go back and design from the current health network website functionality. GD1 explained that if the technical constraints (uncovered problems) had been clearer in the beginning, she would have designed to these technical constraints (Appendix G, page 163, line 314).

Unlike GD1, GD2 uncovered problems from the start. Knowing that the design problem was that the current college homepage had no hierarchy, did not speak to its prospective student audience, and looked dated, GD2, through reflection-in-action, unearthed a positioning and messaging problem (Appendix H, page 169, line 23). GD2 noted, “And that led me to try to steer them elsewhere, towards reality and transparency,” (Appendix H, page 169, line 24).

What happened next was interesting. The messaging problem (a dated site) influenced a technical problem (mobile unfriendliness because it was dated). From these uncovered problems, solutions began to evolve. GD1 wrote in his first journal:

On the more web/interface side of the spectrum, the dated nature of the site raised, among many others a question, what if it was not dated? But, what is not dated? Mobile is pretty new, so perhaps shifting the focus away from the traditional site to a more direct, mobile-friendly, quick and possibly smarter site would be better. But, how could we do that? Perhaps we could make it ideal for any teenager's cell phone? Further, perhaps it could be designed in a smart way, that got the teenager to the information they wanted almost immediately, without needing to scroll through lots and lots of detailed text. Even further, what if the content, while being less lengthy was immersive, maybe told a story? Kids are used to a very fast-paced life style, and they love TV and Dramas. Further they love to think about themselves, not with any malice of course, so perhaps a very 'me-focused' approach would work here. This 'me-focused' experience would work right alongside a school that prided itself on being smaller and more focused, in this way their messaging problems have influenced their technical problems. (Appendix H, page 169, line 26)

For GD2, reflection-in-action was about dealing with the problems that came up. Problems uncovered problems and solutions exposed problems. In the problem-solution relationship, problems defined solutions and solutions defined more problems.

E3 interacted with smaller problems within problems. This forced E3 to focus on the problem-solution co-evolving. He explained:

The design problem is to release an 80% spark/knock/dilution calibration for my engine. Within that design problem, there are smaller problems such as adjusting the knock detection calibration such that vehicles don't detect false knock during performance testing (0-60 mph runs, wide-open throttle runs) but at the same time, still detect real knock at an acceptable rate. This tends to be a double-edged sword. What gives you better knock detection tends to lead to more false knock and vice versa. (Appendix I, page 184, line 9)

By adjusting thresholds (a solution), E3 did not take care of the false knock, but rather he discovered that part of the problem appeared, "...to be that the average signal calculation the controller performs seems to be incorrect for some reason," (Appendix I, page 184, line 15). E3

noted that this is a back and forth process. Partial solutions (adjusting thresholds) pinpointed a problem.

ID6 decided to go with Twitter as the social media platform. This opened up a new range of possible choices and uncovered potential problems because of unknown information. ID6 explored what other communication modes were engaging on Twitter. She wrote, “So if I send a link to a YouTube video, will the campers open and watch it, can I even track that? If I send out a picture of someone in a bullying situation, will campers respond to that more? As I am thinking these ideas, I have run into a copyright concern,” (Appendix L, page 230, line 92). ID6’s discovery uncovered potential problems with copyright issues. This forced ID6 to reflect on the problem-solution relationship. ID6 concluded, “I didn’t go into this design thinking that I would be hiring students to act in a short film on bullying or that I would be taking pictures of bullying situations. I figured I would find these supportive materials online for free. Well I am learning that is not the case,” (Appendix L, page 230, line 92).

For ID7, there is no question that the problem-solution co-evolved as more and more National Healthcare Reform information was gathered. Early in the design, ID7 and an assistant reflected-in-action as they prototyped the training situation. When the assistant asked questions and ID7 could not determine what the assistant was asking, ID7 searched specific sections of the underwriting manual. ID7 uncovered a problem – it was not easy to find the information in the manual (Appendix M, page 242, line 29). ID7 took stock in the unique situation and split the workbook into sections that correspond with the manual and included a trainer debrief after each section (Appendix M. page 242, line 27).

When reflecting on the problem-solution relationship, participants uncovered problems. Participants took stock in uncovered problems, understood the problem, and made changes to the design. Uncovered problems helped participants come up with more solutions.

Research Question #4

Research question #4 was: what impact does a designer drawing from a repertoire of precedents inside and outside of the project have on the reflection-in-action process? Four themes emerged under research question #4:

1. Participants drew from anything and everything.
2. Drawing from outside of the design validated design direction, guided the design, and provided “what ifs”.
3. Drawing from inside the design informed what could and could not be done, supported the design purpose, and guided the design.
4. Drawing on participants’ experience provided design context and made uncertainty more certain.

Participants drew from anything and everything. As a source for inspiration and idea generation, a repertoire of precedents may be gathered from every possible source (Brown, 2009; Dorst, 2011). GD1 benchmarked healthcare, university, and commercial websites. ID4 drew on imagery work that he had done in previous workshops. ID6 looked to see what non-profits were doing regarding bullying and went to the literature regarding the use of Twitter in education. ID7 referenced the ADDIE model with a rapid prototype twist (Appendix M, page 243, line 46). A8 engaged colleagues as an information resource.

In his intent to design a hip and cool college website (Appendix H, page 170, line 33), GD2 drew inspiration from current trends in album covers and www.designinspiration.com. GD2

noticed that popular indie music artists were embracing a new trend in aesthetics (Appendix H, page 186, line 32). In addition, fitting in with early solution idea around “the me factor”, GD2 drew on Swiss design, minimalism, Facebook, and Twitter.

To E3, aesthetics found in a drawing or painting was important to his calibration tables. “I draw on some innate sense of symmetry, pattern, and beauty when creating a calibration,” (Appendix I, page x, line 30). Interestingly, E3 drew on principles of art to visualize something that is not visual. E3 pulled from outside of the design to bring it into the design (calibration tables) and then drew on these tables inside the design.

Drawing from outside of the design validated design direction, guided the design, and provided “what ifs”. When taking stock in the designs, participants often understood the unique and uncertain situation by drawing from outside the design. Even though GD1 started with a just design approach, GD1 validated her initial design direction by looking at medical, university, and commercial websites (Appendix G, page 147, line 148). GD1 drew on specific sites for a reason. GD1 looked at medical sites to see if they are doing anything different. She drew on university sites because they have similar challenges in organizing a great deal of information. Commercial websites tend to be forward thinking, customer-focused, and driven to market themselves.

Researching these websites helped guide GD1’s design especially in taking a user’s perspective in seeking out what works. GD1 noted, “This helped me to think outside the medical bubble and think better, but also realistically. I noticed things that users would like and even expect when visiting other websites (not just medicals ones),” (Appendix G, page 148, line 151). GD1 started out with a simple design approach and drawing from outside the “medical bubble” validated her direction and subsequently guided the design.

GD5 enjoyed websites that utilize full width imagery because it provided the appearance of richness and professionalism (Appendix K, page 217, line 5). Naturally, this worked well for a law firm website attempting to appeal to a younger audience. GD5 drew on her own aesthetic preferences to guide the design.

ID4 drew on statistics, pulled them into the design, used them to guide the design, and then presented a visual to illustrate the data. In essence, ID4 pulled from things outside the design project that he was confident in and had seen succeed. ID4 reflected:

I've also used powerful statistics in past initiatives to make strong points. I'm incorporating some of those statistics into the design. For instance, if a customer leaves your dealership and has service done elsewhere, 90 percent of them won't return to your dealership. I've also developed scenarios, in past initiatives, to illustrate the value of one lifetime customer to a dealership. I intend to map out an "on-the-fly" visual reference, perhaps on a flipchart, of the value of one customer to the particular dealership. (Appendix J, page 205, line 24)

In trying to guide and validate her use of Twitter, ID6 appeared to struggle with how to balance her knowledge about message design with her doubts about its utility in her design. What ID6 would naturally draw from did not apply. ID6 explained, "To me and in the instruction field words are not all that attractive I would say engaging, but the concept of Twitter...is in itself 'engaging' to participants, so the instructional design rules that I know of with motivation, message design, engagement, etc. are not applicable here," (Appendix L, page 230, line 90).

ID7 was thankful that she was able to draw from a combination of the ADDIE model and rapid prototyping (Appendix M, page 244, line 47). Internalizing the model with a rapid prototyping twist, ID7 was able to keep up her design pace. She wrote, "Thank goodness for this process. I originally started with about 15 different topics that I needed to include in the design. I have since dropped several topics...and have added a few others..." (Appendix M, page 244, line 47)

GD2 dealt with a month hiatus in his college website design project. Despite the pause, drawing on another design project, GD2 reflected-in-action on “what ifs” for the college website. GD2 explained in his second interview meeting, “It has not ended. My direct design ended, but indirectly my knowledge is still going,” (Appendix H, page 176, line 113). GD2 concluded, “During the wait period, an idea could be presented,” (Appendix H, page 176, line 123). During the hiatus, GD2 admitted that if a solution or idea came up for the college website, he would document it.

When reflecting-in-action, participants often understood unique and uncertain situations by drawing from outside the design. As Participants drew from outside of the design, they validated design direction, guided the design, and provided “what ifs”.

Drawing from inside the design informed what could and could not be done, supported the design purpose, and guided the design. Just as participants drew from outside their design projects, participants drew on repertoires of precedents inside their design projects. With very little to no direction early in the design project, GD1 started with very simplified design goals. As “larger goals” evolved so did the design’s complexity (Appendix G, page 149, line 154). GD1 drew on the early, simplified designs as she tackled the more complicated design requirements.

GD1 collaborated with the lead developer. This collaboration was crucial for setting needed boundaries (what could and could not be done) and guiding the design (Appendix G, page 149, line 156). GD1 took stock in her conversations with the developer. GD1 reflected-in-action on this is what she had done, now can she push the line on what she had done, and then will it function the way she designed it. In collaboration with the developer, GD1 drew from what she had designed at that point and changed what she had designed based on the developer’s

feedback. GD1 wrote, “Also, he has been able to say that we can’t do something one way because of as technical constraint, to which I can then ask about if it would work still if I changed it in some way,” (Appendix G, page 149, line 158).

From the start, GD2 had a purpose in mind for the redesigned college website. This purpose was messaging that resonated with prospective students. As GD2 designed with this purpose, he pulled from the audience-message-action (AMA) workshop to support the purpose. To get the client excited about the design purpose, GD2 used the recorded AMA workshop to provide content and context to the homepage design (Appendix H, page 174, line 90). From the recorded AMA workshop (inside the design), GD2 picked up on people’s excitement on how students would choose their major on the site (Appendix H, page 174, line 91), and on people’s indecisiveness regarding how to treat athletics (Appendix H, page 174, line 90). GD2 confessed, “The back and forth helped me. The dynamic conflict showed me that there was give and pull so they could meet in the middle,” (Appendix H, page 174, line 90).

Many participants noted that they drew on early drawings, sketches, or models (inside the design) to guide the design. Interestingly, GD5 was very clear that she does not sketch (Appendix K, page 228, line 46). “I can already see where it is going on in my head so I start,” (Appendix K, page 228, line 47). This did not mean that she did not draw from the inside the design project. For GD5, she drew on what she knew from the beginning – design to the law firm’s current information and design a fresh and younger feel (Appendix K, page 228, line 48).

E3 explained that there were procedures and examples of what a calibration should look like (Appendix I, page 187, line 40). E3 began his design following the calibration procedures as they provided what to do and provided guidance. As the design development progressed, E3 reflected-in-action on previous calibrations. E3 noted, “So any calibration at this point starts

from a previous calibration and essentially gets updated as things change on the engine and new learning occurs,” (Appendix I, page 187, line 36).

A8 had the unique situation that he was not onsite. In order to make decisions on what could and could not be done, A8 had to draw from a great deal of inside information. Each decision inside the design had the potential to limit what is possible or not for other decisions. A8 wrote in his first reflection journal:

Every design decision has pros and cons to it. I review the pros and cons and make design decisions with the input of the client, code criteria, industry standards, personal experience. These decisions are ultimately done to achieve the overall objective which is to protect the inside of a facility from the weather. Each decision affects the next design problem. They are woven together or stacked like building blocks. An example of this might be the wind calculation for Tuscaloosa indicated wind speeds of 100 mph. This affects the uplift pressures and indicates the number of insulation fasteners required. (Appendix N, page 258, line 11)

ID4 had the opportunity to draw from specific items inside the design. These items were different for each dealership. At each dealership, ID4 drew on a completed sample management DiSC profile, actual completed DiSC reports for each participant (completed prior to training), and a cumulative DiSC report (consolidation of results from all leadership team members) (Appendix J, page 205, line 26).

From the instructional design start, ID6 had to draw on two important items inside the design. First, there was the social media requirement. Second, ID6 had a bullying guide from the organization. In her reflection-in-action, these inside factors led ID6 outside of the design in order to better understand the design purpose. In regards to the social media requirements, ID6 wrote in her week 2 reflection journal, “I need to research Twitter, Facebook & Instagram or even Vine to find out what our learners are using,” (Appendix L, page 225, line 27).

The bullying guide from the organization was not adequate. ID6 noted, “In most cases, the information just touches upon bullying and does not really offer solutions or ways for girls to get out of bullying situations,” (Appendix L, page 225, line 29). ID6 began drawing from outside the design. She looked at how non-profits and schools addressed major bullying issues among 14-18 year old girls (Appendix L, page 225, line 29).

For ID7, the flow and absorption of information inside the design appeared to dictate decisions and define what is possible or not. Early in the design, ID7 drew on gap analysis and learner analysis, traditional instructional design processes, in order to ask work groups questions that helped ID7 understand problems and revise the design (Appendix M, page 244, line 55). Drawing on another inside design element – pre-formatted templates, ID7 reflected on what was happening, “I am leveraging everything that I possibly can to complete this project by the deadline,” (Appendix M, page 244, line 57).

Participants drew on repertoires of precedents inside their design projects. By drawing from inside the design, participants discovered what could and could not be done, validated the design purpose, and found another way to guide the design.

Drawing on participants’ experience provided design context and made uncertainty more certain. As a source for inspiration and idea generation, a repertoire of precedents may be gathered from every possible source (Brown, 2009; Dorst, 2011). For participants, this included drawing on their own experience, be it inside or outside the design project. When participants drew on their own experience, they provided design context and made uncertainty more certain.

E3’s 80% calibration design development was unique because it was his first project as a calibration specialist. Drawing on his past engineering roles as a Product Line Combustion Engineer, E3 provided context for the 80% calibration design. E3 reflected:

In that role (Product Line Combustion Engineer), I gained considerable knowledge in terms of fundamental engine combustion. That includes the effect of spark timing on engine performance and the mechanisms with which knock occur. Two-thirds of my current role as a calibration specialist involve spark calibration and knock calibration. So I have a firm understanding of spark and knock and just need to become well versed in calibration itself and not the fundamentals of spark and knock. So when I am developing a calibration, I first imagine what I want the engine to do and how I want it to respond under certain conditions. (Appendix I, page 185, line 23)

To the end of his 80% calibration, E3 reflected-in-action. E3 lessened his uncertainty with confidence that he had developed the correct algorithms from the data. One of the final elements of E3's 80% calibration was dealing with a complex, "not regularly occurring" phenomenon called SPI (Appendix I, page 199, line 193). E3 was, "...at the mercy of a 'chance' occurrence" to design an algorithm to handle SPI (Appendix I, page 199, line 193). Drawing on experience and intuition, in order to design a solution for SPI, E3 determined that he needed to look at data from 30 SPI events. He elaborated, "The more events I have recorded data for, the more confident I have in the algo I develop from the data," (Appendix I, page 199, line 193).

From the information that A8 received from each site, he drew on his experience to provide context and then make a design decision. For the Tuscaloosa, Alabama site, the location was in zone four, which mandated a reflective membrane (Appendix N, page 258, line 14). Drawing on experience, A8 reflected-in-action by providing context to the situation. He commented, "My past experience tells me that given the amount of mechanical equipment and foot traffic that this roof might see, we will need a multi-ply membrane rather than a single-ply membrane," (Appendix N, page 258, line 14). In an interview meeting, A8 admitted that a single-ply was cheaper and could work (Appendix N, page 260, line 34). Because of durability, his experience though told him the best design decision was a two-ply membrane.

Like A8, ID4 drew on his experience to know, “where the holes are,” and what can happen in a unique situation (Appendix J, page 213, line 169). Through reflection-in-action and understanding the unique situation, both A8 and ID4 drew on their experience and made changes. For ID4, drawing on experiences created design opportunities (sitting around the kitchen table, two people chatting, and having real conversations with customers) that he then added to his precedent set (Appendix J, page 213, line 169).

ID6 went beyond professional experience and drew from her childhood experiences. This allowed ID6 to provide context to her bullying education instructional design. One childhood experience involved being a member of the girls’ organization that was the audience for her instructional design. ID6 remembers enjoying being part of the organization, but not having fun at the camps. “I just remember being really hot and bugs everywhere,” (Appendix L, page 224, line 23). Another childhood experience involved a bullying experience in middle school. Drawing on the bullying situation, ID6 remembered her own sensitive feeling at that age which affected her reflection-in-action during the design. ID6 confided, “In comparison to what girls/kids have experienced today, I think that my experience was minimal, but it’s still important because it reminded me how sensitive and important the issue of bullying is,” (Appendix L, page 224, line 25). As to how it affected her instructional design, ID6 explained, “Remembering my own sensitive feelings at that same age with the same topic constantly encouraged me to be very thoughtful about moving forward with this issue,” (Appendix L, page 224, line 25).

GD2 coupled his life experience with what is cool and hip with information he had internalized to provide design context and alleviate uncertainty, which he referenced as gambling (Appendix H, page 174, lines 81-83). To move forward with a more edgy college website design, GD2 gambled with a cool and hip approach because he received information from the project

manager that the client was open and did not want to be conservative (Appendix H, page 174, line 82). GD2 summed it up, “It was a guess. It is intuitive like someone gambling. I am just going to pull the handle on the slot and just do it,” (Appendix H, page 174, line 83).

ID7 designed in uncertainty. The flux of no information mixed with a Niagara Falls of information made ID7 reflect, “I am throwing things so fast I am not following any process,” (Appendix M, page 245, line 70). However, ID7’s uncertainty was eased by the basic instructional design rules that she had “internalized” (Appendix M, page 245, line 70). Drawing on her experience as an eight-year instructional designer, ID7 admitted, “At some point, I had to follow some process. What do I really need to know? I have to internalize enough about instructional design so I can pull pieces together that I need,” (Appendix M, page 245, line 72).

Summary

This phenomenological research design used an interactive methodology and multiple data collection methods to study reflection-in-action. The purpose of the interdisciplinary research was to study reflection-in-action regarding three aspects of design activity. Organized by research questions, this chapter provided the qualitative results for the four research questions. Under each research question, I provided support for three to five themes that emerged from the participant reflection journals and interview meetings.

For research question #1, five themes emerged from participants’ reflection journals and interview meetings. Participants’ reflection-in-action made an impact on the design project. When participants reflected-in-action, they took stock in and reacted to external representations which were rich in context, information, and constraints. Participants reflected-in-action knowing the purpose and reality of the design project. During design, participants looked to and

relied on information while they reflected-in-action. Finally, participants reflected-in-action not realizing that they were reflecting-in-action.

Four themes surfaced under research question #2. Participants interacted with information and a lack of information, which kept the design project moving forward. Participants moved the project forward knowing that design opportunities and improvements still existed. Participants moved the design forward toward implementation by turning “what ifs” to design decisions. As reflection-in-action moved the design project forward, participants managed uncertainty.

For research question #3, three themes developed. Through receiving and gathering information and working with constraints, participants better understood the problem-solution relationship. As participants reflected-in-action, opportunities emerged from the problem-solution relationship. As participants reflected-in-action, problems were uncovered from the problem-solution relationship.

Four themes turned up under research question #4. Participants drew from anything and everything. Drawing from outside of the design validated design direction, guided the design, and provided “what ifs”. Drawing from inside the design informed what could and could not be done, supported the design purpose, and guided the design. Drawing on participants’ experience provided design context and made uncertainty more certain.

CHAPTER 5

DISCUSSION AND CONCLUSION

The purpose of this interdisciplinary research was to study reflection-in-action regarding three aspects of design activity: (a) process, (b) content, and (c) context. This study addressed:

1. What is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete?
2. What effect does reflection-in-action have on keeping a design project moving forward toward implementation?
3. What impact does the design's problem-solution relationship have on the reflection-in-action process?
4. What impact does a designer drawing from a repertoire of precedents inside and outside the project have on the reflection-in-action process?

The eight study participants came from four design fields: (a) architecture, (b) engineering, (c) graphic design, and (d) instructional design. Three participants were graphic designers, three participants were instructional designers, one participant was an engineer, and one participant was an architect.

Using criterion sampling, participants: (a) were involved in a short-term project (average length was 64 days), (b) had at least 5 years of design experience (c), were individually responsible for at least 75% of the design work, and (d) were engaged in a non-routine, non-procedural design project (Table 3.1). For the non-routine, non-procedural design project criterion, participants engaged in designs projects that lacked well-formed approaches to solutions (Snider, Culley, & Dekoninck, 2013) (Table 3.5).

Maintaining the process of most phenomenological studies, I engaged eight participants for a relatively long period of time (average of 64 days) (Rudestam & Newton, 2007). As a result, under each research question, themes emerged as I constantly engaged the participants and then had the opportunity to explore these engagements in more detail.

Chapter 4 provided the qualitative results for the four research questions. In Chapter 4, under each research question, I provided support for three to five themes that emerged from the participants' reflection journals and interview meetings. Table 4.1 summarized the themes that emerged under each research question.

In this chapter, I discuss results of the four research questions and significant themes that emerged under research questions. Closely tied to the discussion, I then provide implications for instructional design. I conclude with limitations of the study and recommendations for future research.

Discussion of Results

Unlike many reflection-in-action and design thinking studies, I studied designers designing real projects in the place where they design. Be it an 80% calibration for a 2014 car engine, bullying prevention training for a girls' winter camp, National Healthcare Reform training for customer service representatives, a healthcare website redesign, or roof design development for six U.S. Post Offices across the country, each participant reflected-in-action on an actual design project that had to meet a specific deadline. Each participant released his/her design project.

The fact that participants were designing in reality provided an interesting balance between the driving elements of reflection-in-action found in the literature and what actually happened on the design frontline. The following discussion of results delves into this interesting

balance and then concludes with a discussion on two trends in design thinking and how participants in the study supported these trends.

The discussion begins with how participants reflected-in-action when they took stock in and reacted to external representations. Participants reacted to sketches that took on different forms. The discussion then moves to how participants interacted with information and a lack of information, filled in information holes, and manipulated information. The importance of information was a theme found across all four research questions. Next, I discuss interesting implications of taking new approaches to problems. In the context of an actual design project that is full of complexity, participants interacted with mini-designs, partial solutions, problem layers and the balance of problems and opportunities. I consider how participants drew from their own experiences and intuition, and moved the design projects forward. Finally, the discussion turns to a wider view of reflection-in-action in an ever-evolving world of design thinking. In two design thinking trends, participants supported where design thinking and reflection-in-action are going.

Participants reacting to sketches. In this study, the idea of reflection-in-action was that unique and uncertain situations are understood through attempts to change it, and changed through the attempt to understand it (Schön, 1983; Schön, 1988). As discussed in Chapter 4, when participants reflected-in-action, they took stock in and reacted to external representations, which were rich in context, information, and constraints. This aligns well to how sketching can support a cycle of interpretation and enhance access to earlier designs (van der Lugt, 2005).

External representations or sketches took many different forms. The graphic designer participants certainly engaged sketching in a more traditional sense. Pencil, paper, and crude Photoshop layers fulfilled early sketching for reaction. A8's sketches encompassed a combination of drawings, photographs, and even handwritten notes. ID6 was very specific with

her sketching as she prototyped sending tweets and receiving tweets. ID4 stretched the definition of sketching the most. ID4 interacted with dealership staff and manager participation. More specifically, reflecting-in-action during actual training workshops, ID4 reacted to body language and to dealership team members' interaction and lack of interaction with workshop activities. However participants viewed their own sketching, they all reacted to external representations, which were rich in context. Rich external representations are rooted in authentic situations (real-life, informative, and engaging) and are represented so that they allow for reflection-in-action (Huybrechts, Schoffelen, Schepers, & Braspenning, 2012).

In regards to supporting a cycle of interpretation, there are three kinds of sketches that help identify the role of sketching in a participants' reflection-in-action: (a) thinking sketches, (b) talking sketches, and (c) storing sketches (van der Lugt, 2005). When taking stock in external representations, participants engaged in thinking sketches and storing sketches.

In thinking sketches, designers make use of the sketch to support their thinking processes (van der Lugt, 2005). In essence, sketching helps drive reflection-in-action as designers interpret and re-interpret which leads to new knowledge and new re-interpretation. In one design frame or another design frame, all participants interacted with thinking sketches. The literature describes that thinking sketching is prevalent with engineers and architects (van der Lugt, 2005). For E3 and A8, thinking sketches were vital to their reflection-in-action. Since one cannot see, touch, taste, smell, or hear a cup of calibration, E3 interacted with two dimensional and three dimensional tables in order to work through mini-design and partial solutions leading up to the 80% calibration. In his first interview meeting, E3 asked me to imagine an Excel spreadsheet with the x and y axis (Appendix I, page 189, line 70). E3 continued to have me imagine that the top was engine speed and the left column was pedal position (Appendix, page 189, line 70).

According to E3, the tables were expected to have a pattern and changes in calibration were visualized in the tables. Even though E3 expected his tables to be smooth and symmetrical, at times, he ended up with jagged edges (Appendix I, page 189, line 71). Visualizing it like a painting, E3 reflected on jagged edges, “It’s ugly,” (Appendix I, page 189, line 73). In sum, reacting to jagged and ugly table sketches supported E3’s reflection-in-action. A cup of calibration took form.

E3 was very upfront with his preference of visuals over words. For A8, it was a combination of visuals and words that fueled his thinking sketches. Negotiating six different U.S. Post Offices across the country, A8 relied on the detailed field reports that he received. Dependent on the skills and talents of each field consultant and each site’s constraints, A8’s external representations were as good as the consultants that provided them and as complete as the site constraints would allow. Nevertheless, A8’s thinking sketches included a variety of information – photographs, site plans, reports, zone requirements, and field notes. Whereas E3 had more control over his sketches, like E3, A8 took stock in his thinking sketches, and, drawing from experience, A8 made design decisions and moved the design development forward.

In storing sketches, sketching results in archiving and retrieving information developed earlier in the design project (van der Lugt, 2005). This brings together a theme from research question #1; when participants reflected-in-action, they took stock in and reacted to external representations; which were rich in context, information, and constraints and a theme from research question #4; drawing from inside the design informed what could and could not be done, supported the design purpose, and guided the design. The idea from the literature is that sketches enhance information used in previously generated ideas by providing access to these ideas (van der Lugt, 2005). Access is a key component. For participants, they were always quick

to draw on earlier ideas. Participants' idea archives were fluid and always at their fingertips. With the directive to just design, GD1 reflected on how she began with a very simple design (her earliest sketches), which she continuously drew from as the website design became more and more complex. As the client, project managers, programmers and developers became involved in the ever-evolving complex website redesign, GD1 continued to think on her feet and kept her wits about her as she returned time and again to her early designs.

For E3, storing sketches were archived data. E3 referred to these as mini-calibrations where his calibration data was represented in specific tables at specific data milestones. Drawing from this data and then taking stock in the data, E3 kept his 80% calibration moving forward. This was the reflection-in-action reality of the design frontline. Think about changing while changing it.

Importance of information for reflection-in-action. There is no doubt that information and a lack of information was critical to participants' reflection-in-action. Of the 16 total themes across the four research questions, half the themes involved participants gathering, receiving, reflecting on, and filling in holes with information. As an adaption of Table 4.1, Table 5.1 bolds the eight themes involving information.

Table 5.1

Themes Involving Information are Highlighted

Research Question	Themes
<p>What is the impact of reflection-in-action on evaluation processes while a design is in progress and not yet complete?</p>	<ol style="list-style-type: none"> 1. Participants' reflection-in-action aligned with the definition of reflection-in-action. 2. When participants reflected-in-action, they took stock in and reacted to external representations, which were rich in context, information, and constraints. 3. Participants reflected-in-action knowing the purpose and reality of the design project. 4. During design, participants looked to and relied on information while they reflected-in-action. 5. Participants reflected-in-action not realizing that they were reflecting-in-action.
<p>What effect does reflection-in-action have on keeping a design project moving forward toward implementation?</p>	<ol style="list-style-type: none"> 1. Participants interacted with information and a lack of information, which kept the design project moving forward. 2. Participants moved the project forward knowing that design opportunities and improvements still existed. 3. Participants moved the design forward toward implementation by turning "what ifs" to design decisions. 4. As reflection-in-action moved the design project forward, participants managed uncertainty.
<p>What impact does the design's problem-solution relationship have on the reflection-in-action process?</p>	<ol style="list-style-type: none"> 1. Through receiving and gathering information and working with constraints, participants better understood the problem-solution relationship. 2. As participants reflected-in-action, opportunities emerged from the problem-solution relationship. 3. As participants reflected-in-action, problems were uncovered from the problem-solution relationship.

<p>What impact does a designer drawing from a repertoire of precedents inside and outside of the project have on the reflection-in-action process?</p>	<ol style="list-style-type: none"> 1. Participants drew from anything and everything. 2. Drawing from outside of the design validated design direction, guided the design, and provided “what ifs”. 3. Drawing from inside the design informed what could and could not be done, supported the design purpose, and guided the design. 4. Drawing on participants’ experience provided design context and made uncertainty more certain.
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In a study driven by the problem-solution co-evolution (Dorst & Cross, 2001), Kruger and Cross (2006), based on their data analysis and evidence of designers’ behavior from a verbal protocol, identified four design strategies: (a) problem driven design, (b) solution driven design, (c) information driven design, and (d) knowledge driven design. For the purpose of this discussion, what is important is that all four of these design strategies involve gathering, receiving, and interacting with information. Information is critical to problem-solution co-evolution. This supports what was evident in my study. Participants engaged with information as they reflected-in-action.

What was most intriguing from my study was how participants interacted with information and a lack of information. What Kruger and Cross (2006) concluded from their study paralleled what happened in my study. For designers in the Kruger and Cross (2006) study, the most frequent designer activities included gathering information, identifying constraints, and designing partial solutions. These three activities were definitely prevalent as my participants reflected-in-action.

While most participants gathered information to add elements, context, and substance to their design project, in key instances, E3 actually gathered information to remove factors from the 80% calibration design development. In other words, instead of actively looking to choose

elements that added to the calibration, E3 had to avoid elements that would detract from the 80% calibration. This was most evident when E3 wrestled with the SPI situation. Stochastic preignition (SPI) is a phenomenon in turbo engines. Not completely understood how or why it occurs, the prevalent thought is SPI happens when oil droplets enter the combustion chamber and spontaneously combust under the immense pressure and temperature that occurs during turbocharged conditions (Appendix I, page 191, line 86). Through reflection-in-action, E3 tried different speed/load, spark timing, and other conditions to gain a better understanding as to how SPI occurred in an engine (Appendix I, page 191, line 86). E3 gathered information to understand enough to design a partial solution that keeps an engine from having a SPI event (Appendix I, page 191, line 86). This was reflection-in-action at its best. E3 took stock in the situation and understood the unique and uncertain SPI situation by trying to induce SPI (change the unique and uncertain situation), and then by inducing SPI (the change) attempt to understand how to keep an engine from having an SPI event. E3 interacted with data, experimented, and found the conditions that caused SPI in order to avoid recreating it in the design. The alternative, just wait for SPI to happen and then react to its consequences, was unacceptable.

E3 had the opportunity to experiment with calibration data in a relatively low risk SPI design exercise. Interestingly, this was not always the case for participants. For ID7 in some design episodes and definitely for ID4 in most design episodes, taking stock in external representations missed the element of the hypothetical that other participants had. ID6 had piloted tweets. E3 had his oftentimes ugly tables. GD1, GD2, and GD5 had early design comps. A8 had field data prior to designing the final roof solutions. In these design episodes, participants interacted with low risk exercises to realize the final design at a later point. For ID4, there was no room for low risk exercises; only performance. At dealerships, ID4 reflected-in-action while

facilitating DiSC workshop. In interview meetings and reflection journals, ID4 often used “on the fly” to describe his reflection-in-action (Appendix J, page 204, line 20). The distance between the speculative and the actual was collapsed. In many design episodes (in the midst of a DiSC workshop), they were one in the same.

Although ID7 had more room than ID4 to maneuver between the actual and speculative design spaces, on the design frontline, she was not able to freely experiment as the other participants. ID7 interacted with an erratic flow of information. At times, ID7 designed with little to no information, and at other times ID7 was left with nothing more than an umbrella under the Niagara Falls of National Healthcare Reform CSR information. For ID7, limiting information became a survival tactic and provided realistic boundaries that allowed for forward movement. Otherwise, the National Healthcare Reform training would have drowned in the Niagara Falls of information. ID7 noted, “What is giving me an edge is I know why I cannot use certain information because it is not related to the job function. I cannot relate the piece of information to what a CSR has to do,” (Appendix M, page 247, line 89).

The fourth theme under reflection question #1 – during design, participants looked to and relied on information while they reflected-in-action – highlighted how participants interacted with information. Information often fed participants’ judgments. Participants often relied on their judgment to fill information gaps or anticipate problems that arose due to a lack of information. GD1 and A8 both filled information gaps when information was not readily available when they needed it. GD2 was excited to listen to the audience-message-action session audio from the college website redesign kickoff meeting. What key stakeholders thought informed GD2’s judgment of what would be hip and cool for the college website redesign. For ID4, his professional judgment was a lynchpin of the dealership facilitations, as it was his expertise and

experience that allowed him to gather information and deal with constraints in the moment, and then instantly reflect and respond with a solution.

ID7 is the prime example of how participants interacted with information, a lack of information and how participants filled in information holes. ID7's reflection-in-action revolved around pinning down and then quickly absorbing National Healthcare Reform information that was constantly shifting. This was best exemplified as ID7 went through hundreds of sub-topics to determine what information the instructional design team had, what it didn't have, when would the team get it, who was responsible for making the decisions, could it be pushed to Phase 3, or was it essential to train by Phase 2 (Appendix M, page 241, line 20).

The first theme under research question #2 – participants interacted with information and a lack of information, which kept the design project moving forward – showed how information helped participants, what GD5 called, design to reality (Appendix K, page 220, line 52). Participants were designing real projects with real milestones and real constraints. They had to move the design projects forwards toward implementation. Designing to this reality was essential. Without information, the reality construct used in a design space may have been out of focus or incomplete in important areas thus limiting the potential for solutions. Participants did not know the reality of their design projects without information. In order to move the design project forward, participants had to design to reality.

New approaches to problems. Design problems are amongst the most complex as they are embedded in context and change over time (Jonassen, 2000). In the complexity of their design projects, participants tangled with ill-structured problems. Ill-structured problems make design problems particularly difficult because ill-structured problems are: (a) incomplete and have ambiguous goals; (b) have no predetermined solution path; (c) have inconsistent

relationships among concepts, rules and principles; (d) and require an integration of multiple knowledge domains (Guindon, 1990; Jonassen, 1997; van Merriënboer & Kirschner, 2007).

In the midst of real and ill-structured design situations, Dorst (2012) contends that design experts concentrate on the problem and find new approaches to problems. Replacing old frames with new frames results in opportunities for solutions (Dorst, 2012). Finding new approaches to problems has synergies with the problem-solution co-evolution (Dorst & Cross, 2001). Participants found new approaches to problems and connected to the problem-solution co-evolution. However, in the muck and mud of participants' design project swamps, this was a complex endeavor.

ID7 summed up the reality of what reflection-in-action can sometimes feel like. She reflected, "I feel like I've been to war and the dust is now settling after the battle. The battlefield is littered with draft upon draft of design documents and training materials," (Appendix M, page 247, line 99). As noted throughout the study, ID7 was a good example of being connected to the design purpose and reality as ID7 never really escaped the ongoing changes to schedule, content, and the amount of information available at any one time. Managing these constraints emerged as the larger design problem over and above designing National Healthcare Reform CSR training. For ID7, there did not seem to be any time to concentrate on the problem and find new approaches to problems.

All participants had to trudge through their design swamps. No design project came off flawlessly. No design project was easy. Despite the complexity, participants did find new approaches to problems and realized emerging design opportunities (second theme of research question #3). These came in the form of mini-designs, partial solutions, and problem layers. For E3, taking new approaches to calibration problems meant more opportunities or, "...more than

one way to skin a cat,” (Appendix I, page 184, line 10). Interestingly, E3’s 80% calibration had to coexist and function within a dependent network of mini-designs which was a further design constraint. E3 was directly responsible for 1000 of the 20,000 calibration variables. E3 explained that there were 20 calibrators who contributed to the one calibration (Appendix I page 193, line 104).

Both E3 and ID6 saw opportunities with their problem-solution co-evolution. E3 had the constraint of pushing out a calibration for the 2014 engine, and the opportunity to improve his partial solution calibration for future model years. By deciding on a design-based research approach, ID6 had the opportunity to adjust tweets depending on campers’ tweets. ID6 saw instructional design opportunities beyond the bullying prevention training.

As GD2 fought and embraced constraints, his take on a new approach to problems was that problems have layers. GD2 searched out these layers as he designed a college website that had a hip and cool message not to current students, but to prospective students. GD2 interacted with cool and hip opportunities found in the problem layers. GD2 showed that in the midst of a project engaging with the problem-solution co-evolution was not easy. GD2 searched for a tension, and ultimately a balance, between structure (constraints) against the flight of ideas (opportunities). For GD2, there had to be some tension between the two in order to move forward (Appendix H, page 173, line 72). GD 2 desperately wanted the college clients to choose specific images for the homepage (structure) so he could design content directly on the images (opportunities). Unfortunately, the client did not provide specific images. GD2 had to design a utilitarian homepage with content in boxes that would accommodate any image.

Participants drew from experience and intuition. In the literature, across engineering, graphic design, and instructional design, reflecting and making judgments on what designers

tacitly know means that designers rely on experience and intuition. Spitas (2011) concluded engineers' exploration of a design space is driven by designer intuition and experience. Human-centered designers like graphic designers follow a structure where they reflect on and compare experiences that result in new insights about practice (Conley, 2004). In instructional design, designers use personal experiences, frames of references, design principles, and context knowledge to consider alternative solutions during the design process (Kirschner et al., 2002; Pieters & Bergman, 1995; Rowland, 1992).

On the reflection-in-action frontline, under the fourth research question, a theme that emerged was that participants drew on their experience to provide design context and make uncertainty more certain. For two participants this theme had real synergies with the theme (under the second research question) – participants interacted with information and a lack of information, which kept the design project moving forward. A8 and ID4, interestingly the two most experienced designers in the study, clearly used their experiences and intuition, "...to fill in the missing pieces..." (Appendix N, page 263, line 95). When facing uncertainty and doubt, A8 and ID4 drew on what they knew, what they had experienced in the past, and what their gut told them.

A8's unique situation was that he was not in the field. He reflected-in-action on information that was not always complete. To keep roof design developments moving forward, A8 confidently compensated for missing pieces of information with his experiences. This is where participants' experiences really had an impact. A8 explained that waiting for answers sometimes meant leaving holes in a design or making assumptions based on his experiences (Appendix N, page 263, line 95). Without his 18 years of experience, A8 could have missed a

trouble spot, which could have stalled the design development. “It is all experience with post offices and the trouble spots,” (Appendix N, page 262, line 69).

Like A8, ID4 drew on his 20 years of instructional design experience to know, “where the holes are,” and what can happen in a unique situation (Appendix J, page 213, line 169). Through reflection-in-action and understanding the unique situation, both A8 and ID4 filled in holes by drawing on their experience and then making changes. With one participant remaining after two managers left a three-person workshop, ID4 intuitively switched from facilitation to a coaching session. When a room was too small, ID4 drew on experience and changed the dealership DiSC training environment to just sitting around the kitchen table and talking.

Support of design thinking trends. Design thinking is ever-evolving. As a part of design thinking, reflection-in-action benefits from the design thinking evolution. Two trends that resonate with this study are co-evolution episodes are an integral part of everyday design practice (Wiltschnig & Christensen, 2013) and the scope of design is no longer restricted to products (Goldschmidt, 2013).

In a study’s purpose to advance the understanding of problem-solution co-evolution, Wiltschnig and Christensen (2013) concluded that designers interact with co-evolution episodes in everyday design practice. Once thought of as aha moments, their view of co-evolution episodes corresponds to Dorst and Cross’s (2001) view where co-evolution episodes are not design leaps but rather constructing bridges between the problem and solution spaces (Wiltschnig & Christensen, 2013). Participants were in sync with this position. Design projects lasted an average of 64 days. Although not all intermediate milestones were met, for all participants final milestones were reached. Interacting with problem-solution co-evolution, participants kept reflecting-in-action and kept design projects moving forward.

The design thinking literature now emphasizes that design is concerned with products, services, and systems (Goldschmidt, 2013). Design thinking is a methodology to bring about innovative ideas (Brown, 2009; Goldschmidt 2013). GD1, GD2, GD5, and A8 designed products. It could be argued that ID6 and ID7 designed products, but the bullying prevention and National Healthcare Reform CSR trainings definitely had service elements. E3's 80% calibration design was concerned with a larger engine system. As E3 commented, he was responsible for 1000 of 20,000 calibrations. ID4 provided a breath of fresh air in the study. From reflecting-in-action on the fly to taking stock in learner's body language to drawing from experience and expertise inside and outside of the design, ID4 was a great example of how design thinking has moved away from products.

Implications for Instructional Design

My interdisciplinary study had both scholarly and practical significance for instructional design. Instructional designers are just that – designers. I studied instructional designers along with graphic designers, an engineer, and an architect designing real design projects in the places where they design. Instructional designers can learn much about reflection-in-action from engineers, architects, and graphic designers. For instructional design scholarship, I crossed disciplines to study the impact and effects of designers reflecting-in-action.

To really dig into the implications for instructional design, it is important to return to the opportunity of this study and where this study has its roots – Donald Schön's reflection-in-action. Within the design thinking research, there are two ways to look at the design process: (a) rational problem solving and (b) reflective practice (Brown, 2009; Cross, 2011; Dorst, 2008; Schön, 1983). In this study, I chose to look at reflective practice. In reflective practice, the design thinking literature replaces evaluation with reflection. Designers have a reflective conversation

with a design situation where the situation talks back and the designer responds to the back talk (Cross, 2011; Schön, 1983). In architecture, engineering, graphic design, and instructional design, designers evaluate a developing design project in a range of ways: formally or informally; following traditional scientific roles or intuition. The evaluative process may differ, but designers make judgments of the strengths and weaknesses of the design product or process while operating in a space of complexity and uncertainty. As my study presented, participant' reflection-in-action drove their evaluative processes.

If instructional designers are conducting evaluative processes in a number of forms, then where can instructional designers turn to better understand reflection in the midst of complex, uncertain, and ill-structured problems? Instructional designers can turn to reflective practice where a framework already exists. Designers have been dealing with open and complex problems for years, and designing disciplines have developed practice to do this (Dorst, 2011).

Across design fields including engineering, architecture, instructional design, and human-centered design such as graphic design, designers' ability to rapidly evaluate design during the design process is important to increase design productivity (Brown, 2009; Christensen & Hansen, 2010; Conley, 2004; Green, 2000; Williams et al., 2011; Yeomans, Bouchlaghem, & El-Hamalawi, 2006). Evaluation is part of what designers do. Evaluation is different than other design tasks because evaluation runs through all design tasks (Derelöv, 2008; Williams et al., 2011). However, when asked to describe inquiry methods, designers talk about experience, trial and error, intuition, and just working through (Schön, 1983). Instructional designers understand that rapidly evaluating their design during design has benefits in moving a design forward. Instructional designers understand evaluation is part of what they do. This study has implications

for instructional designers as it provides a rich and thick description of *how* interdisciplinary designers reflect-in-action during design.

Instructional designers use phrases like “thinking on your feet,” “keeping your wits about you,” and “learning by doing” (Schön, 1983, p. 54) to describe designing in the mud and muck of instructional design swamps. Reflection-in-action stresses that the unique and uncertain instructional design situations are understood through pursuits to change them, and changed through the bids to understand the situations. Schön (1983) contends that, for designers, reflection may vary in five distinct ways: (a) designers reflect and make judgments on what they tacitly know about their practice, (b) designers reflect on strategies and theories that are embedded in behavior patterns, (c) designers reflect on the feelings for a situation that leads to taking on an action, (d) designers reflect on how a problem has been framed, and (e) designers reflect on the role that they have taken. The implications of reflection-in-action for instructional design lie here. On the design frontline, instructional designers’ evaluation processes align with these variations in reflection.

Designers reflect and make judgments on what they tacitly know about their practice. Traditionally, in instructional design, formative evaluation is making judgments of the strengths and weaknesses of a design while the design is developing. Many instructional designers approach formative evaluation as craft or art rather than science, which leads to evaluation activities that are more informal than formal (Tessmer, 1993; Williams et al., 2011). Informal evaluation activities and a craft or art approach bring in experience and intuition. In my study, reflecting-in-action and making judgments on what participants tacitly knew meant that participants relied on experience and intuition. The three instructional designer participants relied on their experience and intuition when reflecting-in-action. In reflecting on the problem,

solution, and opportunities during the design process, instructional designer participants drew from personal experiences and design principles, referenced new and old design frames, and intuitively checked their gut. When instructional designers take stock in their design and react to an external representation, they put themselves in a place where experience and intuition become a part of reflection-in-action.

A key element of the study is that instructional designers may learn from other designers in architecture, engineering, and graphic design. Human-centered designers like graphic designers and architects follow a structure where they reflect on and compare experiences that result in new insights about designers' practice (Conley, 2004; Shannon & Radford, 2010). What designers tacitly know helps designers understand what is happening and what could happen. For the graphic designer and architect participants, they consistently reflected on early sketches. Instructional designers do not sketch enough. They need to sketch. When instructional designers taking early stock in whatever is the sketch (pencil and paper or pencil-less and paperless), they know what is happening and what could happen with the design.

There is evidence that instructional design evaluation is not always formal, and evaluation activities become tacit activities that are performed everyday by designers without much thought (Williams et al., 2011). In my study, participants often did not realize that they were reflecting-in-action. What is essential is that on the design frontline, when reflecting-in-action, instructional designers reflect and make judgments on what they tacitly know about their instructional design practice.

Designers reflect on strategies and theories that are embedded in behavior patterns.

As a space rather than a process, design thinking is abductive (Cross, 2011; Dorst, 2011). In abductive reasoning, a designer shifts and transfers thoughts between the required purpose or

function and the appropriate forms for an object to satisfy the purpose (Cross, 2011). In essence, designers move back and forth between an analysis space (required purpose or function) and synthesis space (appropriate forms for an object to satisfy the purpose). Within a design space, designers need to tolerate uncertainty, interact with external representations (sketches, models, and other materials), rely on intuition, and take stock and reflect on the what and how (Cross, 2011). So, what can instructional designers do? Prototype. In my study, participants prototyped throughout their design projects. Instructional designer participant ID6 may have been the cleverest, prototyping scaffolding tweets and prototyping what a tweet would look like on an iPhone screen.

Prototyping is a design strategy that creates reflective opportunities (Brown, 2009; Christensen & Hansen, 2010; Cross, 2011; Pieters & Bergman, 1995). In my study, in early design spaces where participants were doing a lot of prototyping, participants' behaviors were much different than behaviors in later design spaces. In early design spaces, designers' knowledge is low and freedom of how to solve tasks is high while in the end spaces, designers' knowledge of the problem is high and design freedom becomes limited (Derelov, 2008). Early prototyping was abundant in what ifs, exploration, and discovery. Later design spaces were filled with design commitments and decisions.

What is a possible implication of instructional designers reflecting on strategies and theories that are embedded in behavior patterns? The implication is that designers maintain a balance of rationality and intuition and a balance of technical proficiency and creativity (Rowland, 1992). Always, participants in the study designed to reality. Reflection-in-action provides the space where instructional designers may understand what is going on, make

changes, take stock in the changes, and then make more changes. There is flow from what ifs to design decisions; exploration to design commitment. This is designing to reality.

Designers reflect on the feelings for a situation that leads to taking on an action. A designer's world is complex, complicated, and always changing (Brown, 2009; Cross, 2011; Guindon, 1990; Schön, 1983; Williams et al., 2011). Reflecting on a situation and then taking action can result in reduced project time, reduced costs, greater design coordination, and better quality designs (Williams et al., 2011; Yeoman et al., 2006). These are important to instructional designers on the design frontline. Trudging through their complex and complicated design swamps, all eight participants met their final milestones. Continuous reflection-in-action allows instructional designers to respond to changing complexities in a dynamic situation (Williams et al., 2011).

Designers reflect on how a problem has been framed. In practice, instructional designers' designs are highly solution driven and context sensitive which means solutions are gained by means of an iterative and integrated process (Kirchner et al., 2002). As discussed in Chapter 4 and Chapter 5, participants continuously wrestled with the problem-solution relationship, where they defined problems, imagined solutions, and embraced opportunities. This is not new and earth shattering to the instructional design world. Expert instructional designers frame a problem by decreasing the problem space with potential solutions, which then allows designers to explore problems and interpret them as ill-defined, and design intuitively and reflectively by looking at alternative solutions in tandem (Kirchner et al., 2002; Pieters & Bergman, 1995). The significance here circles back to the opportunity of this study. Instructional designers can turn to reflective practice where a framework already exists. Architects and engineers, for certain, and graphic designers have been reflecting-in-action for years. Designers

have developed practices to do this. The three instructional designer participants showed the tenets of reflection-in-action happened in instructional design just as it did in graphic design, engineering, and architecture.

Designers reflect on the role that they have taken. In practice, even though designers sketch and diagram design problems, designers struggle in describing how decisions are made about alternative courses of action (Cross, 2011; Kerr, 1983). In a case study that looked at architectural students' response to an experimental integrated project-based studio, students participated in planned iteration where students looked at the same technologies and issues several times (Shannon & Radford, 2010). The purpose of this planned iteration was to promote student learning and understanding. The authors concluded that design is a cyclical process of reflective practice that includes: (a) architectural design students understanding a design situation and potential by reflecting on design proposals and (b) students self-reflecting on the reflective design process (Shannon & Radford, 2010).

Where is instructional design's opportunity to unleash reflection-in-action and more broadly design thinking? We need to look no further than how our design colleagues in engineering and architecture unleash it. It is in the instructional design classrooms. Instructional design students need to study and learn instructional design from a design thinking approach. This means allowing students to design in spaces that are grounded in instructional design principles such as: (a) be an advocate for the learner, (b) design to reach outcomes and show achievement, (c) design with an eye on the learning and performance contexts, and (d) design authentic learning. Make instructional design students give us something to *react* to, and make it *rich*.

What are these design spaces? First, they are supported with the elements of good instructional design. There is no need to reinvent a new design thinking approach. Similar to, and a variation on other design fields, the instructional design spaces are discover, define, ideate, prototype, and test. Discover and understand learners' fears, dreams, and hopes; and what they want to accomplish. Define and frame problems as opportunities for creative solutions. Ideate and generate lots of possible solutions. Prototype and communicate core solution elements to others so they can react. Test and learn what works and what does not work to improve solutions. The spaces overlap. The spaces inform one another. The spaces allow for reflection, not only on the instructional design task at hand, but also on the role instructional designers take in the design thinking approach.

Limitations of the Study

My fourth research question was what impact does a designer drawing from a repertoire of precedents have on the reflection-in-action process? Referring to the four aspects of design activity (designer, process, content, and context), a repertoire of precedents lines up with design context. There are many contextual components that impact a design project. Designers create the context they work in, make decisions on how to deal with stakeholders, put together design teams, find ways to learn from their design activities, and set up places and find time for reflection (Dorst, 2008). In order to maintain a manageable scope of the study, I studied one specific contextual element (repertoire of precedents) within a design project.

I studied reflection-in-action in regards to three of the four aspects of design activity. My study concentrated on process, content, and context. I did not look at the fourth aspect – designer. Regarding the designer, the literature points to expertise development and how it may be applied to the development of a designer (Dorst, 2008). This approach assumes that expert

designers work differently from novices (Dorst, 2008). In obtaining my participants, I used criterion sampling with one criterion stating participants would have at least five years of design experience.

Future Research

For ID4 and ID7, the time to reflect-in-action was tightly compressed as compared to the other participants. What does this imply for reflection, specifically reflection-in-action? What is the difference between reflecting, which has an element of deliberation, and just reacting to unique situations? The contrast between ID4 and ID7 and the rest of the designers who did not necessarily deal with such tight time requirements may bring to light the difference between reacting (emotional and highly personal) and reflecting (logical and with distance and perspective on the situation). Further research here would be interesting.

Although it was never directly asked of participants, through their reflection-in-action, participants approached their design projects as solving problems. It could be argued that many of the participants began with design opportunities. As presented in the second theme under research question #3, as participants reflected-in-action, opportunities emerged. In order for opportunities to emerge, did participants need to perceive that they had a design problem? Did problems have to first exist to define opportunities? What are the effects on reflection-in-action when a designer begins with a design opportunity versus when a designer starts with a design problem? Future research can bring light to these questions.

Summary

This phenomenological research design using an interactive methodology and multiple data collection methods was successful in studying reflection-in-action regarding three aspects of design activity. In this study, the idea of reflection-in-action was that unique and uncertain

situations are understood through attempts to change it, and changed through the attempt to understand it (Schön, 1983; Schön, 1988). Using eight study participants across four design fields, this study addressed four research questions and their emerging themes. By adhering to my research methodology, I constantly engaged in developing salient factors and then had the opportunity to explore these factors in more detail. In the ever-evolving world of design thinking, this study added more opportunities for reflection. In the instructional design field, this study had implications for how instructional designers design. For design thinking across design fields, this study generated interesting questions for future research.

APPENDIX A
LETTER OF CONSENT

April 1, 2013

Media Genesis
1441 East Maple Road
Suite 200
Troy, MI 48083

Dear Mr. Frederick:

My name is John Baaki and I am a PhD candidate at Wayne State University. I have recently received approval of my dissertation proposal – Effects of interdisciplinary designers reflecting-in-action during design. I am writing to you to request your permission to allow Mr. Ryan Ganss to participate in my research study.

My purpose of my interdisciplinary research is to study reflection-in-action regarding three aspects of design activity. My study will address:

1. What is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete?
2. What effect does reflection-in-action have on keeping a design project moving forward toward implementation?
3. What impact does a design's problem-solution relationship have on the reflection-in-action process?
4. What impact does a designer drawing from a repertoire of precedents inside and outside the project have on the reflection-in-action process?

I request to study Ryan as he works on a short-term project that lasts 75-105 days. I would begin my research relationship with an early May 2013 kickoff meeting at your office. During this kickoff meeting, the agenda will consist of: (a) validating that Ryan meets the selection criteria, (b) reviewing a consent form and having Ryan signoff, (c) understanding the design project, (d) establishing milestone events, and (e) describing Ryan's responsibility for a reflective journal.

In the kickoff meeting, I will ask Ryan to describe the design project. I will inquire what will be the final design project or process and what external representations (drawings, sketches, models, and/or process flows) are expected along the way. Ryan and I will establish design project milestone events. I will recommend that we determine three to four milestone events over the life

of the design project. We will tentatively schedule interview meetings within three to five days following each milestone event.

After the kickoff meeting, I will provide Ryan a calendar which includes: (a) milestone events, (b) tentative interview meeting dates, and (c) weekly reflective journal due dates. Together, we will provide access to a Google Drive document for the reflective journal. Following the calendar, one week prior to a milestone event, I will contact Ryan via email and/or phone to schedule a 45-60 minute interview meeting at your office. The agenda of each interview meeting will have three interrelated items: (a) a review of the design project timeline, (b) a collaborative analysis of external representations, and (c) an interview.

At the kickoff meeting, I will receive fully informed consent from Ryan. I will prepare a form which includes the following information: (a) my information, (b) a brief description of the study, (c) my intent to preserve Ryan's confidentiality and anonymity, (d) my process to prevent raw or developed data from being linked to Ryan, (e) Ryan's right to withdraw from the study at anytime, and (f) notice that Ryan's participation is entirely voluntary. Ryan will sign and date the consent form. I will provide a second signoff so Ryan may provide specific consent to use direct quotes. I will provide Ryan a copy of the consent form. I have attached a consent form for your review.

My interdisciplinary study has both scholarly and practical significance. For design practice, my study will provide more understanding around the dynamics of reflection-in-action. Focusing on designers in action, reflecting on activities happening during the design process, my study will examine the integration of reflection-in-action into different aspects of design. Finally, to assist in providing a more holistic explanation of reflection-in-action, I will observe designers, in the midst of ill-structured problems, interacting with situations by having a reflective conversation with the situation.

Thank you for considering my request. I plan to follow up with you by April 10 to receive your support of my request.

Best Regards,

John Baaki
27233 Cosgrove Drive
Warren, MI 48092
248-376-2098

APPENDIX B**PARTICIPANT INFORMED CONSENT FORM****Behavioral Research Informed Consent**

Title of Study: Effects of interdisciplinary designers reflecting-in-action during design

Principal Investigator (PI): John Baaki
Wayne State University
College of Education
248-376-2098
jwbaaki@hotmail.com

Purpose

You are being asked to be in a research study of interdisciplinary designers reflecting-in-action while a design project is in progress because you are a graphic designer, architect, engineer, or instructional designer. This study is being conducted at each participant's workplace (where he/she designs). The estimated number of study participants at each workplace is between one and three as well as about eight total participants throughout metropolitan Detroit, Michigan. **Please read this form and ask any questions you may have before agreeing to be in the study.**

In this research study, the purpose is to study reflection-in-action regarding three aspects of design activity. The study will address:

1. What is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete?
2. What effect does reflection-in-action have on keeping a design project moving forward toward implementation?
3. What impact does the design's problem-solution relationship have on the reflection-in-action process?
4. What impact does a designer drawing from a repertoire of precedents inside and outside the project have on the reflection-in-action process?

Study Procedures

If you agree to take part in this research study, you will be asked to participate in four to five interview meetings (including a kickoff meeting). The agenda of an interview meeting will have three interrelated items: (1) a review of the design project timeline, (2) a collaborative analysis of external representations (sketches, drawings, and/or models) and (3) an interview. Each interview meeting should take approximately 45 to 60 minutes to complete.

In addition, you will be asked to participate in a reflective journal once a week. The reflective journal will be completed via a Google Drive document shared with the principal investigator. Each journal will take 15-25 minutes to complete.

The principal investigator will keep a field journal which includes: (1) a log of day-to-day activities, (2) a personal log, and (3) a methodological log.

All information collected about you during the course of the study will be kept in confidence by the principal investigator. The principal investigator will keep raw and developed data secured and will limit access to the data to the principal investigator and the principal investigator's advisor.

Taking part in this study is voluntary. You are free to not answer any questions or withdraw at any time. Your decision will not change any present or future relationships with Wayne State University, and its affiliates.

Benefits

As a participant in this research study, there will be no direct benefit for you; however, information from this study may benefit other people now or in the future.

Risks

By taking part in this study, you may experience the following risk: possible loss of confidentiality. The likeliness of loss of confidentiality is very unlikely. All information collected about you during the course of the study will be kept in confidence by the principal investigator. The principal investigator will keep raw and developed data secured and will limit access to the data to the principal investigator and the principal investigator's advisor.

There may also be risks involved from taking part in this study that are not known to researchers at this time.

Study Costs

Participation in this study will be of no cost to you.

Compensation

You will not be paid for taking part in this study.

Confidentiality

All information collected about you during the course of this study will be kept confidential to the extent permitted by law. You will be identified in the research records by a code name or number. Information that identifies you personally will not be released without your written permission. However, the study sponsor, the Institutional Review Board (IRB) at Wayne State University, or federal agencies with appropriate regulatory oversight [e.g., Food and Drug Administration (FDA), Office for Human Research Protections (OHRP), Office of Civil Rights (OCR), etc.] may review your records.

When the results of this research are published or discussed in conferences, no information will be included that would reveal your identity.

Voluntary Participation/Withdrawal

Taking part in this study is voluntary. You have the right to choose not to take part in this study. If you decide to take part in the study you can later change your mind and withdraw from the study. You are free to only answer questions that you want to answer. You are free to withdraw from participation in this study at any time. Your decisions will not change any present or future relationship with Wayne State University or its affiliates, or other services you are entitled to receive.

The PI may stop your participation in this study without your consent. The PI will make the decision and let you know if it is not possible for you to continue. The decision that is made is to protect your health and safety, or because you did not follow the instructions to take part in the study.

Questions

If you have any questions about this study now or in the future, you may contact John Baaki or one of his research team members at the following phone number 248-376-2098. If you have questions or concerns about your rights as a research participant, the Chair of the Institutional Review Board can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

Consent to Participate in a Research Study

To voluntarily agree to take part in this study, you must sign on the line below. If you choose to take part in this study you may withdraw at any time. You are not giving up any of your legal rights by signing this form. Your signature below indicates that you have read, or had read to you, this entire consent form, including the risks and benefits, and have had all of your questions answered. You will be given a copy of this consent form.

Signature of participant Date

Printed name of participant Time

Signature of witness Date

Printed of witness Time

Signature of person obtaining consent Date

Printed name of person obtaining consent Time

APPENDIX C

INTERVIEW PROTOCOL

1. Why or why not have you accomplished the milestone event(s)?
 - A. Why were milestone events accomplished prior to the date?
 - B. Why were milestone events accomplished after the date?
2. What have you designed thus far?
3. Provide clarification and elaboration on specific weekly journal reflections

APPENDIX D**PARTICIPANT REFLECTION JOURNAL WEEKLY THEMES**

- Week #1: Reflect on the development of the design problem-solution relationship. As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?
- Week #2: For your design project, reflect on the outside experiences, images, and other items that you draw from as you work through the design. In other words, what do you draw from that is not part of the design project?
Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the design project?
- Week #3: For your design project, reflect on how you develop partial solutions to advance the design.
- Week #4: For your design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.
- Week #5: For your design project, reflect on how you are moving the project along toward implementation.
- Week #6: For your design project, reflect on your opportunities for solution development. Reflect on unanticipated problems and opportunities.
- Week #7: For your design project, reflect on when “*what if*” turns to design decisions; exploration turns to design commitment.
- Week #8: For your design project, reflect on your interaction with drawings, sketches, and models.
- Week #9: For your design project, reflect on design problems that are incomplete and have no predetermined solutions.
Reflect on how you stepped back and took stock in your design situations.

APPENDIX E**DESIGN PROJECT MILESTONE EVENTS**

Design Project Milestone Events

Design Project: Development of engine calibration to 80% calibration

Date Started: September 28, 2013

Projected Finish Date: December 1, 2013

Actual Finish Date: _____

Milestone Event	Completion Date (projected)	Completion Date (actual)
Trip Prep	10/11/13	
Knock Diagnostics	10/30/13	
80% Calibration	11/11/13	
80% Cal to Next Application	12/1/13	

Reflective Journal Due Dates:

1. Saturday, October 5
2. Saturday, October 12
3. Saturday, October 19
4. Saturday, October 26
5. Saturday, November 2
6. Saturday, November 9
7. Saturday, November 16
8. Saturday, November 23
9. Saturday, November 30
10. Saturday, December 7

APPENDIX F**INTERVIEW MEETING AGENDA**

Interview Meeting Agenda

- | | |
|--|---------------|
| 1. Review of Design Project Milestone Events | 5 minutes |
| 2. Analysis of external representations | 10 minutes |
| 3. Interview | 20-30 minutes |
| 4. Interview Summary | 5-10 minutes |
| 5. Thank You and Close | 5 minutes |
| A. Contact me via phone or email | |
| B. Preview next milestone event date | |

APPENDIX G

PARTICIPANT GD1 REFLECTION JOURNALS AND INTERVIEW MEETINGS

GD1 Kickoff on 9/19/13 5:15 P.M. – 5:45 P.M.

1. GD1 explained that she has been a graphic designer for six years.
2. GD1 explained that this project is different than most of her graphic design projects.
3. GD1: “This project is stressing me.”
4. GD1: “Am I achieving the goals as I have been told to focus on creating the best experience knowing what I know about the company.”
5. GD1 explained that this means, “Come up with something revolutionary focusing on this.” GD1 commented that things are a bit “fuzzy” right now.
6. GD1 explained that this project is different.
7. GD1: “Allows more tools from my toolbox. Usually, I get you can use your crayons but not this.”
8. JB (9/19/13) There are some interesting things happening here early on...Solutions are developing a bit ahead of the problem (integrating three health systems into one integrated website)...But things are moving ahead there is no waiting around for what should be done. It is a “Give them something to react to!” approach to the designs.
9. JB (9/19/13) GD1 is showing early signs of uncertainty and being uncomfortable (“The project is stressing me.”) Two things appear to point to this: (a) the project is different – more tools from the toolbox and (b) things are a bit “fuzzy” right now.

Milestone Event	Completion Date (projected)	Completion Date (actual)
Complete one homepage design that maintains the current health system layout. Complete one homepage that breaks from the current health system layout.	10/2/13	10/17/13
Complete Career Center page (waiting for approval). Complete News page (waiting for approval). Complete homepage (waiting for approval). Complete Locations page (waiting for approval).	10/25/13	10/25/13
Complete all designs and have designs approved.	11/15/13	11/15/13

Reflective Journal

Week #1: Due - Saturday, September 28, 2013

For your website design project, reflect on the development of the design problem-solution relationship.

As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

10. I would say that the project and communications evolved poorly, and that the project/approach is brand new now (will elaborate further down). Problem solving has been consistent throughout the process, regardless of orders/directives.
11. How is the design problem or opportunity leading to solutions? I'm not sure I am clear on this question, because all problems or questions lead to solutions/answers. The quality of those solutions is based on the information received/gathered, understanding of the project, its goals and constraints and working within those (will clarify this below).
12. JB (9/29/13) – This is really interesting. The “quality of those solutions” is based on information received/gathered.
13. How are potential solutions helping to better define the problem? I would say that they aren't so much. The problem is more so defined by what is needed or desired, whether by the user, web standards, what is possible to build, the client, my management, or a combination of all.
14. If this does not answer the question, please let me know.... I'm not sure I am understanding how solutions define a problem instead of answer it. Unless we are discussing complexities discovered.
15. JB (9/29/13) – This is really interesting. Follow up on this. How are “discovered complexities” affecting the problem?
16. Note: Below is a breakdown of all that has happened on this project from its beginning to this date. I am including this because some key actions took place before our first meeting and I believe this will help shed light on the project as a whole and the process(es) that have taken place thus far.

0.0 - Before the Project (New Brand & Colors)

17. For me, part of this project began a few months ago when it was announced that we were altering the colors and some elements of our client's site to fit with the new branding and identity of the name they would now be under with 2 additional hospitals.
18. The largest issues faced when altering the colors of the site to the new “brand colors” was that the “brand colors” were not a complete brand. Instead they were only the colors used in the logo, did not include secondary colors, and all rules in the branding guide were solely based on print and presentational materials that would not help with web or interactive mediums.
19. JB (9/29/13) – So, we have some constraints here.
20. After spotting these issues and communicating them to my supervisor (John T.) and the Head PM on the project (Marissa), I received acceptance from my supervisor but

hesitation from the PM. After my supervisor talked with the PM, this hurdle was removed and I created colors that were complementary to the “brand” colors, which would not compete with them but instead be secondary, darker, and more muted options, so the bright and garish colors from the logo could stand out in the logo and be used sparingly as an accent or to highlight certain sections.

21. A few other options were created, but one of the owners (“leader of creative”) wanted to see what else could be done. So another designer was assigned to create some options. They did not enjoy this and repeatedly mentioned it while working. After seeing the other options, they presented all of mine and the client approved one.
22. I bring up the part about the other designer simply because this bothered me and the other designer, because as they said to me, I analyzed which color options would work best with the “brand colors” to bring out the brand colors more, and took into account what would be easiest for the developer (I kept body text links the same color blue for ease on the developer and because it would be easiest for the user to read and recognize as a link). So... the thought put into it... sort of felt ignored by all of us in creative. Plus, the additional solutions actually moved further away from solving the problems created by the branding not including web/interaction colors/standards.
23. JB (9/29/13) – The constraints were very apparent – no complementary colors, no web friendly colors. The solution was to add, “secondary, darker, and more muted options, so the bright and garish colors from the logo could stand out in the logo and be used sparingly as an accent or to highlight certain solutions.” The additional solutions moved further away from solving the problems created by the branding. However, did this additional solution actually help define the problem more (branding not including web/interaction colors/standards) and emphasized even more that the GD1 solutions (secondary, darker, etc.) were the way to go. Did taking stock in what was going on with the GD1 version and other designer version, provide the better solution to solve the branding issue. Another interesting thing here, discovering the real problem. It starts as change the current site to the new colors. It turns into that the new branding as presented is not web friendly. It is not about slapping on the new brand colors. It is about creating the web brand approach.

1.0 - Data Collection

24. The project began a few weeks ago for me when I was informed that we would be designing a website for our client and the 2 other hospitals, which would all be combining into one. I was informed that we would be using their “branding colors” to design the new look, they would possibly like a responsive website, and that we would be figuring out more information as we went.
25. I was first assigned to benchmark competitor websites to determine which ones are responsive, mobile, functions they have, design etc.,.
26. I researched all the competitor sites and also researched university and consumer sites, because I felt that they would be a good idea to see what other large organizations are doing to meet consumers’ needs, especially with large amounts of content. In the

beginning, all my research was based on Google searches for award winners and top sites in each industry. I was then given two pdfs listing medical site winners for 2011 and 2012. The 2012 list was solely for the doctor directories, but I reviewed the whole site to see their full approach to content, functionality, and aesthetic. After doing this, I created a document of notes outlining the information collected on whether it was responsive, if they had a mobile site, and about the desktop sites. I was asked by the owners to show what I had and was told that I was not doing what they were expecting or needed, I had wasted time, and that the document I was showing needed to be in a presentational format for clients, despite not receiving this information prior or the time to do it (these comments were made by “the creative” one). The “engineering” based owner saw the value in the information and said that he didn’t think it was a waste. I was then asked to leave the room. Shortly after that, I was told to make a presentational document only featuring the “award winning” websites featured in the pdfs given to me.

27. The problems faced with doing this were:
28. The information for both were several years old. The 2011 Award winners were voted on in 2010 and the 2012 winners were voted on in 2011. By web standards, this is extremely outdated.
29. Many of the websites were redesigned since the awards documents were made
30. The awards were given by 2 companies which created a board of voters who were comprised of sponsors and clients. Most of the websites that won were from either clients or sponsors.
31. I brought these issues up to my supervisor and to the assisting PM on the project (Rachel). Both were bothered by the data as well, but I was told to move on with it because it was what the “creative” owner wanted. So, I created a document highlighting the same information found in the PDF given about the award winner, or creating information based on my observations (which may or may not have been why they received the award), but this is what I was told to do.
32. What bothered me about this, is that none to very little of the information I gathered was communicated to the client. So while the information we gave them through the document, may have been “helpful”, in some people’s opinions, to me it was sharing outdated information on what users need, expect, and want from large organization websites and specifically the medical field.
33. The data collected about how many websites were responsive, mobile, or just desktop was never given to this client. However, it was given to another client in the same field in a presentation I was asked to make by the “engineering” owner. It made me happy that this information would help another client make better decisions for their customers, but sad too, because the client I did it originally for did not get it. Also, I knew this might affect their buy in on how I would structure and design the new website, because with all the data collected, I knew it would be best to take a customer/user centered approach with designs more common in commercial and university websites which are further ahead in designs/implementation of newer web technologies and understanding that if you don’t win the customer, your competitor does. Which is sort of ingrained in me after working in the Web Team of the Wayne State University’s Marketing department for a few years.

34. JB (9/29/13) – I am interested to know if this a repertoire of precedents exercise. GD1 likes to gather information, she has talked a lot about communication – information received and gathered. Is this setting up what she is going to draw from?
35. 2.0 - First Set of Designs
After the data was collected, I had a clear understanding of what is currently being done in the medical industry on the web, as well as in other industries. I usually start my design process with benchmarking to gain this understanding of what the competitor is doing, so I don't repeat it, or if it is good, then I can do it better. How much benchmarking is based on the project. Most projects have very little, but this one was nice and closer to what I have done at other jobs.
36. JB (9/29/13) Question answered. "I usually start my design process with benchmarking to gain this understanding of what the competitor is doing, so I don't repeat it, or if it is good, then I can do it better." Don't repeat the bad and do the good better.
37. I was then assigned the task of creating a doctors details page to give an example to the client of what that may look like and was told to include a few different types of content, such as about the doctor, his social media information, videos, things promoting the area he is from, etc.,
38. At the time I was both happy and bothered by the lack of content and constraints (realities of designing/using/and building). My philosophy of design is to learn what is needed, learn what can be done within budget, content, and technological constraints and then create the best experience within them. That way the client receives what is both needed and possible.
39. At the time, I was not told any constraints - what it was being built in, how content was being entered, what the clients goals are, what key aspects of the site need to be highlighted, etc.,. Just that it needed to be done by January 1.
40. JB (9/29/13) Interesting, constraints are important. Very Gordon Murray like. But, she went with it. It was against here design philosophy.
41. So, based on that. I designed comps for the main doctor's page and a details page for an example doctor. The process I used was:
42. **Research** - Used the information from the research I did earlier to determine the best strategy for users to find what they need fast and also learn more as they wanted to.
43. JB (9/29/13) Repertoire of precedents. Something to draw from right from the get go, even though this was a little constraints directive, go and do it. Still had to draw from something.
44. **Navigation** - Since no navigation was provided, I looked over the 3 websites that would be combined into one and created a navigation based on how content may easily be grouped based on what a user may be searching for information on and using labels and terminology that is not so advanced that they may not understand. For example, one site uses the term "Specialties" to describe its services, while the other two hospitals call it "Services." The term "specialties is too vague, because it could apply to many different

things apart from or within services.

45. **Content** - Created lists of content based on what was requested on the page with the addition of other items which may bring value to new customers and returning ones. A customer focused site in design and functionality, with marketing driven content. A commercial approach with focus on: usability, the keeping user's attention/focus because they could go to the competitor, and joining all three groups into one, so the user looks at the new site as from one main source with brands under it (example: P&G owns nestle, Colgate, etc.,)
46. **Functionality** - Since no information was given on functionality, what the site was being built in, or how it was being built. I decided to plan/design as though the site would be built from scratch in-house, would be responsive, and that I would be eventually creating design comps for the client and developer to follow for Desktop, Tablet, and mobile. I planned functionality based on how I wanted the content to be presented and how the user would expect to interact with it, as well as what is possible. For example, I planned to have promotional sliders which feature important/impressive information about the client and its hospitals and doctors. The sliders would have a title and call to action link (which could be inputted from a CMS) and dots indicating how many slides there are and which one is active. On the desktop, the slider changes within in incremented time or the user can click on either the circles or hover over the slider to see the transparent arrows (through JavaScript) that can be clicked to advance or go back a slide. On a tablet or mobile device, the user can swipe to change the image or touch the circles.
47. **Wireframing** - With functionality in mind, I sketched layouts that would work well for a responsive website, on the desktop version. I organized the content based on what I believed would be most impactful and of the most interest to the user, and then as one scrolls down a page, it moves into 2nd, 3rd, 4th, etc,. levels of importance. I also tried to keep in mind that the 3 hospital groups combining all had different approaches to content and imagine, based on their current sites, what may matter most to them too, but combining all that information so it comes from one voice/group. Because working for a university really taught me how much siloed information confuses users when they aren't sure what they want or when they know what they want, but have to jump through administrative based "hoops" or processes to find the content they want.
48. JB (9/29/13) – Few things here...Sketching has taken place...Drawing from university sites that taught GD1 how siloed information can confuse the user. What we are missing from the journal reflection is the reflection-in-action happening during the sketching. She describes that things are happening – I organized this, I also tried, drew from this...Is this taking stock in the situation or design frame and then making changes as she better understands it, and then through understanding it makes more changes? Want to find this out.
49. **Moodboards** - Normally I would create a mood board comprised of styles, colors, elements, and other pieces from various websites and sources which inspire me in designing the website. This time, I did not create a board to show others, because there

was not enough time, but during the research phase I found all that information. It was just stored in my head, not on a board for all to see.

50. JB (9/29/13) Was this difficult to do? A designer is visual but GD1, “just stored it in my head.”
51. **Colors** - The colors of the site were not required to be related to the branding colors, but in designing the website, I used mostly the same colors from the redesign project of our client’s website months prior, because I knew those were approved and live on their website.
52. **Content & Design** - All the thought and process really guided my approach. Now that I had solved all my questions on goals, needs of the user, etc. I then was able to start writing the content for the sections of the page and designing that content based on the content and my plans for how it would function. At this point, it was pretty much just styling and executing the plans made. The only decisions left were for aesthetics on visual hierarchy, how things will be designed to show how they can be interacted with, what is clickable and what is not, etc.,
53. After creating the Doctor’s section page and the Doctor Details page, I was asked by the “creative” owner to make a mobile version. I did so, by creating an optimized mobile experience based on what I had planned out earlier.
54. After those comps were created, I received the request to remove the promotional slider from the details page, so the doctor in the promotional slider did not compete with the information on the details page. I actually was happy about this change, because it went against the request that was made earlier to have more promotional things high on the page. So the change improved the experience and helped a lot.
55. JB (9/29/13) What happens here? Where is the reflection-in-action happening? A request was made (from creative owner or from client) and, “I was actually happy about this change...” Change is happening, but how? GD1 taking stock, creative owner taking stock, client taking stock, all taking stock?

3.0 - Second Set of Designs

56. I was then asked to quickly create a homepage, services page, and details page for a service. Please note that I had still not received a navigation, any content, or even an idea of what would be needed in these sections. This made me extremely frustrated, because I wanted to design with reality in mind, so the designs could be used. The thing that also frustrated me is the fact that I am not like some of other designers. Reality doesn’t scare me or stop me from being creative. In fact, I tend to do better with more information, goals, and restraints of the build/technology because anyone can be creative without limits, but when tested by fire (in this case reality) the real problem solving and creativity comes out. If I’m included in the process, all the better :)
57. JB (9/29/13) Love, “This made me extremely frustrated, because I wanted to design with reality in mind, so the designs could be used.” Want more on this. Okay, this is all really good... Bubbling with Gordon Murray stuff! Need to dig deeper with GD1 on this!

58. So, I moved forward with the plans I had in the beginning and created a services page. The thought here was that the user comes to the services section to learn about the service they want and where they can go to get that service done. They select the service, and then find a location by zip code or service offered. From there they would go to the details page for that location's information on that service. This would mean that each location's content could be used, and new content would not be needed (saving time with the tight deadline of January 1). The details page also has a sub navigation for each location offering that service, so people can see other locations information easily in case they are willing to go further from home, since all locations do have variations in what they offer. This approach was based on how large companies with multiple brands handle their information.

4.0 - Communication Breakdown

59. Up to this point, all comps were created for and based on the requests coming in for the "creative" owner. No information about the project was really given. After the completion of the Homepage, Services, Search Results and Detail pages I received feedback from another PM (Marissa) who I had not received information or feedback from till this moment. I asked who I should defer to for design and other information and it was not well received. The assistant PM (Emily) was sent in to communicate with me about the project and the changes I needed to make based on the Lead PM's requests. That day I learned that there were different work groups for different sections and that were determining content and structure for those locations. I was also informed by the Lead PM that what I created did not fit with what they had or with the current website we would be leveraging to build the site off of to reach the deadline.
60. The best part of this is that when I asked other people about this, they were unsure about certain things. It seemed at this point that no one had a clear idea of what was being done, how things would be met, or what the content or design across the site would cover or how it would function.
61. With so many people commenting and no one knowing what was happening, I got stressed fast. Luckily, I had my supervisor to work through/with, because the Lead PM of that section had very conflicting ideas of how things should be from the Owner and other PMs.
62. JB (9/29/13) Frustration, stressed, confused... Working in uncertainty. Being uncomfortable. From this journal, these are positives in moving the design forward more than negatives. GD1 has not been stymied. She keeps moving. Need clarification on this.
63. A few changes were made based on the PM's request, mainly the search feature went away because the current site we would be building off of doesn't have a database. The services page was also forced to have promotional areas on the left, because the way the current site's pages were built, despite adding visually clutter and confusion to the user. Finally, the service detail no longer had different sub pages for each location offering it (which broke up the content), instead it was now one long scrolling page with anchor tags

at the top. This was the hardest page to do, because there was a lot of back and forth over whether there should be tabs that hide content or not.

64. JB (9/29/13) Back and forth with whom? In what context? How did this occur?
65. The current site has tabs, which is bad for SEO. Lucky for me, another PM who is an SEO expert mentioned this. This allowed me to have back up, cause it wasn't considered an issue when I said it, but became one when it was said by her. Well, at least, it was fixed. While the scrolling page with anchor tags is a horrible user experience, I was slightly happy that we weren't hiding content from search engines (so we got the slightly less evil).
66. JB (9/29/13) In these early stages, I am seeing that reflection-in-action is happening with others. Is this true? Is GD1 reflecting-in-action by herself and with others?
67. Around this time, I felt pretty annoyed with the "process" that was happening. It seemed at this point that everyone had different opinions and requests and no one was in agreement. Also, no one included me in anything. Not sure why this was done, I've experienced it on many other projects too, and it is like trying to do something with your hands tied behind your back. Frustrating and limiting. Then being questioned about why things were not done "right" according to objectives that were never given is horrible. This really zaps the drive and creativity out because there is more energy and time spent trying to get information that with help in design. Worse is when a PMs or Owners think that you don't need to be part of decisions because you just design things. I think what they fail to see is that when I am designing anything, whether content or imagery, it is all layout and design. It all requires thought, process, and directives. Probably the worst thing about my job here and what differs from everywhere else I have been is the separation between information architecture and user experience work and the designers. Not sure why it is that way, but it creates a lot of issues further in the design and build phases.
68. JB (9/29/13) – very telling statement, "This really zaps the drive and creativity out because there is more energy and time spent trying to get information that with help in design." Will this affect moving the project forward, "Probably the worst thing about my job here and what differs from everywhere else I have been is the separation between information architecture and user experience work and the designers. Not sure why it is that way, but it creates a lot of issues further in the design and build phases." I am interested to see when milestones are not met.
69. Okay... back to the project.

5.0 - Business Trip

70. The owners and some PMs went to present all our findings and work, including the designs, to the client and all the various teams involve. During this time I sat in a meeting where the "creative" owner explained my designs. This bothered me greatly because:
71. No one talked with me about the designs, the thoughts behind them, what the goals were, about the content in them or anything. Yet, he presented them with statements like "we did this for this reason" and "designed it this way because." It is horrible pouring your

soul and energy into something and not being asked about it, so people talking about don't have a full idea about it. It was also bad being allowed to sit in on the meeting over the phone, but not being able to introduce yourself or have people even know you exist. Finally, the worst part was all the questions and things clients were raising that I knew the answers to or could proposed ideas for, but couldn't. I used to meet with clients at my old job, so I found that by answering questions and consulting during the meetings, we saved time and money dealing with it earlier on.

72. JB (9/29/13) Is this reflection-in-action or lack of to GD1?
73. All that aside, during a two day span, many design requests came in. Unfortunately, it was a "do this now" situation. Just like before, many requests came in from different people. Even cases were people in the same room emailed me with conflicting requests, which required discussion to determine the best move. At this point, I was essentially a pixel pusher fulfilling requests.
74. JB (9/29/13) This is interesting, "At this point, I was essentially a pixel pusher fulfilling requests." How does she get over these things and keep designing?
75. Pretty much everything was up for change according to the perspective we had back at the office and we had gone from consultants to people doing every request the client had, whether it makes sense or not. I actually thought of leaving at one point when a lead PM and the "Creative" owner started disagreeing on what I should do, but both wanted it done "now". Glad I had my supervisor to help me make sense of things.

6.0 - Everything has Changed

76. With colors, mobile, and everything else in the air and subject to change. A group of us met to talk about design. From my perspective, there was some discussion on different aspects of how things could be done in time, but the design and structure was basically the "creative" owner sketching out what I was to do. I fully understood that things needed to change for the site to be designed and built by the deadline, but I was really bummed that I basically was back to being a pixel pusher in the "creative" owner's eyes. It seemed to be more "this is what we are doing" and less, "how would you lay this out?" for the alternative style. At the end of the meeting we decided that we will be offering two designs. One only editing the styling of the current site, but using the same structure and another one, altering the structure.
77. Looking back, I wish we would have done this in the beginning.
78. I would have known the constraints of the project.
79. I would have known the plan for building.
80. I could have come up with other design styles and ideas based on what we have. Meaning I could be just as inventive/creative, but also have everything sized right for the current site. As it stands now, I basically have to redo all I did.... and I'm not even sure I would have styled things as I did with the sizes of the columns and other areas of the website that currently exists which I will be working with in. Wish we could have designed for reality first, and then was asked to make an altered version for phase two of their site. Think we would be further ahead with the project if we had.

81. JB (9/29/13) This is interesting. It appears here that the problem-solution have had to develop together. No one knew the problem and no one knew a solution. But, the early solutions have helped define the problem that maybe the homepage should include what it has now and then maybe there is a phase 2. How have each informed one another?

7.0 - Moving Forward

82. Moving forward, I'm putting all the things from the past aside. I'm going to look at this as a new project, because in a way it is. It is more like most of our projects. Rushed. My only hope and what I will work on trying to improve, is getting the PMs to include me or at least inform me of the thoughts behind the decisions being made. This is key to good design. Because someone may request for something to be done, and knowing why allows me to come up with ideas that can make it even better. For example, say the reason for a change is that a call to action is supposed to stand out more than something else. If I am just told to change text or some other request, without being told that, I miss out on the opportunity to choose a different font, change the color, add a highlight or box, or any other treatment which may achieve the true goal. The request also may just be the solution derived by the client or the PM, sometimes asking for other options switches us from mindless pixel pushers to consultants/experts. This can't always be the case... but I sure hope is more so moving forward.
83. JB (9/29/13) – Clarification and elaboration on this, “My only hope and what I will work on trying to improve, is getting the PMs to include me or at least inform me of the thoughts behind the decisions being made. This is key to good design.”

Interview Meeting #1: Friday, October 4, 2013 5:00 P.M. – 5:56 P.M.

84. JB: There was a 10/2/13 milestone to complete a homepage design that maintains the current layout from WPAHS and a homepage design that breaks from the current layout from WPAHS. This milestone was not reached on October 2 and there is currently no date when it will be reached.
85. GD1: The homepage is on hold. “We are waiting for internal stakeholders to determine what goes on homepage then put it to design.”
86. Regarding a new deadline, “I don't know. I have not been told.” “I have had to switch gears to Find a Doc which I have.”
87. GD1 explained that she will not move forward with the homepage designs, “until we get everything figured out. This door closed (homepage) and this door opened (Find a Doc).”
88. JB (10/8/13) Is this designing in frames? One frame is closed and another opens up.
89. Follow-up question: What is happening?
90. GD1: “What does client want on page before we design?”
91. Follow-up questions: Is this good?
92. GD1: “Yes, I suggested this. I don't mind conceptual work, but as a designer you need to know how it works. You need to know the constraints you are working with.”
93. GD1: “The more information I have, the more we know how it will work, the easier to build and the easier for mobile.”

94. GD1 explained that the issue she is running into is that much of the work has been conceptual ideas, try this, or try that. These conceptual ideas are running into, "...what can we deliver and what are the core things."
95. Follow-up question: What does GD1 mean by conceptual?
96. GD1 explained conceptual ideas are that it would be nice if we had video here, content that is different. These types of things are important, but you should not get to them until later. Right now, need to focus on the core information.
97. GD1 explained that the content is important because it gets you closer to real stuff and then design something usable for the website builder.
98. JB: In reflective journal week #1, GD1 discussed "Discovered complexities." What did she mean by this?
99. GD1 talked about the problem as the goals. There are constraints within the goals and when she receives more information, it throws in more complexities. She works to come up with solutions for the goals. The goals are what need to be address.
100. JB (10/8/13) This is interesting. The problem is really goals. It is more opportunities than problems.
101. GD1: "It is a circular process. I come up with something. I then evaluate and then I come back to coming up with something."
102. JB (10/8/13) This is how GD1 reflects-in-action. It is a large circle and as she designs the circle gets smaller and smaller. As it gets smaller, it is more about focusing on the details of the design.
103. Follow-up: How does this happen?
104. GD1: "I look at user expectations; constraints like budget, timelines, client expectations; and how it affects developers building it." "How can I come up with something great for the client and what platform will it be on?"
105. GD1 explained that even the browser can throw a wrench in what she can do.
106. GD1: "I am constantly evaluating through the process."
107. GD1: "As you evaluate, the circle becomes smaller where you consider smaller things like better colors and different ways to play with things."
108. JB (10/8/13) This is GD1 reflecting-in-action.
109. GD1 explained that she likes to keep current with the changes that are occurring. Her goal is to make it seamless and let the developer create what she designs. When she knows what the client wants, the change the client wants; she then knows how to approach it. The client may say something like I want a different color which really means the client wants an area to stand out. GD1 explained that when you cannot interface you cannot get this information.
110. GD1 explained when she is able to get information, "I can think of six different ways to do what you want."

111. JB (10/8/13) This is the Kees Dorst approach. New approaches to problems result in multiple opportunities.
112. GD1 explained that getting information helps her understand the goals.
113. GD1 wants real information.
114. GD1: "The circle is real big in the beginning. I know there will be several iterations internally." GD1 explained that in her position with this organization, the approach is that it needs to be seen before discussing what needs to be done.
115. JB (10/8/13) Again, reflecting-in-action.
116. GD1 explained that I know what I create will change. Sometimes, what I give is disappointing because I do not have all the information.
117. JB: I asked GD1 to explain what she draws from outside of the design.
118. GD1: "I look to other sites to understand what is being done; not to copy what they are doing; what are people using, and what is happening in other markets."
119. GD1 continued that she gets an understanding of what is happening inside and outside of the industry. She finds experiences on how things are done. She looks at what is happening outside of the design.
120. GD1: "This is another way to evaluate in that circle."
121. JB (10/8/13) This is GD1s repertoire of precedents outside the design.
122. GD1: "Constraints are awesome, actually."
123. GD1: "I used to be an artist, now I am a designer. The difference with art is it is what I created, if you accept it or not, I don't care."
124. GD1: "Design is for other people. You have to curb yourself and look at how the person is going to use it."
125. GD1: "For me, constraints are important. I want it to be buildable, doable, sustainable, and usable."
126. GD1: "Design is reality. It will be used."
127. JB: I asked that even though GD1 noted in her week #1 journal that she gets frustrated she keeps moving forward.
128. GD1: "I personally cannot just stop. This is where creativity really comes out."
129. GD1 continued that when she is at her most frustrated this helps her push over constraints. If people tell her no, she finds a way around.
130. JB: I asked GD1 to discuss the difference between sketching wireframes and mood boards where she stores it in her head.
131. GD1: "For me, sketching is pen and pencil. It is the lowest technology first. I can throw it away and no one cares. When it is polished, it is hard to throw it away."
132. GD1 explained that when sketching, GD1 does different variations. She looks at different iterations. Then, she finds one to go with.

133. GD1 noted that she will find things like a, “piece of a website”, certain font, or a “texture”. She, “banks these away.”
134. GD1 explained that she calls this information architecture. She needs to separate these out in the beginning. For her, she has to strip the things she banks out so she can focus on the best solution then she brings in the things that she banks away.
135. JB (10/8/13) Here GD1 is reflecting-in-action and framing as she goes along. The banking is interesting. She takes stock in her sketches and finds one and goes with it and then brings in the things that she has banked.
136. JB: I asked as the circle gets smaller, are more people involved.
137. GD1 noted that it can go either way. As the circle gets smaller, she has more say.
138. GD1: “In the beginning, more people have a say and then they drop off.”
139. GD1 explained that if I don’t know what I am designing for, I’m not designing.
140. GD1: “Let me know what targets I need to meet. If I don’t know, I blindly design.”
141. Response from GD1 after reviewing interview notes on October 6, 2013:
142. Looks good. Only thing I might tweak is at the end where it says:
143. "If I don’t know what I am designing for, I’m not designing.” “Let me know what targets I need to meet. If I don’t know, I blindly design."
144. Not sure that is fully what I meant.
145. If possible, I'd like it replaced with:
146. If I am not given the right information and do not know what I am designing for, then I will make my best guess as to the goals to fill in the blanks, so I can continue to process and do my job. Ideally, I would be briefed on the project and kept in the loop on changes. Unfortunately, this doesn't always happen.
147. JB (10/8/13) Her clarification really helps to understand how she keeps the project moving forward. She wants information, but if she doesn’t have the information, she makes her best guess as to the goals and keeps moving along. It doesn’t always happen that she gets all the information so she keeps moving.

Reflective Journal

Week #2: Due - Saturday, October 5, 2013

For your website design project, reflect on the outside experiences, images, and other items that you draw from as you work through the design comps. In other words, what do you draw from that is not part of the website design project (for example a non-health care website or a project you did in the past)?

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the website design project (for example, an earlier design element from an earlier comp or a very early sketch you made)?

148. The outside influences I draw on are from the benchmarking I did on medical websites, colleges and university websites, and commercial websites that contain many brands (like

Comcast, GM, P&G, etc.) While reviewing the sites, I evaluated the amount of content they have, the number of brands or subgroups they have, how they direct users to information, the functionality offered, and their mobile strategy/approach (if applicable) and its similarities and differences to the desktop version. The reason for selecting the sites to review, I did is that they are all award winners or leaders in their industries. The medical websites were primarily to determine how other hospitals and medical organizations handle their content, what users experience when visiting them, and how up to date they are with current web trends. The schools/universities were selected because they also have many groups and sections that they oversee (such as different departments and schools within the college/university. Their target markets tend to vary, but they usually lean towards younger individuals for undergraduate studies and usually are pushed to move faster than the medical field which caters a wide variety of people on different devices, with large concentrations of older individuals as well. The commercial websites were selected because they tend to be the most forward thinking in terms of web trends, because they are customer focused and driven to market to the customer.

149. JB (10/11/13) The sites that GD1 drew from were chosen for a reason. Medical sites to see if they are doing anything different. University sites because they have a similarity in that they are organizing a lot of information and there are colleges within the universities like specialties within a hospital. Commercial sites tend to be forward thinking, customer focused and driven to market themselves.
150. While academic and medical institutions also have customers, it is more common that they view them as “Students” or “Patients”, which in some cases reduces the impact they have. For example, in academia, the administrators and staff often have more say in what is featured on websites and information is written with keeping them happy first. In the medical field, it is usually the doctors who carry the most weight. While over the past few years, it has become clearer that patients and students are customers and can go anywhere the true impact and importance of that fact hasn’t fully reached those industries like it has with commercial companies. There is improvement, but it seems in terms of messaging and web technologies that commercial sites are the early adopters, academic sites are 2-3 years behind and medical is 3-4 years behind. I have seen a few examples of better medical websites, but there are still things about them that hold them back from the level of a commercial site.
151. In researching about these industries and comparing various sites on various screens and devices, I was able to see how people took short cuts, or didn’t, what strategies people had and decisions they made about the content and functionality of the websites. This helped me to think outside of the medical bubble and think bigger, but also realistically. I noticed things that users would like and even expect when visiting other websites (not just medical ones).
152. JB (10/11/13) Interesting...GD1 appears to feel that she has gone outside of the, “medical bubble and think bigger, but also realistically.” But, she has stayed within the web. As a follow-up, does she go out and beyond the web. This is outside of the design (university and commercial), but still in this broader category of web.

153. Through the research, it was clear to me that the future of medical websites would be moving closer and closer toward commercial websites. This established and confirmed the goals of making an easy to use, customer center, informative, drill-down approach website that is visually impactful and enjoyable for the user to visit. This included the addition of searching for information in different ways and pulling information from databases (This was later changed in the comps, because the current website we are using to build from doesn't use databases and is unable to offer new functionality with the aggressive timetable of the project.)
154. Inside design influences I draw on now are my original web comps and goals. I compare the much more simplified goals we have now to the larger ones I have. So while designing the newer stuff, I ask how I can incorporate the most of what I learned, planned and hoped for in the original, into this new way. Already there have been some issues, but I am rolling with any changes which occur to try to make things work for everyone. The interesting thing to me is that, I would have probably had the same style and ideas in my head from the research I did before hand, even if I had not done the design comps.
155. JB (10/11/13) So, early comps are not in vain. They visualize the, "...more simplified goals." Now, with larger goals, what was, "...planned and hoped for in the original..." was used in the newer comps. What is interesting is that she believes that she would have ended up in the same place if she had not done the earlier comps. She would have used what she drew on from the "outside" comps. Is this always true?
156. I have also been pulling a lot from work with a developer on the project (Paul). He and I have met several times to discuss how things are built on the website and to run ideas past him. This has proven invaluable because it has allowed me to see where I can push lines and where I can't.
157. JB (10/11/13) This is interesting. Inside the project, GD1 drew on conversations with the developer who provided insight in what could and could not be done. So, there is reflection-in-action with the developer. Here is what I am thinking, can I push the line or not. It is the developer's know-how on what it can do that she draws on. But, she is taking stock in what she is doing. Drawing from what the developer gives her is reflection-in-action. GD1 reflects on what she has done at this point. She draws on what the developer tells her as it relates can her design at that time function in the way she has designed.
158. Also, he has been able to say that we can't do something one way because of a technical constraint, to which I can then ask about if it would work still if I changed it in some other way.
159. JB (10/11/13) So, here is the reflection-in-action. The designer begins to change from what the developers says about what she has designed.
160. Today, and other times, we have found solutions to get my end goal and not add extra work to him, all by talking things through. I'm really happy that I am able to interact with him in this way. A lot of other projects separate the designer and developer during the design phase. We may run a design by one just to see if it is possible to build something, but the developer we ask may not be the one that is building it, nor are they working on it

or about to at the time. As a result, they aren't fully thinking about or working in the code at that moment to notice all the issues they will face. Also, designers are not normally told when the design is approved or moves to development so they often do not get the opportunity at my current place to communicate the thought, functionality, etc., that is in the design. This results in the developers having to make this information up as they go and sometimes building a site differently that it was intended. I think the more developers and designers interact, the better it will be for both. In their understanding of each other, the project, and information they can take with them moving forward on other projects to save time and money.

161. I just re-read the question to make sure I stick with it :) I would also add the wireframes I made as a reference and the videos that are a part of their new branding. The print branding that has been created doesn't fully fit the needs of what we are doing. But the videos and write ups on messaging shows what they are aiming for at least, so that is continually being kept in mind.
162. JB (10/11/13) Again, drawing on things inside the design – early wireframes and videos explaining the new branding.

Week #3: Due - Saturday, October 12, 2013

For your website design project, reflect on how you develop partial solutions to advance the design.

163. Hmm... Not sure what this question is pointing towards specifically. I am taking it that you mean any micro or small decisions made in design to move the project forward.
164. This week was basically a get things done week. The colors were not fully agreed upon till mid week, nor was the navigation. As a result, I ended up getting blessings from john to tweak the footer navigation based on the draft version provided. Doing so made the footer more consistent with the header navigation and the site as a whole.
165. While the colors and navigation were not approved we (my supervisor and I) decided to move forward by design the groups sections that had approved wireframes or ones that were close, such as News, Events, and just started on Locations.
166. I was able to make changes to the wireframes in all to make them more consistent with other sections on the site (which made me feel good). Also, through clearing ideas with the developer and then the PM before designing, I was able to make changes that would greatly impact the user's experience and not affect development too much. For example, the news on the current site is displayed in a 3 column table. The left column shows the date the article was posted, the middle is the article title (just text), and the left column is filled with "Read More" links. Since the list is laid out this way, more attention and focus is given to the dates and read more links. This makes it more difficult for the user to visually scan through article titles and I imagine based on what I have been told about the back end that it is hard for screen readers as well because they will read the table left to right as well. To fix this, I replaced the table layout with one column. The article title is

shown first and is now a blue link and below it in a light gray is "posted on" and the date the article was posted. This small change will put the focus on the articles themselves and make it easier for people to visually scan what they are looking for.

167. JB (10/14/13) So, the partial solution of the article title and the blue link helped to impact the user's experience and not have an adverse affect on development (two of the bigger goals that they are trying to reach).
168. Another small change was the search form fields used to be rounded, as were some of the buttons. It would be easy for our developer to do this using CSS3, but it isn't Fully supported in all browsers (even IE 7, 8, & 9). Since this client usually likes everything to look the same in all browsers, and because it would be easier for the developer in Drupal, I changed the rounded buttons and fields square. It changed the visual affect but with some tweaking it looked fine and will help the developer save lots of time too.
169. JB (10/14/13) Interesting... Reflection-in-action on buttons resulted in changes to the buttons. This in turn will help the developer save time and move the project forward. Interesting, the button change to help the developers affected GD1's desired look, but with some tweaking it looked fine. This is real reflection-in-action making a difference. What would possibly happen if GD1 did not do something, stayed true to her design? The button problem would probably not come up until testing in different browsers. But, reflecting on it now and making the change prior to the build will save time later and make everything more efficient. This is a great example.
170. Finally, another adjustment made was brought on by the clients request. After approving colors, they contacted us stating that the buttons felt to prominent for them and they wanted the style and colors changed. They were a bit vague in the way they worded the request, so I decided to keep the style the same, but switched the button text from white to the buttons color and the button's color to a light gray. The light grey gave hint that it is a button and the darker colored text looks like a link. It isn't as nice as it looked before and the buttons blend into the page more than I would like now. But the user can still tell they are buttons, the style was maintained for the most part, and the client was made happy by fulfilling part of their request because the goal they want done was achieved without doing everything they asked for/suggested. Changing only the Colors also meant that I didn't have to change as much in all the designs created before the one the client requested it on. So a lot of time was saved.
171. JB (10/14/13) Again, GD1 is moving the design forward with partial solutions. While reflecting-in-action, there seems to be negotiating going on with the client and the developer. It is early in the game which is good, but GD1 appears to be making compromises. Is this okay? Follow up on this. Is this what happens when you reflect in action?

Week #4: Due - Saturday, October 19, 2013

For your website design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

172. Well, a few things come to mind.
173. First, Drupal is not user friendly. I say this because it's very structure requires that all pages are unique or it adds numbers to the page's URL and May affect the actual structure if the site. For example, say two sections on the website contain a services page. Both pages cannot be named services or it will require more work/time to make it work. So to fix this, the PMs decided that we would place the name of the section before it. So 'Services' becomes 'Ortho Services' or 'Cardiovascular Services.' This would be fine, if: 1) The User wasn't already clearly in the "Cardiovascular" section (for example); 2) all the other links in that section didn't have to be called out the same way (Ortho Doctors, Ortho Services, Ortho Locations,etc..) I started off trying to propose ideas on how to work through this, but after being told 'No' to each idea, I decided to let it go and do it as requested so I could move on to working on comps for other groups. That said, I was able to change a few page names to be shorter/easier to understand and did have some influence in how some of the specialties section navigation was structured. I think this was the result of talking with the PM working in the navigation and giving feedback. They said they were happy to hear feedback and to be able to talk it over with another person, since it was mainly them working it at that point. So it was nice that They were open to my thoughts, but even better that I could have, what I hope what will be, a positive affect on the project and the users experience.
174. JB (10/22/13) GD1 has spent a lot of time understanding Drupal. This has helped her make changes to her design. When she makes changes, she goes back to a developer to validate that Drupal will allow these changes. Remember, this design project started with little direction. It was almost – just design! Now, the designer takes stock in what she is doing and makes changes based on her continuing understanding of Drupal. Validate that I am seeing this correctly.
175. Second, the developer showed me how the find a doctor section was coming along and we both noticed how weird the results list looked when it included doctors without images, so we decided to make a generic 'no photo' image to replace the gaps and keep consistency in the layout. It was nice because we decided, I made the image and it was executed. There was no consultation with the client or a PM. We just knew it would be something easy to do that would solve a problem we discovered.
176. JB (10/22/13) This is definitely reflection-in-action – “It was nice because we decided, I made the image and it was executed.” GD1 is in a design frame with the developer. They see something, reflect on it (“...noticed how weird the results list looked when it included doctors without images...”)
177. Lastly, when designing the careers section page the PMs and I discovered how much the graphic map and content on the page changed the meaning of the page and the map itself. As a result, different map styles were created, as well as variations in placement and

content to show various ways to highlight similar information. At one point in the process I wasn't sure how we would get the right messages represented, but the most fascinating thing to me was that I soon learned through communications with the PMs that there wasn't a 'right 100%' direction. Each solution represented different issues or needs the user may have or different approaches. In the end, it just will boil down to what the client would like to communicate... But I think there are some solid options and thoughts behind what we did. That interaction with the PMs actually helped invigorate and spark my excitement in the project, when I could have easily hit a creative wall otherwise. Especially cause we were able to give each other open feedback as we talked ideas. It was nice.

178. JB (10/22/13) This is very interesting. We are back to problem/solution co-evolution. As there was reflection with PMs, opportunities evolved (“...but the most fascinating thing to me was that I soon learned through communications with the PMs that there wasn't a 'right 100%' direction.”). GD1 continues, “Each solution represented different issues or needs the user may have or different approaches.” Opportunities ended up bringing solid options. This keeps the design project moving. Is it the opportunities that keep her from hitting a creative wall? Need elaboration here.

Interview Meeting #2: Friday, October 25, 2013 5:05 P.M. – 5:50 P.M.

179. JB: The milestones have been a bit fluid. What has been reached?
180. GD1 explained that the Career Center page waiting for approval; News page done and approved; Homepage done and approved, Locations page waiting for approval.
181. Follow-up questions: How do you feel about this?
182. GD1 explained, “I feel much more confident than before.”
183. GD1 explained that however, on Tuesday, October 29, the designs to date will be shown to the client's higher ups.
184. GD1: “I don't know what will happen here.”
185. GD1: “I am plugging along with the information I have and this make me feel good.”
186. GD1 explained that that there are odds and ends that need to get done. She still needs to design mobile but it follows the designs that have been made. So, there is a little pressure off in regards to the mobile.
187. JB (10/28/13) Having set milestones is not easy for GD1. It is the actual design project and that it has been a unique design journey. There is one milestone – January 2, 2014. Now, there are key milestones along the way. But, they are a bit fluid. They move along as more information is gathered.
188. JB: When drawing from things outside the design, did GD1 go beyond the web world? What from outside the design is appearing in the designs?
189. GD1 explained that she stayed in the web world.
190. GD1: “A lot of the design style is more flat similar to Google, Microsoft, and Comcast sites.” GD1 explained that she has pulled from corporate sites where simplicity is important. An example is the icons – very simple.
191. GD1 explained that even without looking at sites outside of the “medical bubble”.

192. GD1: "I may have gone this way without these."
193. GD1 explained that she has designed a simple approach from the very beginning.
194. JB (10/28/13) So, GD1 did go outside the "medical bubble", but what she started with when she was told to "just design" has remained throughout the design. A simple approach.
195. JB: What is GD1 drawing on from inside the design? There were early comps.
196. GD1 explained that even though there were early comps, "Stylistically, I would come up with same look without the earlier comps."
197. GD1 explained that early comps did not help her as much as it helped the client and internal staff. It helped to show where we want to go in later phases.
198. GD1 explained that initial thoughts in early comps were scrapped because of Drupal, how things are set up in Drupal, and the deadlines.
199. GD: "I am always 10 steps ahead as I can see it in my head. But, not everyone works this way so I have to show them."
200. JB: What has impacted the design more drawing from inside or outside?
201. GD1 explained where the designs are right now, the early comps.
202. GD1: "I got feedback and designs got approved. What got approved spearheads what we are now designing."
203. GD1: "You approved this so this one look looks like this. I am drawing on what I have done."
204. GD1 explained that she is now the, "consistency and branding police." Now, the designs are more templates.
205. JB (10/28/13) GD1 did a lot of upfront design work. Early approvals have spearheaded later designs. The heavy lifting is over as now she is the "consistency and branding police". This is crucial to moving the design project forward. Early reflection-in-action helped get designs approved and now it is using what was designed and approved as templates for the other sections.
206. JB: Validation that partial solutions are driving the bigger goals.
207. GD1 confirmed that partial solutions drive bigger goals. As she has worked with different groups, there have been a lot of little decisions made which has resulted in partial solutions that affect the build.
208. JB: Elaborate on the compromising and negotiating that is going on.
209. GD1: "I am making compromises and I am okay with that."
210. GD1: "Lots of times I make compromises because of the client or developer's skill set. Oftentimes, these compromises do not happen until the developer is building."
211. GD1: "But what is nice (with this design project), the conversation is happening now instead of later. It is nice to have this in the forefront."
212. JB (10/28/13) When GD1 reflects-in-action she negotiates and makes compromises. But in these design frames where compromises are made, GD1 is okay with the compromises. The compromises do not go against the design look and feel.

213. JB: This project started with a Just Design! mandate. Now, GD1 is taking stock in what she is doing and making changes based on her better understanding of the Drupal constraints. Elaborate on this.
214. GD1: "There has been enough design approval so I just keep the same layouts and styles."
215. GD1: "It helps to have the different comps with variations of content. With something approved, I can point how content is being displayed."
216. GD1: "It reigns in crazy ideas and keeps it consistent."
217. JB (10/28/13) This is keeping the design project moving forward.
218. JB: It appears that even later in the design project there is still the problem and solutions co-evolving. Explain if this is going on.
219. GD1: "Everything has not been black and white. It has been refreshing to talk to people and have them open to different ways to do things. This is nice."
220. GD1 explained that sometimes people are too rigid even though different ways would be better.
221. GD1: "It is frustrating as a designer when it is too rigid. Open discussions and giving opinions are very nice."
222. GD1: "I see it will not work, but I can't do it because the direction is too rigid."
223. GD1 explained that more thinking (reflecting) can uncover more problems and then more solutions can come up.
224. JB: To this point, GD1's demeanor appears to have changed. At first there was uncertainty and frustration. Now, there is excitement, things are moving forward, she is fascinated by what is happening.
225. GD1: "Once I got a better idea of the end goal it was nice."
226. GD1: "I believe that what I came up with in the beginning could have been developed, but it was not reality."
227. GD1: "I don't like designing without constraints because it is not real. I felt better when I got clear direction regarding what it was going to be built off and that the platform would be built in Drupal."
-

Response from GD1 after validating interview on 10/27/13.

228. Just noticed two things...
229. Under ...
230. "JB: It appears that even later in the design project there is still the problem and solutions co-evolving. Explain if this is going on."
231. Change...
232. GD1 explains, "I see it will not work, but I can't do it because the direction is too rigid."
233. To...

234. GD1: "Often times, I can see something won't full solve the problem, but if the other people on my team are not open to listening or considering other options, it can often lead to major problems down the line when those issues then come up. It's very frustrating."
235. JB (10/28/13) The problem-solution evolves. Remember, GD1 talked about how she can see 10 steps ahead. This co-evolution – other options to solve the problem – keeps the project moving forward.
236. Under...
237. JB: To this point, GD1's demeanor appears to have changed. At first there was uncertainty and frustration. Now, there is excitement, things are moving forward, she is fascinated by what is happening.
238. Change...
239. GD1: "I don't like designing without constraints because it is not real. I felt better when I got clear direction regarding what it was going to be built off and that the platform would be built in Drupal."
240. To...
241. GD1: "I don't like designing without constraints because it is not real. I felt better when I have clear direction regarding what is needed, what it will be built in, and when it is needed by (time constraints). Knowing it was in Drupal and learning its constraints along with the current site's constraints helped me in making solutions for real issues."
242. JB (10/28/13) This is very interesting. GD1 is not designing for design sake. The constraints are part of reflection-in-action. Think about the discussions between GD1 and the developer. The problem-solution relationship is driven by real issues and real solutions. Reflection-in-action has always been real.

Reflective Journal

Week #5: Due - Saturday, October 26, 2013

For your AHN website design project, reflect on how you are moving the project along toward implementation.

243. The project seems to be moving along well. At this point we are probably close to 40% complete on the design (when including the mobile versions that need to be done). There are quite a few sections awaiting approval, but we are moving forward on other sections based on the ones that have been approved.
244. There have been a couple set backs when requests from the VP required changes to be made which affected things already approved by them before. Sometimes I wish that we could just say no to certain things, but it seems that some PMs don't take that approach which means more work for me and more issues for the developers. Probably the most frustrating part. If it was up to me, I would have standardize guidelines for the PMs to work within because they all seem to have very different approaches, some more successful at moving things forward than others. I've just been trying to fill those struggling on what others are doing that our succeeding, but I can tell that some have

already stopped caring about the project cause there are other projects they are doing too. All I can do is try my best to encourage those in that spot, make suggestions, help problem solve, and try to help them feel good. Hope helps people get a second wind.

245. That said, I've been pretty much working on a first come, first serve basis with the teams, and it seems to have actually improved things. On some projects PMs can wait too long to send a PRF. So, for example, a PM may have 8 hours worth of work and they give us the PRF a day and half or the day before it is due. This timeframe fails to take into account other projects we are working on, meetings and other responsibilities we may have. What is nice about this one is that I have been able to be more direct with PMs who do this and have them understand that I need to know things further in advance and that projects will be done on a first come, first serve basis. Being able to treat them as clients placing orders has helped remove more of the stress and pressure from me... Cause I already put a lot on myself to do well. I have also noticed that they seem more open to and desire my thoughts on their sections. It is nice to be a consultant again. I've missed it, and don't always have opportunities to do it.
246. JB (10/30/13) So, GD1 is helping move the project along by being more direct with the PMs. Need to follow up if her role as a consultant is helping to move the project along. In an earlier journal entry, GD1 had noted, "That interaction with the PMs actually helped invigorate and spark my excitement in the project, when I could have easily hit a creative wall otherwise."
247. A huge blessing is that I am supposed to get a new computer on Monday. I'm soo excited and happy because after months and months of my computer running slow, freezing and losing work, I will hopefully have a machine that can handle the design software and a regular speed workflow. So one of my biggest frustrations will hopefully be alleviated and I will get to work at my normal pace.
248. My biggest concern at this moment is that designs approved by the VP will be shown to the president on Tuesday, when some of our team visit the client. I'm hoping that he is fine with it, because if he isn't I may have a lot of work ahead to redo.
249. JB (10/30/13) Need to follow up on what happened here.
250. Another concern is that the presentation document is completed to the owner of my company's liking. I finished all the changes requested that I could, but am waiting on one of our PMs who is in another state to give me more information. She seems to be key in this project but I find that she is often MIA or has poor communication when she does deliver information. The owner seems to be the same. He asks for vague things and then waits till the last minute to give feedback. He also doesn't provide content but expects me to guess what he wants to say or deflects to the MIA PM. Issues like this send me through the roof emotionally because it is so inefficient. Lucky for me, I have a great supervisor. He is good at reassuring me that I can only do what I can and that if I am not given what I need, it is okay to move on to something else till I have the stuff. This is how I would feel and work with a client. But based on how the owner treats people in the creative department and his lack of understanding of process and time, it makes me stress out that

I will get in trouble or fired. I hate admitting this, but he actually made me cry one day out of frustration and how he treated me. Luckily my supervisor was there or I might have walked off the job that day. The owner has been more hands off lately which has helped. I think for me, unrealistic expectations cause me stress. Stress stifles creativity and makes it harder for me to do my job. Especially when it seems like my job is in jeopardy if I don't do exactly what the owner wants when he wants it.

251. All that said, I am feeling better about things, but will feel much better after Tuesday when we hopefully get the blessing from the president.
252. In the mean time, I'll be focused on the presentation till I get the okay from the owner and then I can hopefully get back to working on section designs, cause the presentation document has been taking time away from them.
253. JB (10/30/13) There is irony here. She feels better about things but she is waiting for approvals to keep moving forward. So, there is actually a lull in order to keep moving. It's like everyone has to catch up to her so she then can keep moving forward. Elaboration here is needed.

Week #6: Due - Saturday, November 2, 2013

For your AHN website design project, reflect on your opportunities for solution development.

254. Reflect on unanticipated problems and opportunities.
255. This week was a crazy one. At the beginning it was all about moving forward and doing minor changes for the team presenting to the head client in another state. Towards the end of day Monday and into Tuesday requests started coming in for edits to designs I did a year ago which I was told the client had seen and I busted butt to get to them then. At the same time I received my first wireframe from the pm on specialties for the project and made it more consistent with other comps using the new style. I also created color options on the mobile comps and other comps for them to show the top client so they could approve the colors. Once our team returned from seeing the client more things remained in the air, such as the colors we are using and the final design styles we are going with. There seems to be an internal disconnect and differences of opinion within our own team members, the one owner, the top client and the person we have been working with who is under the top client. With so many opinions and different requests without people communicated, I have found myself so fed up with the project and different people that I have been telling people 'no' or 'this is how it needs to be' to some individuals. Doing so has made a difference in solving problems and how the project runs. In almost every job I have been in, I have been looked at as an expert or advisor. People have asked me for my opinion and thoughts. That doesn't really happen with the owner and I, but it is going to have to start to be that way if things are going to continue to run more smoothly. So it seems this week, more problems occurred from the team/decisions than the work itself.
256. Oh, almost forgot to mention, there was also a quick request for me to create a 5 page large format presentation and create content for it in time for a meeting the client has. When that request/expectation came in, I told my supervisor to let the owner know I

wouldn't be doing it. I knew that with the edits on the homepage, edits on other sections, and the micromanaging style of the owner there was not only any way I could do all that work on my own, but I also couldn't handle it do to the attitude and treatment I would receive from the owner. My supervisor completely agreed, so other designers ended up being brought in to work on the presentation and I took more of an advisor/creative direction role, mainly providing direction and feedback on different design decisions and helping with pointing them to assets and resources previously made that would help. While all this was happening, I also advised/directed a designer on how best to style 3rd party mobile app screens they were assigned. It was nice to have the opportunity to direct and lead, especially because they were all asking for the help/direction and by them doing the leg work, I had time to get more of the edits done too. So by the end of the week, we all managed to save the day as a team. A few issues rose up along the way, but I think tapping into my management experience and other experiences helped me reduce frustrations for others and help solve problems that occurred along the way. For example, one of the designers was being difficult and not in step with the rest of the team. I spoke with him once to try to calm him down and help get him in step with what was needed. Thought all was well till I was alerted by another designer as to the inconsistencies in his work with the rest of the team, so I let her make the needed changes to make things cohesive and we shifted his tasks to help alleviate the issues. Also had him meet with the content team so the other designers could continue to progress on the presentation and changes needed. Toward the end of the day he realized on his own how far he was from the rest of us and commented on it to us. By then he was better understanding the goals and by the end of the day, things came together nicely. I was really proud of everyone. They did a good job of being autonomous, yet bringing me in to direct and lead as needed. Reminded me of the job I had before my last :)

Week #7: Due - Saturday, November 9, 2013

For your AHN website design project, reflect on when “*what if*” turns to design decisions; exploration turns to design commitment.

257. What if...hmm... The project as kept some of its original direction, but there have been a lot of "what if this was here" and "what if this functioned like this" from the client and one of my company's owners. Some of these have resulted in flat out "no, that's not possible" answers, others have been "I'll add the image or other thing to the design to make them happy, but if they don't have one in the actual content, then it won't be there", and finally, there have been a lot of "this was said to not be possible, but the pm changed their mind" or "it will hurt the developers and the project but it is what the client wants and the pm and owner are insisting we do it, instead of telling them it isn't possible or wise." "What if" in this stage is my least favorite thing to hear because we should be past the ideation and planning to the execution portion of the design for the desktop version.
258. JB (11/12/13) This is very interesting. “What ifs” at this stage are no good. It is now about execution. Ideation and planning are over. Exploration has turned to commitment at least in the mind of GD1. GD1 is now worried that the “what ifs” will hurt the developers. What is the turning point for the “what ifs” turning to design decisions and

exploration turning to design commitment? Is it the deadline? Is it a need to keep the design moving?

259. Another issue that has surfaced is "what ifs" in terms of the mobile site. The owner wants us to move forward with making the mobile pages before we have figured out how many sections will be mobile and how the navigation and all is levels will be handled in a responsive design. This was explained as a bad idea, but it was insisted that it start anyway. Another designer has now been brought in to work on some of these, but they have no prior understanding of this project and have never worked on a responsive design. So in addition to my other work, more time is spent answering questions and directing this designer on something that will have to be redone later when navigation and other issues are sorted. This 'what if' is 'what if someone helps Joy'... Not a good 'what if'
260. Finally, in working on the homepage mobile version, the owner did not like how it came out. When explaining why it would look that way because it is responsive and images can only scale down not up, I was told that I should talk with the developer to make sure that the 'what ifs' where possible.
261. JB (11/12/13) Can “what ifs” turn into constraints? In other words, there is a point in the design where the “what ifs” become another constraint to overcome like Drupal restrictions, timeline, information, etc. Need elaboration here.
262. Since the developer had gone home already and we had discussed it before so I already knew what was and wasn't possible, I altered something's to make the owner happy, but knew some of it would require more work for the developer. This made me feel horrible. Cause it seems like no one requesting things will accept no. Making the site responsive was a bad decision, cause it requires more work in some ways for the developer, because it has to look nice on almost all devices. Also the owner and others seem to want the mobile version to look and function like a mobile website, with all the customization, etc. Which isn't realistic. I think this may be why the other designer was brought in. The owner seems to think that this designer is 'very creative' and 'thinks outside the box.' While I agree their work looks nice, what the owner fails to understand and accept is that a lot of what they create is not possible due to budget and time constraints most of the time.
263. JB (11/12/13) This is answering my question on what may be driving that it is too late for “what ifs”.
264. What is also frustrating is that because I design for reality, I am often times viewed as more conservative and less capable of making designs like the other designer.
265. JB (11/12/13) How does this play into “what if” turning into decisions and exploration turning into commitment?
266. This is in no way true. If the budgets for our projects were larger and we had more development time to build wild things then I would design them.
267. JB (11/12/13) So, initial constraints (budget and timeline) are driving the design project still. They are always there, but GD1 has continued to move the project forward. Is it because the constraints have been consistent? Does this keep GD1 focused on the reality?

268. I just don't get how everyone is real when they look at budgets and money, but so far from reality in what they expect when they look at design. Tired of this project. The inconsistency and the utter lack of respect for the developers, time constraints, and reality of the project.

Week #8: Due - Saturday, November 16, 2013

For your website design project, reflect on your interaction with drawings, sketches, and models.

269. I'm guessing this is referring to if there were any and how they related to what I did. I did sketch preliminary wireframes for different sections, which we deviated from in certain ways later on as content and direction on the project changed. After that, a few groups (divided by section) provided wireframes, but others provided little to no direction. In those cases more miscommunications occurred and issues between those groups, the client, and designs. I do not believe this was solely the result of not having wireframes but a mix of lack of clear direction of those group leaders, miscommunication, and lack of boundaries with the client. When on an accelerated timeline, it is crucial to establish due dates and sign off dates with the client to remain on track. The client must also understand that once they have given approval that the project will move in that direction and cannot be changed till after that date. If approval doesn't mean anything and thought isn't put into how things will flow and function ... And if it is feasible to build in the timeframe... while wire framing and sketching then there isn't any point in doing it, because the defining an end will be near impossible. Especially if the plan changes on a whim and without purpose. Sketching and wire framing is part of mapping out a plan and help determine that plan's execution. Like blueprints on a house. While they can be altered, the core plan should remain in tack if it is going to survive. The more tight the deadline, the more imperative it becomes for the plan to be the most simplistic and easiest to execute, to ensure successful completion. Additional features, etc should be set aside for later to respect the timeframe of development.

270. JB (11/23/13) So, interacting with the sketches and wire frames set the framework. They can be altered but the core plan should always remain intact. In this project, the designs deviated far from the early sketches and wire frames. In many instances, depending on the section, the core did not remain intact.

271. Unfortunately, there have been so many deviations and compromises along the way, that I am no longer sure we will succeed. I feel truly bad for the developers and for all the weird code they are having to create to make things work in time. They seem down about it too. But all I can do now is make edits as requested, because I am not in control. I may bake them cookies though... That might help moral at least :)

Interview Meeting #3: Monday, November 18, 2013 12:02 P.M. – 12:36 P.M.

272. JB: As the final milestone, it was projected that GD1 would be done with all designs. Is GD1 done?

273. GD1: “Yes, except for the mobile version and depending on any other edits.”

274. GD1: “For the most part, I am done. Now, more like housekeeping at this point.”

275. GD1 explained that not everything is approved.
276. GD1: “I could have been done a long time ago if the client had accepted things. This is the nature of the beast.”
277. JB: GD1 noted that she was acting as a consultant with project managers in order to move the project along. Asked for elaboration on this.
278. GD1: “It was a situation where it kept falling back on to design. It was hard for project managers to keep it moving as everything fell back to design.”
279. JB (11/23/13) It is interesting that design and the GD1 drove the project. This can be traced back to the fact that GD1 started with no direction and no information. It was just – design. Design drove the project. Oftentimes, it is the site mapping and wire framing that provide the framework for the design. Here, design provided the framework for the traditional framework things.
280. JB: There was a situation where the designs were shown to the client’s executive team. Asked GD1 what was the result of this.
281. GD1: “The specialties got reworked quite a bit, not the other sections.”
282. GD1 explained that for specialties they referenced designs that she did over a year ago.
283. GD1 explained that she was not sure if they were going to like the whole system or just parts.
284. GD1: “There was quite a bit of work from that trip.”
285. GD1: “Specialties began to look like locations. A lot of tasks were put in after the trip.”
286. JB: GD1 kept the project moving forward. But, there was a lull as GD1 had to wait for approvals. It was as if everyone had to wait to catch up to her. Asked GD1 to elaborate.
287. GD1 agreed that there was some irony here.
288. GD1: “The only section I had questions marks with was specialties. There were no wireframes. There was no information. Most other sections had this.”
289. GD1: “I had most difficulties with this section.”
290. GD1: “Specialties was just behind than other sections.”
291. JB: I wanted GD1 to elaborate on what were the turning points for the “what ifs” turning to design decisions and exploration turning to design commitment.
292. GD1 explained that deadlines played a major part.
293. GD1: “You have ideation and everyone may not be there so maybe you have a second ideation.”
294. GD1: “It had to be more linear to hit the deadline. It was so tight with such an accelerated deadline.”
295. GD1: “Get something done as best it could be done to get it out.”
296. GD1: “Once the client saw it that should have been the turning point instead of having client change it.”
297. GD1 explained that the homepage is a good example where last week edits were reviewed and the client had a disconnect. GD1 explained that it is too late in the game for it to be happening.
298. JB (11/23/13) The constraints resulted in getting something done as best it could be done.

299. GD1: "This is fine if you will push back the deadline." GD1 noted as a result only 2 or 3 of the requested edits got pushed through.
300. GD1: "Something can seem so small but it can throw off so much like the messaging."
301. JB (11/23/13) GD1 would design and she would reflect-in-action. She would reflect on the unique and uncertain situation and make changes as best she could with the information that she had. She would then get feedback from the client which would make her reflect-in-action more. These seemingly small changes had a huge impact on the unique and uncertain situations. GD1 has to move to another design space and reflect some more. GD1 not only reflected on how it affected the design, but also how it would affect development. Multiple spaces here to reflect in.
302. GD1 explained that there was no structure for changes in phase one and changes that would be for phase two.
303. GD1 explained that the requests were for phase one instead of phase two.
304. GD1 noted that no one has explained this to the client that changes this late in the game need to be for later.
305. JB: I wanted GD1 to elaborate on budget and timeline driving the project this late in the game.
306. GD1: "It would have moved along regardless of the timeline."
307. GD1: "Being aware of the timeline constraint benefitted in getting things figured out. It affected everyone else in getting things pumped out."
308. JB (11/23/13) The time constraint helped keep the project moving. It helped in, "getting things pumped out."
309. GD1: "It helped in constraining and saying 'no' and helped with the budget for design. I did not do extra work that deviated from the plan."
310. JB: In previous reflection journals, GD1 noted that she designs for reality. How did the constraints keep GD1 focused on the reality?
311. GD1: "I am sad in a way that the technical feedback was inaccurate. Things are now working out better and things have been tweaked for the developers."
312. GD1 explained that things that she was told and then switched back to how it is in the current site caused her extra work.
313. JB (11/23/13) Here is another example where the problem and solution developed together. GD1 designed for one way only to switch back to how it functions on the current site. There was co-evolution of the problem and solution.
314. GD1 explained that if the technical constraints were clearer in the beginning she could have designed to these technical constraints. She noted that she then would not have needed to go back.
315. JB (11/23/13) For GD1, the problem(s) was never defined. As she designed solutions, she came up against technical constraints that came about because of what she was designing. This then pushed her back to design from the current website functionality.
316. GD1 noted that designing for reality sometimes is seen as designing conservatively.
317. GD1: "If it doesn't make sense to design it and show the client, then I am not going to design it."

318. JB: Feedback from GD1, via email, in reviewing summary for accuracy. (11/23/13)

319. Hello John,

320. I don't really remember us discussing budget (as noted in the second to last section). I do recall us talking about timeline and believe my comments were solely about that.

321. Personally, I think we overshot the budget in many ways. Between the changes and time spent with the committees, the initial design work, the constant presentational work done to impress the client after they agreed to go with us, the technical miscommunication, and all the edits/requests by the client and Marissa which added to design, but will definitely add to development.

322. Hope this helps.

323. Thanks,

Reflection Journal

Week #9: Due - Saturday, November 23, 2013

For your AHN website design project, reflect on design problems that are incomplete and have no predetermined solutions.

Reflect on how you stepped back and took stock in your design situations.

324. One big issue involving design is imagery. When I started on the project, no images were provided so the majority of them were from istockphoto.com, but after designing all the comps and after many were approved I was then informed that the client had a shutterstock.com account and that I was only to use it, if no images were given by them. Since the client didn't provide us with them (this still is true) I went through the shutterstock images trying to find similar images. It was such a waste of time and very disheartening. 1) because the images are generally not as good; 2) if I had known in the first place that they had the account and that that was where we were only supposed to get them, then I would have done that in the first place. (This is another case of the PM not telling me and then being like "didn't you know that they only will use their own or images from shutterstock?"... And me fighting with all my being saying "no. My clairvoyant filter must have been broken. :/ "); 3) and most upsetting to me, it was a big waste of time and the screw up added to there budget (again).

325. JB (11/23/13) Late in the game, images became a challenge.

326. Another good example is, yesterday, the social media page was approved, but the image they made a big deal of wasn't purchased. I was told to look on shutterstock for a replacement. After 5-10 mins of not finding anything similar, I asked the pm on it if we could just have them purchase that image instead, since it would run only \$38 for them to do so instead of how much time we would bill them to find and edit a replacement (potentially a big savings for the client). I was told that we were supposed to use shutterstock as dictated by the main pm. After some more discussion and essentially

wearing down the pm with logic (don't like doing that but some PMs seem to never want to ask questions or explore other options) we decided that she would contact the client and see if they were fine with purchasing it. If we didn't hear back in a few days or if they said no, then we would look for alternatives. The most aggravating part to me about it was while I get that they have unlimited hours with my company and it is hard at times for PMs to sometimes get decisions from the clients, I couldn't wrap my brain around why we wouldn't just do what is best for the client and the project. Heck, we could even purchase the image ourselves and then bill them for it. Why run their budget up on poor communication, logic and peoples "learning experiences"... Just seems risky to me... Cause there is always the chance they may not go with us again, if we are too pricy or inefficient on things.

327. Another issue was that they navigation for the specialties section was never finished while I was designing it. I knew the real site would have many levels, but since they weren't available, I made some up and developed a style and plan for how the different levels in the navigation would look and function. That extra forethought combined with making a style guide for the developers to follow has come in handy for build, because the developers weren't stopped by another thing needing to be done. I was thanked by one of the developers for this, which made me feel good. Especially knowing that I had done all I could to try to make things easier for them.
328. JB (11/23/13) It is interesting to see how GD1 kept things moving forward. Over two months into the design, the navigation is just decided on. This is an important part of a webpage design, but GD1 kept designing by, "I made some up," and then developing a style and plan for how the different levels in the navigation would look and function.
329. JB (11/23/13) It is interesting that GD1 faced uncertainty throughout this design. She never really seemed to feel comfortable with it. GD1 understands that it is part of design, but often notes that the uncertainty created caused a lot of inefficiency. But, on the other hand, even though GD1 was always working in uncertainty, GD1 kept the design moving. When there was little to no direction or information, GD1 kept it moving. When specialties were changed late in the game, GD1 kept it moving forward.
330. Looking back, I think that the project's designed turned out pretty good. There are things I would have done differently, and things that I wouldn't have, but based on time constraints, weird communications/differing goals, the client, my lack of complete control ;) ... I would say it turned out pretty good.
331. JB (11/23/13) It is never perfect. It is "pretty good." The constraints hang in there until the end and just make it pretty good. But, it gets done. It keeps moving forward. And with all the uncertain and unique situations, GD1 understood what was needed and made changes. She kept reflecting-in-action and kept the project moving forward. The problem and solution co-existed to the end. The specialties section did not come together until the end. The problem (what the specialties should look like) was defined by a year old design. The solution came from a design that was designed a year ago under different circumstances. Reflection-in-action was so fluid for GD1. She was always doing it.

332. Hopefully the images they pick and the content they have doesn't ruin it... But it's out of my hands now :)
333. Thank you for including me in your project. It has been nice to stop and reflect on things throughout the project. So much so, I believe I may start doing weekly journals on my own.
334. I hope that this has been helpful for you and if you ever have questions or another project that you need a designer for, feel free to let me know.

APPENDIX H

PARTICIPANT GD2 REFLECTION JOURNALS AND INTERVIEW MEETINGS

GD2 Kickoff on 9/23/13 5:10 P.M. – 5:35 P.M.

1. A graphic designer for over six years.
2. GD2 explained that this project is different than most of his graphic design projects.
3. GD2: “I have a lead role and I own it.” “I can take a lead role and I care about it because it is not just a task.”
4. GD2: “Tasks can detach me from my work.” If I just get a task, I get frustrated. There is no back and forth.”
5. GD2: “There is what I call design brat mentality. Designers will be strongly opinionated which gets me in trouble.”
6. JB: The idea with design brat mentality is that designers do not want to hear from anyone but themselves. The designers know best.
7. To this, GD2 commented, “If someone shows you what is better, that works rather than tell me.” When asked if all designers are like this, GD2 replied, “I have observed this with certain people.”
8. GD2 explained that this project will involve designing a motion piece which is a teaser for everything that CUANM is doing. Right now, there is not a lot to go on – a direction card and a few drawn faces. There will be a script, visuals, and a storyboard. There is an upcoming convention when this will be shown.
9. JB: There is something similar to GD1 here. For both of them, one of the key reasons that for each these are non-routine, non-procedural design projects is that each is not starting with a lot of guidance. GD2 had nothing but a direction card and a few drawn faces while GD1 says things are fuzzy because she is working from what she thinks is the best experience and what she knows about the company – no traditional wireframes.
10. JB: It is very interesting that GD2 mentioned that he would rather people show him what is better than tell him what is better. Like a designer, put it in visual terms. I need to see that it is better than just hear it is better.
11. JB: I wonder if GD2’s repertoire of precedents will have anything to do with his dislike of just doing tasks. When he owns it will he draw on things outside and inside of the project? “Tasks detach me from my work.” This is interesting.

October 15, 2013

12. JB: The original design project was canceled by the client on September 18. The new project is a website re-design for a college. This will be the first time that GD2 has designed an entire college website. GD2’s organization has not had the opportunity to do a complete college website redesign.

Milestone Event	Completion Date (projected)	Completion Date (actual)
Design Wireframe	11/4/13	11/4/13
Start homepage Design	11/15/13	12/8/13
Complete a homepage design	12/2/13	12/15/13

Reflective Journal

Week #1: Due - Saturday, October 19, 2013

For your college website design project, reflect on the development of the design problem-solution relationship.

As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

13. These questions are a little weird; I don't really understand the terminology, so I will interpret them as best I can, I may end up going off on a few tangents though, so bear with me.
14. As you understand the design problem or opportunity, how are solutions evolving?
15. Personally I find true solutions do not evolve yet, however ideas come from a process of asking myself and in some cases others a bunch of 'what if' questions. 'What if I used this site?', 'What if a student was half-driven to find a college?' or 'What if a parent with very little time visited this site? What if they planned more time?'
16. JB (10/26/13) What is the difference between a solution and an idea? Interesting, the What if questions bring in the audience.
17. But it's more abstract than that, more like playing a guessing game and then comparing the guesses with observation and experimentation. You present your idea and see if others like it. Then you make a product. Whether the product is a solution or not relies on experimentation, which in the area of web/application design is the period of time after the product launches up until it is re-designed or resigned.
18. JB (10/26/13) Need elaboration here. Again, what is the difference between idea and solution?
19. Adobe photoshop in this regard is still not a solution, but through revision it gets closer to being a true solution. I guess ideas evolve from the problem and then a product is made in hopes of being a solution.
20. JB (10/26/13) So here, GD2 uses ideas as if it is the same as solutions.
21. How is the design problem or opportunity leading to solutions?

22. I have no real good idea how to answer this with words, but perhaps this can illustrate it better:
23. In this instance the ‘design problem’ is that the college’s homepage has no real hierarchy on its page, further it is not speaking to its target audience, instead it seems more focused on its own achievements rather than its prospects. Furthermore, the site looks dated, but this was only half of the problem. After speaking with the PM I came to understand that the college is a smaller, less overwhelmingly bureaucratic school. But instead of playing on this strength, they seem more focused on fabricating a reality where they are bigger. This begs the question, why, in a time when colleges are seen as big and fairly freedom-starve restrictive machines would a college want to fit in to the normal college scene? The new thing is to be small, focused, independent and passionate. This will get applications from prospects that would fit best at their college.
24. In this way the design problem has presented us with what was potentially another problem, a positioning/messaging problem. The intent seemed to be flat out lying, they wanted to lie. And that lead me to try to steer them elsewhere, towards reality and transparency.
25. JB (10/26/13) So, through reflection, begin to understand that the problem has another problem. And now, ideas (solutions?) lead to, “steer them elsewhere.”
26. On the more web/interface side of the spectrum, the dated nature of the site raised, among many others a question, what if it was not dated? But, what is not dated? Mobile is pretty new, so perhaps shifting the focus away from the traditional site to a more direct, mobile-friendly, quick and possibly smarter site would be better. But, how could we do that? Perhaps we could make it ideal for any teenager’s cell phone? Further, perhaps it could be designed in a smart way, that got the teenager to the information they wanted almost immediately, without needing to scroll through lots and lots of detailed text. Even further, what if the content, while being less lengthy was immersive, maybe told a story? Kids are used to a very fast-paced life style, and they love TV and Dramas. Further they love to think about themselves, not with any malice of course, so perhaps a very ‘me-focused’ approach would work here. This ‘me-focused’ experience would work right alongside a school that prided itself on being smaller and more focused, in this way their messaging problems have influenced their technical problems.
27. JB (10/26/13) So here is the co-evolution of the problem-solution. This is really interesting. The messaging problem (a dated site) influences the technical problem (lack of a mobile site because it is dated). From this, the ideas (solutions?) start to evolve (“perhaps”). Now, GD2 has co-evolution – “This ‘me-focused’ experience (an idea/solution) would work right alongside a school that prided itself on being smaller and more focused (the school’s issue), in this way their messaging problems have influenced their technical problems.”
28. How are potential solutions helping to better define the problem?

29. Understanding the problem by asking questions creates more conditions that are in some way related to the problem. This makes the problem have more layers, and each time a new layer emerges, the problem becomes more clear as the consequences of that new layer, brought on by the questions become more apparent. So potential solutions help us define problems simply by trial and error I would wager.
30. JB (10/26/13) This is interesting. Need elaboration on a problem's layers. So, solutions can help define the layers and bring the layers out? This is what happened above, correct? Problem – the site is outdated... Ideas start... Problem layer – the message is not there... Idea make it more transparent, geared toward students (how students want to get information)... Problem layer – technically the site is not close to being mobile friendly... Idea make it so it is, now idea opportunities... (1) design is smart for a phone, (2) Immerse students and tell a story, (3) Take a “me-focused” approach. These ideas (is it really trial and error) get to the problem.

Week #2: Due - Saturday, October 26, 2013

For your website design project, reflect on the outside experiences, images, and other items that you draw from as you work through the design comps. In other words, what do you draw from that is not part of the website design project (for example a non-college website or a project you did in the past)?

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the website design project (for example, an earlier design element from a very early sketch you made)?

31. I drew inspiration from imagery I found at <http://designspiration.com> and also from current trends as reflected in album covers, like these: <http://www.culturebully.com/wp-content/uploads/2011/01/CUT-COPY-ZONOSCOPE-COVER.jpg>
<http://cdn.pitchfork.com/news/43482/80235a61.jpg>
32. Mostly indie music and anything considered hip. I noticed that popular artists are starting to embrace this trend in aesthetics. It was also just a gamble based on this line of reasoning:
33. “The definition of cool is often determined or at least influenced by what the prior generation of youth considered hip” So indie music is all the rage with college kids, or at least my generation, so I’m taking a gamble that the design trends that we see on designspiration will reach the youth looking to move into college.
34. JB (10/28/13) This is very interesting. GD2 has gone outside of the web world but staying true to his belief that the design should be very focused on the student. He had come up with solutions based on the “me-focused” approach. Now, his ideas are moving into design. He is providing something to react to. Elaborate on “gamble”. Why is this a gamble? GD2 has spent time thinking about the problem-solution. He has reflected on it. Has the problem not evolved enough? Are the solutions not really solutions, but rather just ideas. What is the gamble?

35. A similar gamble was made for the 'Claim Your Youth' project, of which I get the impression the client was very happy with the results, only time will tell though if this gamble will work in favor of the desired results. So taking risks sometimes is necessary when becoming inspired.
36. JB (10/28/13) Elaborate on taking risks. How does working the problem-solution relationship increase or decrease the risks?
37. I also drew inspiration as always from Swiss design and minimalism, because I feel it is one of the best ways to preserve legibility and clarity of the information being presented. So could be a personal bias, I admit.
38. https://www.google.com/search?q=swiss+design&espv=210&es_sm=91&source=lnms&tbn=isch&sa=X&ei=arNqUvO0OImqkQeBk4Bw&ved=0CAkQ_AUoAQ&biw=1276&bih=683
39. I also drew from the 'individualistic' approach of the current generation, 'the me factor', as illustrated by Facebook and Twitter. Once again a risk.
40. JB (10/28/13) GD2 draws from a lot of stuff. Themes, what is cool, minimalism, what is considered hip. GD2 is drawing on specific things outside the design for this design project. These things fit with his early solution ideas. Is it safe to say that depending on the design project, he would draw on different things outside of the project?
41. I drew also from the scrolling sites of today such as these:
42. <http://www.wearetelegraph.com/>
43. <http://www.chevrolet.com/camaro-sport-coupe.html>
44. These sites focus more on a narrative and exploration/skimming than a grid system of deep and comprehensive information as seen on websites like this: <http://www.cisco.com/>. These new sites are always considered 'cool' or at least they seem to be popping up more often and are often selling a product or a strong piece of marketing, which is necessary for Olivet, they wish to market themselves.
45. JB (10/28/13) Again, drawing on things that align with what his solutions are in regards to the problem-solution relationship.
46. Need elaboration on what GD2 draws on from inside the design.

Week #3: Due - Saturday, November 2, 2013

For your website design project, reflect on how you develop partial solutions to advance the design.

47. I listened to the AMA meeting logs and acquired AMA notes from the PM, then redesigned a wireframe with solutions that satisfied the client's desires and expectations. Listening to the AMA was very helpful as it helped me narrow in on the client's personality. Something often overlooked is that when you simply send notes forward you lose all the inflections and cues a client gives off, some would argue that this makes it harder to design for a client because of dreams of grandeur, but I argue that a well seasoned designer can distinguish between the dreams of a client and the feasible ideas. JB (11/5/13) This is very interesting. How does GD2 distinguish between the two?

48. Hearing how progressive the clients were, how open they were, and how friendly and good humored they were gave me the confidence to pursue certain design and strategy concepts.
49. JB (11/5/13) Earlier in the design process GD2 was coming up with ideas that fit a “me” and “hip” approach. There were early solutions. Early opportunities from what GD2 knew at the time. Now, GD2 is getting more information. How does this keep the opportunities going?
50. They mentioned they wanted to target specific audiences such as more women, especially low income families and minorities. I took that and more intel and developed three new personas that fit their desires. I developed solutions that would satisfy each persona’s needs. For example, The client wanted to tell student stories so I chose one of the new personas named Jacki and wrote a quick introduction about her, then placed into a content area that would display this kind of content.
51. JB (11/5/13) Solutions continue. Has the problem really been defined? If not is that okay?
52. Further, I created mock content based around their feedback in the AMA, as to enforce their ideas and to try to get them excited about implementing certain concepts that were in the current scope. A copywriter could have done this part, but with the companies limited time and resources I decided to try to develop something myself, in an ideal world I would have worked with a copywriter on this.
53. JB (11/5/13) Interesting. GD2 draws from the AMA which is part of the design process. GD2 drawing from inside the design project.
54. Overall I found that understanding who you are designing for can be just as helpful as understanding their goals. Because it allows you to gauge yourself, so you do not go wandering off in the wrong direction.
55. JB (11/5/13) Get clarification. Is this the students or the college who wants the new site? Or both?
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Interview Meeting #1: Thursday, November 7, 2013 12:05 P.M. – 12:45 P.M.

56. JB: There was a wireframe deadline the week of 11/4/13. The PM walked the client through the wireframes and now waiting for client to provide feedback. So, milestone was completed.
57. GD2 explained that there were 2 wireframes produced. He produced one wireframe while another designer produced another wireframe. Both wireframes had similar content based on the AMA workshop.
58. GD2 explained that at this point only wireframes have been produced.
59. JB: Referencing a reflection journal, elaborate on the difference between a solution and an idea.
60. GD2: “A solution is a solution like a mathematical problem. An idea is just an idea. I think of ideas that will solve the problem.”

61. GD2 provided an example. An idea like a slide show can solve a problem for immediate engagement.
62. GD2 continued, "Solution has a funny buzz today. It disturbs me. It's not the true meaning of the word. What does a graphic solution mean? I make graphic ideas that could be a solution."
63. GD2 explained that when dealing with complicated systems it may be difficult to visually relate it. Maybe, it is not best related visually, but rather best related with words.
64. JB: Asked for elaboration on how GD2, through reflection, begins to understand that the problem has another problem.
65. GD2: "The first thing I felt was confusion. It was all about the hierarchy and the message."
66. GD2: "The question was what makes them different. It was not in the homepage."
67. GD2 explained that he does have a fault where he fires a preemptive strike. He said he needs to keep this in mind.
68. JB: Asked for elaboration on the problem-solution co-evolution.
69. GD2: "It is a stream of consciousness. This one leads to another thing."
70. GD2: "My process works 90% of the time."
71. GD2 explained that when there is a problem process he will often inject a new idea into the process. He continued, "Structure disrupts the organic process."
72. GD2: "Conversely, when structure is in place already, it can help make aware of the structures before the organic process."
73. JB (11/24/13) GD2 comes up with new ideas for the "process". When there is too much structure, "injecting a new idea" can be disrupted. But, when there is structure in place it can help in awareness for ideas. Here is a very interesting take on the problem-solution (ideas for GD2) co-existing, co-evolving. For GD2, it appears that he doesn't think of it as co-evolution ("It is a stream of consciousness. This one leads to another thing."). Rather, it is just there all the time. The problem comes with structure so you know where the organic process (ideas) will begin. The organic process should not be disrupted by the structure.
74. JB: Asked GD2 to elaborate on his idea of a problem's layers.
75. GD2 explained that when he was reflecting on the "me" approach, "Each step was a layer with a problem. The main problem was we are not communicating. Okay, this can mean lots of things."
76. GD2: "What are the layers of communicating and then have ideas for the layers."
77. GD2: "I relate mathematics and physics as much as possible." For example, GD2 explained when looking at how energy is consumed in a system other problems happen and this is design.
78. GD2 further explained that he can have a slide show to address an issue but the audience may not know how to operate a slide show. "How do we address this problem?"

79. JB (11/24/13) Design is about dealing with the problems that come up. A solution may cause another problem to address. Problems can define solutions and solutions can define more problems.
80. JB: In reflection journals, GD2 reflected that he was taking a gamble with going with what is hip idea. Asked for elaboration.
81. GD2: “The gamble is what is cool and hip changes all the time.” “By the time it comes out, it may not resonate. But this may be okay. There may be a residual audience like older people who like it and the younger audience follows what the older audience likes.”
82. GD2 explained that he moved forward with the gamble because the PM expressed that the client was open and didn’t want to be conservative. Also, there was no time to get data. GD2 had to make a decision. He based it on life experience that it would resonate.
83. GD2: “It was a guess. It is intuitive like someone gambling. I am just going to pull the handle on the slot and just do it.”
84. GD2: “You have to be comfortable to take risks.” The payoff can be huge and it takes risks to get great results.”
85. GD2: “When I draw, I am a perfectionist and the execution is often wrong. I stumble and erase too much and my page looks like crap.” “When I keep tripping on myself, it doesn’t resonate.”
86. JB: In a reflection journal, GD2 noted, “...but I argue that a well seasoned designer can distinguish between the dreams of a client and the feasible ideas.” Asked for elaboration.
87. GD2: “When a designer is experienced, they have a perspective to stay away from no man’s land and Pandora’s Box.”
88. GD2: “If you are afraid that a designer will go on a tangent, for a seasoned designer this does not happen,”
89. JB: GD2 mentioned that listening to the AMA really helped in getting information. How?
90. GD2 explained that in the AMA, one woman wanted to down play athletes and athletics, but the dean did not want to. GD2 continued, “The back and forth helped me. The dynamic conflict showed me that there was give and pull so they could meet in the middle.”
91. GD2 further explained from the AMA he could pick up on people’s excitement. For example, the AMA participants were open to a different way to have students pick their major on the site. GD2 continued, “You cannot pick this up in written words. The voices emphasized ideas.”
92. JB (11/24/13) GD2 draws on a recorded AMA session. This is inside the design. It was how people interacted with one another which gave him insight into what he could and could not do. He was able to pick up on the subtly of “give and pull” so there could be a meeting in the middle.
93. JB: Asked for clarification on who is his audience, the web users or the client (college admin).
94. GD2 explained that the website users are a given. He knows tangents that will not resonate so he doesn’t go there.

95. GD2: “I as a designer can get my feelings hurt pretty easily. No one liked to have his ideas slapped down.”
96. GD2: “If you know who you are designing for, you can be in alignment to it.”

Reflection Journal

Week #4: Due - Saturday, November 9, 2013

For your website design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

97. We have not made any designs yet.

Week #5: Due - Saturday, November 16, 2013

For your website design project, reflect on how you are moving the project along toward implementation.

98. We are waiting on the clients approval of wireframes. So I have not been pushing it atm in favor of other projects and agendas.

Week #6: Due - Saturday, November 23, 2013

For your college website design project, reflect on your opportunities for solution development.

Reflect on unanticipated problems and opportunities.

99. Unanticipated problems, like delays from the client are not uncommon. Once we propose a design a client can sit on it for quite a while.
100. My opportunity for solution development on this project was high, as I had the ability to absorb both the PMs notes and the clients words as recorded by the AMA meeting. More often than not I focused on those ‘omg’ moments clients expressed, which I described earlier on.
101. My opportunities were rather high as we had initial control over the wireframes.
102. JB (11/27/13) GD2 had a very unique opportunity to “absorb” the PM notes and the AMA recordings. This provided GD2 good, validated information to drive his wireframe designs which he says increased his opportunities for solution development as GD2 had initial control over the wireframe. His wireframe reflected the notes and recording.
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Interview Meeting #2: Monday, November 25, 2013 12:00 P.M. – 12:16 P.M.

103. JB: GD2 had a milestone of November 15 where homepage design comps would have been started. However, GD2 has not begun the homepage design comp because the client has not approved the wireframes. GD2 is at a standstill. Producing actual artifacts has stalled.

104. GD2 explained that there is no feedback from the client.
105. GD2 explained that it is an out of sight, out of mind situation.
106. GD2: "It has to be. You have to care about your work in the moment. Once it is sitting there, you have to move on."
107. Follow-up regarding what GD2 does in such a situation.
108. GD2: "I will keep things organized. Mood boards, emails, I put them in a binder so I can pick it up again."
109. Follow-up regarding if the standstill is an advantage or disadvantage.
110. GD2: "It could be an advantage and disadvantage."
111. Advantage?
112. GD2: "You can learn things from another project. Technology changes."
113. GD2: "It has not ended. My direct design ended, but indirectly my knowledge is still going."
114. JB (11/27/13) This is very interesting. Even though GD2 is not directly working on the college homepage design comp, GD2 is still reflecting-in-action on the college homepage as he designs other projects. GD2 reflects-in-action as he reflects on other projects. The actual work has stalled
115. JB (11/27/13) The actual work has stalled to no fault of GD2. But, he is still designing. He is still moving the design forward because he is keeping it fresh in his mind. It is on his design radar.
116. Disadvantage?
117. GD2 explained that there is a disadvantage from a billable side and that he will have to wrap his head around it again once it gets going.
118. GD2: "If it is too long, it could be obsolete. You would make it better because you were working on the information that you had."
119. GD2: "I have to practice constraint. They could come back and say we sat on it because we didn't like the direction so start over again."
120. Follow-up on what would be too long of a wait.
121. GD2: "In my mind, I may have a unique perspective, but six months. You are looking at massive updates or it could still be relevant."
122. GD2 explained that if something comes up that affects the design he will document it.
123. GD2: "During the wait period, an idea could be presented."
124. GD2 mentioned that he is currently working on a design that, "...could tie into the college site."
125. JB (11/27/13) Again, GD2 reflects-in-action about the college site design as he designs another project. If something comes up, he will document it. To directly move forward, GD2 needs the client to approve GD2's direction.

Reflection Journal

Week #9: Due - Saturday, December 14, 2013

For your website design project, reflect on when “*what if*” turns to design decisions; exploration turns to design commitment.

126. What if the background image changed based on the slide? I had made the slideshow full site, in a sense, but only the image would change.
127. What if, further, this image was visible through the navigation?
128. What if I used small headers instead of large ones? This would allow the content to shine, rather than the header.
129. What if a student wants to apply anywhere in the site? Sticky navigation with an ‘Apply’ button would make that easy
130. What if, I was more lenient about the color red being only links and applied it to the Student Highlight area, what if that whole area was a button and not just a button in the area? Would that negatively affect the user? If so what if the area being red still expressed it was a link/linked to an interior? I think that could be a thing, so I took liberty and made the whole areas background red, which made it stand out more and still did not break the functionality, based on the above reasoning.
131. What if I just made the design and this time did not worry about any decisions I did not agree with on their end? I tried it, and this design is the result.
132. JB (12/17/13) Need elaboration here. Did all these “what ifs” come to fruition? Need to look at the design as GD2 walks through these.
133. For your website design project, reflect on your interaction with drawings, sketches, and models.
134. Honestly, I just sketched out some quick ideas involving where the imagery would go and how it would be layered into the comp, but this was rushed, so I was not very detailed.
135. JB (12/17/13) So, there are a couple of things here. First, GD2 waited around to be rushed. So, as soon as feedback was provided on the wire frames it was a rushed job. If GD2 had more time, would he have sketched more? Did the sketches that he made provide enough?
136. For your website design project, reflect on design problems that are incomplete and have no predetermined solutions.
137. How the student will discover their major is still undetermined. So it is simply a link or button atm.

138. The questions a student would normally ask have been wrapped up into an online support system, which is good, but that system is still a mystery to us.
139. Assets, we had none, everything was a placeholder, So in theory the entire comp is incomplete, as we do not even have a confirmed default image anywhere on the comps.
140. There was no time to explore how the drop downs would function or how anything on the page would change based on click or user interaction. A lot of UX decisions had to be set aside in the interest of budgeted time. I did not even explore how things may move or transition.
141. JB (12/17/13) When will these things come together? Will GD2 be involved in these designs to take care of these items?
142. Reflect on how you stepped back and took stock in your design situations.
143. I had to be very careful about the use of red, it was the only color we really had to use, and color is usually reserved for links and buttons. In this case buttons and links were either on red or in red. In the case of the Student Highlight area I made the entire area red, because I am confident it is not confusing in this instance, as the entire area in concept is just a link to an interior feature, much like the CTA items under the primary 'messaging' slideshow.
144. The large background image was added to satisfy the clients desire to have the site reflect the style of the Notre Dame site, which had big imagery. There were no provided assets, so I took an image offline of their campus as a placeholder, I felt using a campus image, especially one of the tower would be a safe bet, Preferably the image would be fixed and selected purposefully, but with no real room for that kind of thought or execution the placeholder had to do.
145. For a while now I have been using pre-made icons, such as the arrows on the red CTA areas, the reason I no longer make my own icons is that there is rarely any time and these icons are very well designed. Also by using these icons all the time, they become more standard, and in essence a language of themselves for use in visual communication. NO need to re-invent the wheel when everyone is using the same model, and it works.
146. The logos we got for the badges or accreditations on the bottom of the page were rather starkly different than the college's colors imagery and design. Keeping in mind that I tried to design in accordance with a kind of image they already had I felt the logos as in really upset the design, the reason being the colors were not complimentary and further made the logos difficult to read at such small sizes, so I took a chance and inverted them and de-saturated them to make them monochromatic. Now in most circles that would be quite the liberty, but I assumed that showing these logos in a monochromatic style would likely fall in line with the standards each one has in place already.
147. Now how did I step back? I literally stepped back and also stopped and stared and thought real hard while comparing the design with other designs, benchmarking mats and previous experience. If I saw an issue I addressed it.

148. JB (12/17/13) So, here GD2 is reflecting-in-action. How did this all play out? Was this one step back, understand, what is going on and make changes? Or, was it multiple step backs, multiple understanding, and multiple changes? Need elaboration here.

Email from GD2 after interview #3 on December 18, 2013

149. Just some extra feedback, now that you have my brains attention.
150. In college I took a typography class. Each week we were assigned to make 4 variations of a simple poster. Each iteration the professor let us do one more thing, constraining our choices of typography and composition.
151. The first week was, for example was something like this:
152. You may use the typeface Univers, Regular (no bold or italics) and as many line breaks as you need. A lot of people had similar results, but some people had made the most innovative solutions to those constraints ever. They discovered that they could break up lines into individual words, or break them up into phonetics, all kinds of possibilities.

Interview Meeting #3: Wednesday, December 18, 2013 12:10 P.M. – 12:50 P.M.

153. JB: GD2 had a milestone of November 15 where homepage design comps would have been started. Because the client did not approve the wireframes, the homepage designs did not begin until the week of December 8. GD2 completed a homepage design, but the client had yet to provide feedback.
154. GD2: “I produced one design based on a wireframe.”
155. GD2 explained that the design comp is just like the wireframe with a few modifications from client based on the wireframes.
156. JB: Asked for clarification that all the “what ifs” came to fruition.
157. GD2: “As much as I could, I did.”
158. GD2 explained that the time constraints and the hours were tight.
159. GD2 explained that he waited around to hurry up.
160. GD2: “If you have a lot of stuff on your plate, like for me, I have to switch gears to do this.”
161. GD2: “My drive for the project is dead.”
162. GD2 commented that he had a little drive at the end, but his hours were gone to keep designing.
163. JB (12/29/13) This is interesting. GD2 had to wait around for the client to give the okay to move to the design comps. Once GD2 was designing the comps, he had the constraint of getting done quickly and the hours he could spend on it. This is ironic as he waited around to then hurry up. It is also interesting that GD2’s drive went away. In interview #2, GD2 had commented that he kept thinking about the college homepage as he designed other things. But, in the end GD2 lost the drive.
164. Follow-up regarding did he go back to earlier ideas.
165. GD2: “Off the top of my head, I had to be done.”
166. GD2 explained that he went back to look at styles, but did not look at any notes.

167. GD2 commented everything was to get it completed.
168. GD2: “I did go back to reflect but only for a very short time.”
169. JB (12/29/13) It got to a point where GD2 needed to just move the design forward. However, even though GD2’s interest was waning, he still went back and reflected (...”for a very short time...”). This reflection-in-action helped move it forward.
170. JB: Asked GD2 to elaborate on how he interacted with sketches.
171. GD2: “I tried to fit in as much as possible. I sketched for 10-15 minutes and then got the design going.”
172. GD2: “Sketching is very important, but there is usually not enough time.”
173. GD2 explained that there is uncertainty if he is going to get more projects so he keeps his plate clean and moves out projects as soon as possible.
174. GD2: “When I design I am designing and coming up with fonts, content, and assets.”
175. GD2: “It becomes a mess in your head. You multitask and at times you are just getting it done.”
176. GD2: “Designers are just not designing.”
177. JB (12/29/13) Two things are interesting here. First, sketching is important to GD2 even though it may be for a short time. In the design comp space, this is GD2 drawing from the wireframe that he created. The 10-15 minutes of sketching is a reflection-in-action space so GD2 can then get the design moving. The sketching phase moved GD2 to the design comp space.
178. JB (12/29/13) Second, GD2 feels that designers do more than just design. For GD2, it means that he has to reflect on assets, content, and fonts before he can actually begin to “design.” What is interesting is that GD2 makes a distinction between the two, but GD2 knows both are part of design. GD1 also spoke to this. Interestingly, GD2 rolled all into design where GD2 speaks to them separately.
179. Follow-up regarding the importance of constraints. What if I gave you six images to choose from?
180. GD2: “So much easier. Now I am designing.”
181. GD2: “You have given me constraints. I have to use these. I can do it.”
182. GD2: “Typographically, when I don’t have constraints I have to be more general. It has to fit everything.”
183. JB (12/29/13) This is very interesting. GD2 wants constraints. When he doesn’t have constraints, he has to design with a broad brush. He cannot be too specific because the design has to be general enough, in this case, to accommodate all types of images.
184. JB (12/29/13) But, if GD2 had specific images that would be used, he then would see the problem-solution coexisting. A specific image allows GD2 to possibly get rid of general text boxes and place text right on the image where it would allow. But, when he doesn’t have a specific image to work with then he doesn’t really know the problem and the solution has to be a catch-all. GD2 wants the problem-solution to co-exist as he moves the design forward. The image wasn’t a thought in the wireframe space. But, then in the design comp space, it becomes an opportunity (problem). GD2 looked at the problem from a different perspective and this resulted in a bunch of opportunities as long as GD2

- was held to specific images. But, he was not, so his opportunities weren't as many. He had to design not knowing what the images would be.
185. GD2 explained on the current design, type is in a box. If the client would confirm that the current image is the final image, then the type could be on the blue sky.
186. GD2 concluded that since he doesn't know the image he has to be more general with design so it fits all possible images.
187. GD2: Designers work best when they have constraints."
188. JB (12/29/13) This is reinforcement of what has been shared by other participants.
189. GD2: "There is stress. My decision making is skewed."
190. GD2: "I am worried about the what could happen, and I make sure I corner it."
191. JB: Asked GD2 to elaborate on if he will be involved in tweaks moving forward.
192. GD2: "If I had more control, I would have."
193. GD2: "I didn't have time for the dropdowns."
194. GD2: "I am not happy with what I have designed. All the rushing and no decision making, sometimes it is not a homerun."
195. JB (12/29/13) In the end, GD2 moved the design along. GD2 produced a design comp within the time frame and within the budgeted hours. But, GD2 is not pleased with it for the reasons described above.
196. Follow-up on what if the client likes it.
197. GD2: "As long as they are happy, I am happy. They have a solution."
198. JB (12/29/13) GD2 got it done and the client has something. His design has a purpose. It has an end.
199. GD2: "Design is not art."
200. JB: Asked GD2 to elaborate on how his reflection-in-action happened. Was it one step back, understand, what is going on and make changes, or was it multiple step backs.
201. GD2: "The first one sounds more mechanical. For me it is more organic."
202. GD2: "If I step back, I may just see one thing and change and then this may allow me to see something else than can be changed."
203. GD2: "At first, I didn't have the big image. I was much plainer. Then, I stepped back and saw it was plain."
204. GD2: "When I changed the background image, other things had to be changed."
205. GD2: "My dream would have been to have an image that had space for text, but it didn't happen this way."
206. GD2: "Instead of typography and image working together, they just exist together."
207. GD2 explained that his design is utilitarian.
208. GD2: "With big companies, they put constraints on everything. Like the car companies, this car has to be cropped this way. The car has to be at this angle."
209. GD2 explained that design has purpose.
210. GD2 used a light bulb example. The constraints are that the light bulb has to make light and screw into a socket. There are multiple ways to make this light bulb with these constraints.

211. JB (12/29/13) GD2 used “organic” to describe he design spaces more than once. GD2 uses reflection-in-action by moving from one space to another space. As GD2 understood his unique situation, he made changes. These changes helped him understand his situation more and then he made more changes.
212. JB (12/29/13) GD2 summarized the design as “utilitarian.” The design just existed instead of working together.
213. JB (12/29/13) GD2’s comment about the light bulb in very Kees Dorst like.

APPENDIX I

PARTICIPANT E3 REFLECTION JOURNALS AND INTERVIEW MEETINGS

E3 Kickoff on 9/28/13 2:00 P.M. – 2:25 P.M.

1. An engineer for over five years.
2. E3 explained that this project is different than his previous engineering projects. In July 2013, was moved to a new position. Now a calibration specialist. On an engine, focus on calibration for sparks and ignition. This is his first design project as a calibration specialist.
3. E3 develops this calibration.
4. The engine that he is working on is in the marketplace. He is working on an upcoming model year.
5. E3 is working toward a January release date – 100% calibration.
6. Right now, he is at 65% calibration. By December 1, he will be at 80% calibration. This is where we will take the project to. It is not like he knows where 70% and 75% will be. So, we will find other milestones to follow. One milestone will definitely be December 1; this will be the 80% calibration milestone. This is what he is working toward right now.
7. JB: This is going to be interesting. First, E3 is in a new position. This is his first design project in this position. So, he is definitely in a non-routine, non-procedural design project. It will be interesting to see what he draws from. Does he go back to his previous engineering toolbox? His repertoire of precedents will be interesting.
8. JB: E3 has December 1 milestone. He is going to be at 80% calibration. It will be interesting to see how his reflection-in-action moves the project along.

Milestone Event	Completion Date (projected)	Completion Date (actual)
Trip Prep	10/11/13	10/11/13
Knock Diagnostics	10/30/13	11/6/13
80% Calibration	11/11/13	11/18/13
80% Cal to Next Application	12/1/13	12/1/13

Reflective Journal

Week #1: Due - Saturday, October 5, 2013

For your engine calibration design project, reflect on the development of the design problem-solution relationship.

As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

9. The design problem is to release an 80% spark/knock/dilution calibration for my engine. Within than design problem, there are smaller problems such as adjusting the knock detection calibration such that vehicles don't detect false knock during performance testing (0-60 mph runs, wide-open throttle runs) but at the same time, still detect real knock at an acceptable rate. This tends to be a double-edged sword. What gives you better knock detection tends to lead to more false knock and vice versa. Other little problems involve prepping a vehicle for an altitude development trip. This involves making sure all data acquisition equipment is working properly, which it was not.
10. The design opportunity is leading to solutions in that it provides opportunity to explore the calibration and truly flex what is possible and what is not possible. The opportunity of building a robust knock detection calibration first forces a plethora of data acquisition to understand the problem. Then of course there are more ways than one to skin a cat.
11. JB (10/11/13) What is interesting here is that he begins to talk about opportunities and that opportunities result in, "...more than one way to skin a cat." Is E3 taking a different approach to the problem (Kees Dorst)?
12. I can either change the rate with which the noise signal is averaged or adjust the thresholds that determine if the signal-to-noise level is indeed knock. Based on previously collected data, I determined the appropriate rate to average the noise signal. This then put me down the path of surgically adjusting the thresholds. I say surgically because I am only adjusting the thresholds in speed/load zones that appear to be experiencing false knock. Now this process is a bit back and forth. So when I move the thresholds up, now I probably won't detect real knock as well. So then I might want to adjust the thresholds back down a little. But then I might false knock again. So essentially I will go back and forth until I reach some happy... or unhappy medium.
13. JB (10/11/13) Why could it be an unhappy medium?
14. But as I adjust the thresholds, I see that some of the false knock events are unaffected because the signal-to-noise levels are too high. So I discover that part of the problem appears to be that the average signal calculation the controller performs seems to be incorrect for some reason.
15. JB (10/11/13) So adjusting thresholds is looking for solutions. But, here by adjusting thresholds, there is a discovery of what may be part of the problem – "the average signal calculation the controller performs seems to be incorrect for some reason." Possible solutions (adjusting thresholds) are defining or maybe, more appropriately, pinpointing the problem. E3 already noted that it is a back and forth.
16. Why this is occurring, I am not sure yet. It will take more discovery to figure that out. So potential solutions better define the problem because of basic trial and error. You try something to fix the problem, if it does not fix it, or cause some other problem, the original problem becomes better defined.

17. JB (10/11/13) So, more discovery is needed. Interesting that E3 uses discovery. Why use discovery? E3 uses trial and error to find potential solutions that better define the problem.
18. JB (10/11/13) He is better defining the problem. Early he was using opportunities, but now back to problem, is it both?
19. Now at the same time, I have to prep for our altitude development trip. Truth be told, it is not crucial that I go on the trip. The altitude specific portion of the calibration is already developed. So I am going on the trip as support for other engineers (if they have questions or issues with my calibration) and to make sure nothing goes wrong with my previously developed calibration. At the same time, the vehicle/vehicles that I need to use to continue my own development work will be on the trip, so I need to go, just to get in-vehicle development time. The trip also provides valuable real driving time in the vehicle as opposed to just driving on a track. And this is where you discover many problems and opportunities.
20. JB (10/11/13) Interesting, he is able to reflect-in-action with real driving time instead of driving on a track. Is this where reflection-in-action takes place?
21. As I stated previously, I had to prep one vehicle before being shipped out. The data acquisition equipment appeared to not be working correctly. I essentially could not connect to it. A full half-day of diagnosing the issue and reaching out to several individuals finally led me to contacting the right person for support. I probably spoke to 3 different people that each gave a small sliver of information that finally led me to the right person, Claudio, the support engineer for the data acquisition equipment and to the right solution. This was crucial, because now when I am on my development trip, my vehicle will be operating properly and I will be able to collect the data I need. But again, the problem started with not being able to get the data acquisition equipment to work or connect to my pc. I reached out for help, and everyone gave me something to try. I would try the potential solution and when each potential solution didn't work, it narrowed the focus and led me to realize what the true problem was. And so when I finally spoke to Claudio, I was able to better define the problem to him and he led me a solution fairly quickly.
22. JB (10/11/13) Trial and error helps figure out solutions that work and this in return better defines the problem.

Week #2: Due - Saturday, October 12, 2013

For your engine calibration design project, reflect on the outside experiences, images, and other items that you draw from as you work through the design. In other words, what do you draw from that is not part of the engine calibration design project (for example an engineering project you did in the past)?

23. I generally draw on my past engineering roles as a Product Line Combustion Engineer. In that role, I gained considerable knowledge in terms of fundamental engine combustion. That includes the effect of spark timing on engine performance and the mechanisms with which knock occur. Two-thirds of my current role as a calibration specialist involve spark calibration and knock calibration. So I have a firm understanding of spark and knock and just need to become well versed in calibration itself and not the fundamentals of spark

and knock. So when I am developing a calibration, I first imagine what I want the engine to do and how I want it to respond under certain conditions.

24. JB (10/14/13) This is interesting. Love the term imagine.
25. JB (10/14/13) Would like to follow up on this. Is this choice of word on purpose?
26. Then, I delve into the calibration to see if the software is capable of executing what I envision.
27. JB (10/14/13) What I am interested in is clarification on where this imagination comes from? Is it all on his past experience as a Product Line Combustion Engineer?
28. If it is, then I calibrate as I intended. If not (which happens often), then I simply make a sort of compromise between what I imagined and what is capable. This proves to be a bit of a struggle at times. I want my calibration to be perfectly optimized. And with infinite time and resources, I could “perfectly optimize” it. But calibrations have exact release dates. For better or for worse a calibration will be released on such-and-such date. The cal might be good, it might be terrible, but it will get released.
29. JB (10/14/13) Interesting, reflection-in-action must keep the project moving forward.
30. Design is not perfect. It has to be good. So you can only polish the rock so far before you have move on to other things. And I always have to keep the customer in mind. I don’t get paid to perfect my calibration development skills, I get paid to release a calibration that will please and add value to the customer. So it is not necessary to have a perfect calibration, it just needs to be perfect for the customer. In addition, I draw on some innate sense of symmetry, pattern, and beauty when creating a calibration.
31. JB (10/14/13) This is interesting. It is like a visual that really isn’t a visual. This is pulling from outside of the design and then bringing it into the design and pulling from it.
32. So a cal (short for calibration) ends up being a series of tables and values essentially. Some tables are two-dimensional, other tables are three-dimensional. So a two-dimensional table can be plotted and it would be a line. And even if I can’t think of a fundamental engineering reason for why the line should have some sort of form (linear, exponential, parabolic, etc.), I always tend to want to have the calibration take some sort of form because I assume an engine operates according to a set of physical laws even if I don’t know what laws they are. The same goes for three-dimensional tables. But instead of being plotted as a line, these are plotted as a surface. And I literally say, “oh that is ugly”.
33. JB (10/14/13) What a great quote! Talking about the ugliness and beauty of calibration! Need to have E3 elaborate on this.
34. When I look at a surface, I want it to be smooth, and when it’s not, I delve into the calibration to see if I did something wrong, or if I can change something. I guess you can consider this as drawing on an image from within the design project...
35. JB (10/14/13) There is definitely a transition happening here. Pulling from the outside moves the inside and then pulling from the inside.

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the engine calibration design project (for example, an earlier design element from a very early “sketch” you made)?

36. Inside the design experience I draw from previous calibrations. So any calibration at this point starts from a previous calibration and essentially gets updated as things change on the engine or new learnings occur.
37. JB (10/14/13) Would E3 consider this working within frames where each frame affects the next frame? Reflection-in-action occurs – more learning and then updates as things change. Would like confirmation that changes help understanding and understanding results in more updates and changes?
38. So whenever I make an updated calibration, I literally compare it to a previous calibration. I do this both as a check that I made the intended changes but also as a sense check that what I am doing now is correct based on the new information I have.
39. JB (10/14/13) Reflection-in-action at work. What does E3 mean by a “sense” check?
40. We also have procedures and examples of what the cal should look like, give or take. So obviously I look at procedures when I am developing a calibration, because they tell me what to do and give me guidance. Also, developing a calibration is a collaborative effort in that while I release a specific portion of the overall calibration, there are several other calibrators that release other portions of the calibration. Then there is a lead calibrator that puts all of the calibrations together. So every other person on the team offers some insight along the way. So while I could just make my cal by myself without any input from anyone else, along the process I tend to try and listen and learn about other parts of the overall calibration and see if it relates to my cal at all. Sometimes it does, sometimes it does not.
41. JB (10/14/13) Listen. Learn about other parts. See if it relates to his cal.
42. I try and draw from whatever insight I can gain from my fellow calibrators.
43. JB (10/14/13) So, E3 draws on what other calibrators do because they all roll up into an overall calibration. There are also procedures to draw on from within the design.

Interview Meeting #1: Wednesday, October 16, 2013 10:00 P.M. – 10:35 P.M.

44. JB: There was a 10/11/13 milestone to complete preparation for a trip to Colorado and Utah to test the calibration on vehicles. This milestone was reached on October 11.
45. E3: In regards to if the milestone was reached, “I would say yes.” E3 explains that he had the “bulk” of what he wanted done for the trip.
46. JB (10/22/13) E3 talks about how there are always opportunities to improve. It is his stance that he has to get something out. So, in that thinking, the milestone is hit because he had the “bulk” of what he wanted done for the trip. For him, it is not a cup of calibration that he can look at. For this milestone he had the bulk of what he wanted in regards to calibration. It will never be perfect for E3, but he is always moving forward.
47. The test car is set up with the calibration. Follow-up comment: Your design is not like other designs. I cannot have a cup of calibration. You do not have an external representation.
48. E3: “At the end of the day, that (car) is the product. Final external product is the car.”
49. E3 explains that the car is set up with a combination of all the calibrations. Drive the vehicle and the instruments set up triggers. Collect data and analyze it later.

50. E3: "In vehicle, I can change things on the fly and see how it responds to change. I have this ability."
51. E3 explains that often he sees something, grabs data, analyzes it, and then makes changes for the next day. E3 continues, "Today, I was out and tried something; changed a parameter."
52. JB (10/22/13) This is reflection-in-action. For E3, his reflection-in-action takes place driving the vehicle. He has data to help him understand and from the data he can make a change for the next day. The process is not two steps forward, one back. He keeps moving forward. He takes stock in what he does. Within his design frame (a day's worth of driving), the calibration takes on a life of its own. Today's frame influences tomorrow's frame after the reflection-in-action.
53. JB: Wanted clarification on if E3 feels that he is dealing with problems or opportunities.
54. E3: "I guess lots of times it can be opportunities." E3 explains that with an engine in year 1, you do the best you can as you have to put something out there. As time goes on, you can improve the car and make it better.
55. E3: "These are opportunities to make it better."
56. JB (10/22/13) This is becoming more and more interesting. As the problem/solution co-evolve, there is this constant reference to opportunities. Solutions generate opportunities from what is defined as the problem. I wonder if this is due to the fact that E3 has to do his best to get something out there so now for the next year he is looking at opportunities to make it better. It is not that the problem has not been solved. It's that the solutions for year 1 create opportunities for year 2.
57. JB: Wanted clarification on E3's journal reflection: "...I will go back and forth until I reach some happy...or unhappy medium."
58. E3 explains that sometimes you are trying to satisfy two different means that are opposing one another. For example, more performance versus getting from a to b (pleasant drive). These are two different calibrations, but there is one calibration for one engine. Can't have both...an "unhappy medium."
59. JB (10/22/13) E3 accepts that it is never perfect. But, he is always moving his design forward. He has constraints – the new model year. His reflection-in-action puts him in a position to move the calibration to production even if he is dealing with an "unhappy medium."
60. JB: Wanted elaboration on E3's journal reflection that adjusting thresholds is a discovery of what may be part of the problem. Are the possible solutions (adjusting the thresholds) defining the problem or pinpointing the problem? Is this the same thing? If not, what is the difference?
61. E3 explains that it is defining the problem. "I know the problem from a broad level. I have to get to the details to see what is causing the problem." E3 explains that there is more than one way for the problem to occur. There are different reasons why something can happen. Thresholds help to filter out other things.
62. JB: Wanted validation that this is a discovery. E3 used discovery in his journal reflection.

63. E3: "You have an expected result. But, when you don't get it you get more information then you change." E3 explains that this is a discovery process. He makes one change and sees what happens. He then makes more changes.
64. E3: "The more you understand the more tools you have." E3 explains that as time goes on, the variables grow rather than shrink. New things come up as you move forward.
65. JB (10/22/13) This is almost reflection-in-action by definition. E3 uses "discovery". He works in a design frame and he is discovering as the calibration within that design frame becomes alive. He moves to the next design frame.
66. JB: Follow-up: Isn't this counterintuitive to a design?
67. E3: "Yes, it seems to be." E3 explains that for calibration, from model year to model year things keep growing as you discover more and more complex problems.
68. E3 explains that he draws on his experience as a product line combustion engineer. This gives him the idea of how things work within the engine.
69. JB: Wanted clarification on E3's journal reflection, "I draw on some innate sense of symmetry, pattern, and beauty when creating a calibration."
70. E3 asked me to imagine a table. Imagine an Excel spreadsheet with the x and y axis. The top is engine speed and the left column is the pedal position. The table is expected to have a pattern.
71. E3: "I expect it (table) to move and be smooth and symmetrical." E3 explains that what you end up with jagged edges. "It's ugly." Now, E3 is dealing with outliers.
72. E3: "I don't understand everything on the engine. I have to rely on data."
73. Follow-up to, "it's ugly."
74. E3 explains that the spreadsheet visualizes calibration, "just like a design or painting."
75. JB (10/22/13) Making calibration a visual. This is remarkable. This is how he takes stock in what he is doing. He has something to react to. This is such a great image.
76. JB: Wanted clarification on the term "sense check" that E3 used in week 2 journal reflection. "I do this both as a check that I made the intended changes but also as a sense check that what I am doing now is correct based on the new information I have."
77. E3 explains that he does his best to ship it out the door. You have the 2013 model year calibration and you compare that to the 2014 model year calibration. You compare what is different. You do new testing and you have new data. For example, hot weather testing.

Reflection Journal

Week #3: Due - Saturday, October 19, 2013

For your calibration design project, reflect on how you develop partial solutions to advance the design.

78. Along the process of developing a calibration, I come across problems or opportunities to improve the calibration.
79. JB (10/22/13) Again, a reference to opportunities.

80. Many times I will change or alter the calibration that will alleviate the problem some of the time, but perhaps not all of the time. Other times, a partial solution occurs because there is little data or I do not want to broaden the spectrum of what I am changing. For example, a fellow calibrator complained to me that my calibration pulls out too much spark from the engine during low humidity idle conditions. I agreed with him that there is no need for the calibration to pull out anymore spark under those conditions. So I adjusted the calibration such that at low enough engine speeds and low enough loads (essentially idle), no “humidity spark” will be pulled out. I could have taken the time to think, test, and see whether I could expand the speed-load zones where I could “zero-out” the humidity spark. But I decided to only zero-out the spark in the very small area that would affect idle. Thus, this partial solution is good enough to get the job done, but may not be the calibration possible. Part of the reason for this partial solution is time and energy, the other part is risk. The more tweaks I make to the calibration, the more chance I don’t evaluate it as well as I should, causing risk that a problem will pop-up in the future that I had not foreseen.
81. JB (10/22/13) Partial solution occur because of time and energy and because of risk. The partial solutions help to keep it moving forward because he better evaluates it. Need follow up here, is evaluation the same as reflection-in-action here? To this point, E3 has clearly reflected-in-action. In some instances, he is the definition. Is evaluation different?
82. I spoke previously about adjusting knock thresholds in select speed-load zones where false knock was occurring. I did not revisit the whole calibration table in that case, I simply went with a partial solution of select portions of the table. This again was to mitigate risk. Also, the problem of false-knock occurs during a specific 0-60mph maneuver. Most customers would not experience this problem, thus a partial solution was developed to satisfy a problem that occurs during a portion of a driving experience.
83. JB (10/22/13) So, again, the partial solution mitigates risk which keeps the design moving forward. So for clarification, are we back to our “ugly” table and he is finding a partial solution for one of his “jagged edges?” Need clarification here.
84. So as a calibrator I am responsible for a certain portion of the calibration. Out of say 20,000 variables, I am responsible for about 1,000 of them. Many times when a problem is experienced, I will make a mini-calibration (some subset of those 1,000 variables) and send it to whoever is experiencing the problem. I might later include this mini-cal into a later release of my whole cal, but many times this mini-cal might just be used by the intended party so they can do their testing or bypass whatever issue they saw. This is another example of a partial solution. The mini-cal is just a way to bypass an immediate problem while trying to solve a bigger problem or develop something bigger. The mini-cal can be considered a “fix for now”, until I can develop something better in the future.
85. JB (10/22/13) “The mini-cal can be considered a ‘fix for now’, until I can develop something better in the future.” This seems to support E3’s approach that his calibrations for this model year create opportunities for next year’s improvements. The focus is always moving the calibration forward toward implementation. Without partial solutions, would he ever release a calibration? In other words, does a whole cal solution really

exist? If not, then reflection-in-action on min-cal is the only way to move it forward.

Week #4: Due - Saturday, October 26, 2013

For your calibration design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

86. A unique and uncertain situation has been trying to develop an SPI calibration for my engine. SPI is stochastic preignition, a phenomenon in turbo engines. I have to develop a calibration that will detect when SPI occurs and react to it appropriately. SPI is a fairly new phenomenon and it's not completely understood how or why it occurs. The current thought is that oil droplets enter the combustion chamber and spontaneously combust under the immense pressure and temperatures that occur during turbocharged conditions. The thing about trying to calibrate a detection algorithm for SPI is that you need to get an SPI event. These events don't occur regularly, and there is even question as to the mechanism that causes SPI. Thus, I have to try to induce SPI without knowing exactly how to do that. So as I try different speed/load, temperature, spark timing, etc. conditions, I am gaining better understanding as to how SPI occurs in an engine. And while I try to get SPI to occur several times on an engine, SPI is damaging to the engine, so I don't want to overdo it. So to reiterate, I am trying to induce SPI, which I don't know exactly how to induce it because I don't completely understand the phenomena. Then I am trying to induce enough SPI events so I have a good dataset with which to characterize an SPI event and then hopefully gain enough understand that I can keep the engine from having an SPI event occur at all, as opposed to just waiting for it to happen and reacting to it.
87. JB (10/28/13) Wow! This is reflection-in-action! It is a unique and uncertain situation that E3 is dealing with. Taking stock in the situation and understanding the unique and uncertain situations of SPI by trying to induce SPI (change the unique and uncertain situation); and by inducing SPI (change) attempt to understand how to keep an engine from having an SPI event.
88. JB (10/28/13) E3 is proactive here, "...as oppose to just waiting for it to happen and reacting to it." Elaborate on this. E3 is pushing the reflection-in-action. He is making it happen. It just doesn't occur. It is an active process.

Week #5: Due - Saturday, November 2, 2013

For your calibration website design project, reflect on how you are moving the project along toward implementation.

89. I am moving through the required steps of completing my 80% calibration, just not at the level of efficiency I would like. Part of the issue is resources. I do not always have access to a vehicle, to test facility, or to the human resources I require. Our test vehicles were shipped out for a development trip, so there were a couple of days I did not have access to a vehicle. Once I did get a vehicle to work in, I reserved time in a test cell to do some of my diagnostic testing. Unfortunately it was not communicated to me that I couldn't use the test cell because my vehicle is all-wheel drive and the test cell can only handle front

wheel drive vehicles. So that set me back. But probably the most important resource I needed to utilize was a human resource. I needed my technical specialist to guide me through the testing since this I was unfamiliar with the procedure. My testing was finally progressing, but because we worked very late Wednesday night (that night was the only time we could get into the proper test facility to execute the testing), my tech specialist worked from home Thursday and also took Friday as a vacation day. That left me alone and unguided to complete the testing. But even still, I collected most of the data I needed, so I began analyzing it, but my unfamiliarity with the data analysis tool I was supposed to use led to me being somewhat inefficient and again, needing to rely on some expertise from other engineers. In the end, I have really just become pressed for time. I should have started this portion of my testing and calibration development earlier, but other things always come up. I will eventually fully develop the cal. It will be later than intended, but not critically late.

Interview Meeting #2: Saturday, November 2, 2013 10:45 A.M. – 11:20 A.M.

90. JB: There was a 10/30/13 milestone to complete Knock Diagnostics. This milestone was not reached on October 30.
91. E3: In regards to if the milestone was reached, "I did not hit it." E3 explains that the week leading up to 10/30/13 he did not get through all the testing.
92. E3 stated that he ran into resource issues. Even though he had a test vehicle in reserve, it was an all-wheel drive vehicle which was not going to work.
93. E3 states that timing just did not work out as there was one more test that he had to do. This goal will be completed by November 6 which puts the milestone one week behind.
94. In regards to being a week behind with the milestone, E3 states, "It's okay, but not ideal." This sets him back for his 80% calibration as he will not have all the data for the 80% calibration, but he is not at 100% calibration yet.
95. JB: Wanted to follow-up with E3 regarding is evaluation the same as reflection-in-action.
96. E3: They are different. E3 explains, "Evaluation is looking at a system, but you may not do anything. You are just evaluating. You just want to evaluate the situation."
97. E3 further explains that evaluation is characterizing something and document that it is.
98. JB: Asked E3 to elaborate on a partial solution that mitigates risk keeping the design moving forward. Does E3 find partial solutions for the "jagged edges" on his "ugly table"?
99. E3 explains that when he looks at an ugly table he may try to smooth a jagged edge. However, he could look at a fairly smooth table and the partial solution could make it uglier because he may move up the threshold and make a jagged edge. E3 notes, "I am making the table uglier, but I am coming up with a partial solution."
100. JB (11/13/13) Partial solutions are crucial for E3. Interestingly, the partial solution may make the table uglier as it may result in another jagged edge. In reality, the table will always be jagged. What is important to E3 is that he is always moving the design forward. You do not have time to start from scratch, so E3 is reflecting-in-action often. His approach to partial solutions is all reflection-in-action.

101. E3 adds, “You don’t go back to the whole table. If you change things too late then there could be consequences.” “Realistically speaking, the table will always be jagged. You have to move forward and you don’t have time to start from scratch.” “You never completely revisit the table and you never start from scratch.”
102. JB: Asked E3 to elaborate on, “The mini-cal can be considered a ‘fix for now’, until I can develop something better in the future.” Without partial solutions, would he ever release calibration? Does a whole cal solution really exist?
103. E3 states, “The whole cal solution doesn’t exist until the release of 100% calibration which you are developing in a time frame.”
104. E3 explains that there are 20 calibrators who can be contributing to one calibration. E3 explains, “If I don’t get them a mini solution, then they can get stuck with their calibration.”
105. E3 states, “Mini-solutions are needed along the way to make the whole solution.” Striving toward RPR (100% calibration), but if something is wrong then he will need to update it later.
106. E3 confirms that without a mini-cal the design does not move forward. E3 continues, “You can’t just try things out. I am dependent on other calibrators.”
107. JB (11/11/13) Another example of E3 moving the design forward. There is a lot of reflection-in-action that happens with mini-solutions. This reflection-in-action on mini-solution keeps the design moving forward.
108. E3 provides an example. If shutters are open it allows for air flow. If shutters are closed it does not allow for air flow and is more aerodynamic. There is a calibration for E3’s work where he needs the shutters open. He went to another calibrator to get the shutter open. E3 probably could have figured out how to open the shutter. But, he needed a mini-solution to keep his work moving forward.
109. JB: Asked E3 to elaborate on him pushing the reflection-in-action. He is making it happen. It just doesn’t occur. E3 is proactive, “. . .as opposed to just waiting for it to happen and reacting to it.”
110. E3 explains, “I try to be in control as much as possible.” “I make it happen.” E3 uses a visual of turning a knob or pushing a button. When this is done, E3 states, “I get a better understanding of the response.”
111. JB (11/11/13) This is reflection-in-action. By “turning a knob” or “pushing a button”, E3 better understands the response. When E3 better understands the response, he can turn another knob or push another button.
112. E3 explains this further. When he is driving a car, he may see or feel a change, but he does not know what is happening. He continues, “I try to do things, so I have a better understanding of what is going on.”
113. JB (11/11/13) Another example of E3 reflecting-in-action.
114. JB: Follow-up – Is being proactive part of how you are wired as a designer, or is this what engineers do?

115. E3 explains, “In development, you have to push it and put in inputs. This is what engineers do.”
116. E3 continues, “Then, there is validation after development where you see what happens.” In development, engineers push it and try to get it done.

Reflection Journal

Week #6: Due - Saturday, November 9, 2013

For your calibration project, reflect on your opportunities for solution development. Reflect on unanticipated problems and opportunities.

117. I’ve actually come to always expect problems in these types of development projects. This is not because I am a pessimist, but simply because when you are developing something new, there are always problems that arise due to not knowing what to expect.
118. JB (11/12/13) Is E3 okay in this world? There is uncertainty here. E3 has worked in uncertainty from the beginning. E3 keeps the project moving forward. This whole project has had uncertainty. Is it the uncertainty that keeps him going, or is there just enough certainty to keep it going? Or, is it the ability to reflect-in-action?
119. One such unanticipated problem was my cam phaser enable calibration. Cam phasers use oil as the actuating fluid to move the phasers. When an engine first starts up, there is a period of time needed for oil to go from the oil pan and actually fill the whole oil lubrication system. And so during that period, you don’t want to move the phasers because there is not enough oil in the circuit. Previously we set the calibration to delay moving the phaser for a period of time after the engine RPM passed some low threshold. But really we wanted to set the calibration based on oil pressure because that is a better indicator of whether oil is present to actuate the cam phasers. So a calibration software change was made to facilitate this. Unfortunately, after making the new calibration, we discovered a glitch in the software that incorrectly applied the delay I previously spoke about. This was a problem that needs to be solved with a fix to the software. But software changes take a long time to implement so the solution was to revert to the old way we used to calibrate enabling cam movement based on engine RPM. The short term solution was not hard to implement, but root causing the issue and deciding what to do took time and effort that was unexpected.
120. Opportunities are a bit of a joke around the office because opportunities are just a politically correct way to say problem. But true opportunities do exist. Sometimes however there is hesitation to seize new opportunities because of the old “it’s not broken don’t fix it.” For example, the old way to enable cam phaser movement based off of engine RPM worked. But there was an opportunity to calibrate that function differently (and better). But because the software change was not implemented properly, a problem was actually created! But true opportunities do make themselves available in general when brand new programs are being developed. This current project I’m working on however does not really lend itself to new opportunities. There are certainly calibrations that were developed before I came on the project that have the opportunity to be

improved, but because of time and the averse culture to risk, those opportunities cannot be realized.

121. JB (11/12/13) This is very interesting. Does it make a difference that E3 is a new calibration specialist? In other words, does it change that he is new and may see things differently? So, constraints can knock down opportunities. Is this okay? The design project has to be completed. Would chasing opportunities result in a design spiral? Are the problem-solution co-existing? Are opportunities helping to define the problem this late in the game?

Week #7: Due - Saturday, November 16, 2013

For your calibration design project, reflect on when “*what if*” turns to design decisions; exploration turns to design commitment.

122. Several times during the calibration process there are “what if” moments. In my experience, someone comes to me with a problem my calibration is causing them. My calibration is already set at this point, so now it becomes, “what if” we change it slightly, what will happen. Well in these instances, I first brainstorm what potential problems can be caused from altering my calibration. Then I change my calibration and test it and see if those potential problems prove true.
123. JB (11/27/13) True reflection-in-action happening here.
124. If they do, then an alternate path has to be explored. If the potential problems don’t prove true AND I see a benefit to the change, then I commit to the change and move forward with the new calibration I just made.
125. JB (11/27/13) Reflection-in-action results in moving the design forward. Great example!
126. This can’t be done all the time. Some calibrations are inherently more risky to change and those “what ifs” simply don’t become part of the final calibration unless the “what if” is properly explored at the time the calibration is first being developed as oppose to a relatively late change. But exploring those “what ifs” are still important because they serve as good learning experiences.
127. JB (11/27/13) What ifs are always good. Follow-up for E3...Is a late what if an early what if for the next model year?
128. I might not know when I will be able to apply whatever learning I gather, perhaps never, but if the time and opportunity exists to do some what if exploration, I take it. One might not get the opportunity later.
129. JB (11/27/13) Is the What If exercise another way of discovering solutions and ideas that help define the problem?
130. What is risky about turning a “what if” into a design commitment is that there is usually no formal procedure to validate that what if. We have procedures to develop calibrations, and technically, those procedures should produce the best possible calibration. But when I come across a “what if”, I usually test it and validate by simply driving around with the new potential calibration until I get, what we call a “warm fuzzy” feeling inside that it works. And then I simply have to make the decision whether to move forward and make the “what if” into an actual calibration change. If I consider the risk low, I usually just like to make the decision to make the change and don’t second guess it.

131. JB (11/27/13) Back to the risk discussion. Bobby Layne once said, “I never lost a game I just ran out of time.” Where is the balance in that a what if never will become a design commitment because the risk will always be too high and the what if can become a design commitment with enough time. Would E3 ever say, “I never lost a what if opportunity I just ran out of time.”

Interview Meeting #3: Wednesday, November 20, 2013 9:15 P.M. – 9:45 P.M.

132. JB: There was an 11/11/13 milestone to complete 80% calibration. This milestone was not reached on November 11.

133. E3: “I did not come through with all deliverables. I handed in 80% calibration, but it didn’t have everything.”

134. E3 explained that he had to do diagnostics for the calibration and he didn’t do SDI calibration.

135. Follow-up regarding the consequences of not delivering all the deliverables.

136. E3: “It’s not ideal, but okay. The big thing is to have 100% calibration. We want to have everything in there.”

137. E3 explained that the timing was tough and some resources were not there. There was a resource availability issue.

138. E3 noted that for 100% calibration diagnostics will be needed.

139. E3 concluded, “It is almost done.”

140. JB (11/27/13) For E3, the 80% calibration is a stepping stone for the 100% calibration. “It’s almost done,” and the big thing is to have everything completed for the 100% calibration.

141. JB: What is the 80% calibration deliverable?

142. E3 explained that it is an Excel file that has a list of variables and values. It is a table.

143. E3 noted that he is responsible for certain calibrations. He provides a csv file that is exported to Excel.

144. JB: Wanted E3 to elaborate on designing in a world where problems always arise.

145. E3: “It’s okay. It’s only a problem when you don’t put enough time in and you fall behind.”

146. E3: “If you properly allot for problems they are expected. But, if you only have a week, it can be a problem.”

147. E3 noted that it’s not a problem when you can plan for it.

148. JB: Asked E3 if it is the uncertainty that keeps him going or is there just enough certainty to keep it going?

149. E3: “There was not ever enough uncertainty that I just threw my hands up.”

150. E3: “There was enough certainty to keep going.”

151. E3: “In the calibration world, there is not an option to throw your hands up.”

152. JB (11/27/13) This is interesting. E3 worked in uncertainty which from journal reflections and previous interviews drove his reflection-in-action. E3 had a lot of

reflection-in-action. There is an interesting balance here. There was never too much uncertainty. There was always enough certainty to keep it going.

153. JB: Asked E3 if it made a difference that he is a new calibration specialist?
154. E3: "It definitely kind of changes the view on how I operate."
155. E3 explained that at idle conditions in hot and humidity the calibration can be adjusted. Hot and humidity are bad for idling; make the engine unstable. E3's predecessor never altered the calibration for idle.
156. E3: "They saw me as new, and asked me."
157. E3: "I said I can make it work and I adjusted the calibration a bit."
158. E3: "In that situation being new made a difference."
159. E3 explained that this may have been different if he was seasoned because it ended up being more work.
160. JB: Asked if constraints knock down opportunities to improve the calibration.
161. E3: "Constraints can result in opportunities not realized."
162. E3 explained, for example, in a turbo charged engine the calibration is not ideal.
163. E3: "I have thoughts but there is too much risk in the program."
164. E3 noted that he would need drive time which is not possible so it cannot be realized.
165. Follow-up on if these then would be opportunities for 2015.
166. E3: "Sometimes, opportunities could be realized due to timing. So, it could be realized in 2015."
167. E3 explained that opportunities that are realized with more time and are risky could not be realized because of the risk.
168. E3: "Never take the leap for that risk."
169. JB (11/27/13) Risk is interesting here as a constraint. E3 has thoughts on how to improve the calibration for a turbo engine. With time this could be rolled out in 2015. But, the risk constraint supersedes the time constraint. It is an opportunity that cannot be realized.
170. JB: Asked E3 if chasing opportunities results in a design spiral.
171. E3: "Design spirals can happen. There comes a time where you decide to stop tweaking."
172. E3: "You can get in and endless spiral. You have to make a decision."
173. E3: "You are looking for a perfect solution and this can be endless tinkering."
174. E3: "I have to look at priorities. You have to take one priority over the other where I find something that fits a priority with the information that I have right now."
175. JB (11/27/13) This is a theme that comes up over and over. The design is never perfect. It appears that constraints make it almost impossible to have the perfect design. Some participants (GD1) have called it designing for reality. E3 has information right now and uses that information to design the best he can. Decisions have to be made, constraints have to be accounted for, the design project has to have an end. E3 and many other participants focus on keeping the design moving forward. They use reflection-in-action to do this. But, in order to keep the design moving forward, perfection may not (never) occur.

176. Follow-up: Like the example of fuel efficiency versus performance?
177. E3 explained that it is about the priority.
178. E3: "If the calibration helps you meet the target and not go over the top, you want to meet both of them."
179. E3: "A decision needs to be made on which one."
180. E3 noted that he has to make it happen as someone makes the priority for the calibration.
181. JB (11/27/13) This brings in the problem-solution co-evolution discussion. For E3, fuel efficiency and performance are solutions that hurt one another. So, the solutions can define the problem. Is it performance? Is it fuel efficiency? Is it both? E3 notes it is about meeting a target where you can meet both of them. Again, it is not going to be perfect because they negatively affect one another. The problem-solution relationship co-exists. One is always with the other.

Reflection Journal

Week #8: Due - Saturday, November 23, 2013

For your calibration design project, reflect on your interaction with drawings, sketches, and models.

182. Typically we use models as analytic predictions. So for parts of my calibration, we actually try to predict what the calibration should be, before we start making the calibration. This activity at least limits the scope of my work as I use analytic predictions to get me close to the expected calibration! and then I do some fine tuning to optimize the calibration. Models are also used within the calibration software itself. For example, there is a residual fraction model that predicts what the in-cylinder residual mass fraction is based on the exhaust pressure of the engine.
183. JB (11/27/13) Need elaboration here... Do analytic prediction models act as low-fidelity prototypes? In other words, are you using fewer resources?
184. I typically use drawings as reference for mechanical parts. Even though my job is to make calibrations, I am still working with physical hardware, and sometimes I need to make reference to how the hardware is configured. This can be default positions for a throttle, turbocharger, camshaft phasers or maybe wiring diagrams for certain electronic components. This is critical, because I need to have a sound understanding of how the engine is configured and how it works before I can try to calibrate and make it operate how I want it to. It's like trying to go from where you are to point B, but you need to know where you are. Otherwise you can't even begin to try to reach your destination. Drawings of the engine allow you to know where you are.
185. JB (11/27/13) Like a true designer, interacting with drawings and models.
186. Finally, sketches are typically used during informal technical discussions. Usually when one engineer is trying to explain to another engineer how something works, sketches are quickly drawn up to serve as aides. The saying that pictures are worth a thousand words is very true. But honestly in the technical realm, sketches are more clear and deliver the necessary information faster. Don't get me wrong, some verbiage is needed to convey thoughts, but for the most part, a sketch goes a much longer way.

187. JB (11/27/13) This is very interesting. The visual is key. The visual delivers the necessary information faster. It keeps things moving. Validate this.
188. What does E3 think about, “Give us something to react to”? Is this what this is all about?

Week #9: Due - Saturday, November 30, 2013

For your calibration design project, reflect on design problems that are incomplete and have no predetermined solutions.

189. One design problem that is incomplete and does not have a predetermined solution is updating the SPI algorithm in the calibration. SPI is a special kind of preignition event in an engine that is very severe and potentially damaging to an engine. An algorithm needs to be developed to detect SPI (when it occurs) in an engine and differentiate it from regular knock or preignition. A good algorithm needs to be developed from many (at least 30) recorded SPI events. Right now I have 1 recorded event.
190. JB (12/2/13) Is this the reason that E3 only has one recorded event is that E3 had to keep the project moving forward? Is this the time constraint coming up again? Will you have this completed prior to 100% calibration?
191. Until I get enough data, I will not have a solution or updated algorithm. If I literally had to release my production calibration today, I would have to use the algorithm that was developed previously for the old engine controller we used. The problem with trying to use that old algo on this new controller is that the HWIO is different between the controllers, so the inputted signals are different and thus the algo would not be accurate for a different inputted signal. But that old algo would be better than nothing.
192. JB (12/2/13) Need validation that for 100% calibration the algorithm will be set.
193. This problem is concerning because SPI is not a regularly occurring phenomenon and needs to be induced on the engine, which is not simple. So I am at the mercy of a “chance” occurrence, occurring 29 more times. Honestly, looking at data for 30 events is just a feel good number on past experience. But really this is a level of confidence situation. The more events I have recorded data for, the more confidence I have in the algo I develop from that data.
194. JB (12/2/13) To the bitter end, E3 is still reflecting-in-action. Inducing SPI, which we saw in earlier journal and interview meetings, is reflection-in-action. A unique and uncertain situation that once understood changes are made to better understand and then make more changes to try to induce the SPI.

Interview Meeting #4: Wednesday, December 4, 2013 9:15 P.M. – 9:45 P.M.

195. JB: There was a 12/1/13 milestone to complete 80% calibration to next application transfer. This milestone was reached on December 1.
196. E3: “Yes, this was completed. We, as a team, were early.”
197. E3 explained that he was able to make calibration for the next application. E3 was able to transfer over the new software and the new functionality.
198. E3: “Some problems occurred, but I was able to get in a vehicle and figure it out and had a good cal by the 12/1 milestone.”

199. E3 explained that it was different than last time when he did not have the resources available. This time E3 has the resources to figure out the problem. E3 had the resources early enough and the timing helped.
200. JB (12/11/13) Unlike the last milestone, E3 had the resources to complete the milestone. It was still the same constraints – needed the proper vehicle, needed the time. This time E3 was able to design in the constraints.
201. JB: Asked E3 to elaborate on if a late “what if” is an early “what if” for the next model year?
202. E3: “Yes, usually it will. What ifs are good for the exploration process. Sometimes nothing happens.”
203. E3 explained that sometimes you can use “what ifs” for the next model year.
204. JB (12/11/13) This is interesting. E3’s what ifs turn into a design decision for the current model year. But, the what if may not be totally satisfied in the current model year. So, then what ifs can be used for the next model year.
205. JB: Asked E3 is the “what if” exercise is another way of discovering solutions and ideas that help define the problem?
206. E3: “What ifs help define the problem.”
207. E3 provided an example where on an earlier trip E3 had to deal with cold temperatures. E3 looked at tables to add or take out spark. The ‘what if’ was to add spark to see if the engine could take it.
208. E3: “I adjusted calibration and added spark.”
209. E3 continued that this adjustment could add fuel economy in cold weather. For this model year, this was no good as it was too late. But, for the next model year it could help. Under cold temperatures, there may not be enough power so the exercise could help this.
210. E3: “This was a what if that I explored and down the line it could help.”
211. JB (12/11/13) The idea that a what if may not come to fruition in a current model year due to the time constraint. However, “...down the line it could help.” We have seen this with other participants. It is all about opportunities. E3 looks at the problem (spark and cold temperatures) from a different perspective and E3 sees an opportunity to improve fuel economy in cold temperatures. The time constraint for this model year does not kill the exploration and the opportunity to help down the line (the next model year).
212. JB: Wanted E3 to elaborate on would E3 ever say, “I never lost a what if opportunity I just ran out of time.”
213. E3: “If I had all the time in the world, some what ifs would come to fruition if they had a benefit.”
214. E3 explained that if E3 could work on it at his leisure he could provide management an update and then E3 could continue working on it.
215. E3 continued that this way, the next time management asked E3 could show that he has an improved calibration.
216. E3 explained that this would happen outside of the production.
217. E3: “But, it doesn’t happen like this. There are certain calibrations that have to be done.”

218. JB (12/11/13) There is this interesting balance between exploring and what ifs and moving the calibration to 100% calibration. E3 balances it so well. E3 knows that he has to complete the calibration. E3 is always asking what ifs and trying to find opportunities to explore the what ifs.
219. JB: Asked E3 if analytic prediction models act as low-fidelity prototypes so that E3 is using fewer resources?
220. E3: “Yes, we use fewer resources to do it this way instead of building an engine and a car to test.”
221. JB: Asked E3 to elaborate on if the visuals that he uses keep things moving because the necessary information is received faster.
222. E3: “I guess it does, but on a small scale for meeting deadlines.”
223. E3: “When I look at a sketch it can help in the short term. It saves, maybe, an hour. This is small in terms of my deadline.”
224. E3 explained that visuals are more of a preference.
225. E3: “It is more a preference thing. I like to take a minute then get back to reality.”
226. JB (12/11/13) Two things here. First, E3 likes to react to visuals. This is a personal preference. It is the space he likes to be in. Second, there is the continuous theme across all participants about the reality of design. It is design for a purpose not design for design’s sake.
227. JB: Asked E3 if his one recorded event regarding SPI is because E3 had to keep the project moving forward?
228. E3: “I was working on other things. It took a lot of resources.”
229. E3: “It is a headache. I can’t just push a button.”
230. E3: “I had to get a vehicle, retrofit with equipment, drive it around until I get the numbers for SPI.”
231. Follow-up on if this will be completed prior to 100% calibration.
232. E3: “The goal is to have it by 100% calibration.”
233. E3: “I will have it complete. I will try my hardest.”
234. E3: “I currently have a previous year’s calibration. It is not right because of different hardware.”
235. E3: “If I can’t do it I will use the old calibration.”
236. E3: “There is no way to short cut it. So, I will try.”
237. JB (12/11/13) E3 described the SPI example in depth in a reflection journal. It is an excellent example of reflection-in-action. Now, I see why it is such a great example of reflection-in-action. Reflection-in-action is the only way SPI can be solved. As E3 states, “There is no way to short cut it.” It is reflection-in-action by necessity or requirement. Solving SPI (there is a problem-solution relationship here) is all about designing in frames and reflecting-in-action and moving to the next SPI frame. E3 says that he needs at least 30 occurrences of the SPI. This is 30 design frames that requires reflection-in-action for each.

Reflection Journal**Week #10: Due - Saturday, December 7, 2013**

Reflect on how you stepped back and took stock in your design situations.

238. I usually take a step back and take stock in my design situations before and after segments of a project. Before, I look to see what the potential for the project is and what resources I have. Then I formulate some sort of plan and think about how the project will play out. This helps because I can realize if I need to procure more resources, or alter my plans for any reason. It also helps because it's a chance to keep focused on the big picture. Sometimes one can get wrapped up in the specific task at hand or focused solely on a minor detail, but a better perspective exists when you take a step back. Yes I am trying to develop a specific engine calibration, but the true end goal is to design, build, and sell great cars, so whatever I do, I want to keep that in mind.
239. After I complete a task, I again take a step back and assess how things went. How much time did it take me to complete the task, what could have been done better, did I truly accomplish what I intended or needed. Usually the biggest takeaway is how I could have executed the task better and faster. Or more broadly, how I can better apply the resources I have more effectively the next time I have to use them. This all ends up being a sort of lessons learned that I try to apply moving forward.
240. Finally I take stock in the design solution, or how good the calibration is. To be honest, I'm not sure what I do with this information, but I feel it is important to know whether the calibration I developed is good or bad. If it is good, I give myself a little pat on the back. If it is bad, then I recognize that shortcoming! and keep open the option for future improvement in mind. Sometimes problems will come and to address the problem, a calibration change would have to be done. Well if the calibration is good, then I am less likely to change that cal and I look for other solutions or explanations for the problem. If the calibration is bad, then I am more likely to try a calibration change and see if it fixes the problem.

APPENDIX J

PARTICIPANT ID4 REFLECTION JOURNALS AND INTERVIEW MEETINGS

ID4 Kickoff on 9/29/13 12:10 P.M. – 1:00 P.M.

1. An instructional designer for over 20 years.
2. ID4 explained that this project is different than most instructional design facilitations.
3. ID4: “You have to be flexible. Everything is different”
4. ID4 will go to six different dealerships and each dealership will be different.
5. This is two-day events for car dealerships. Two sessions with leadership and two sessions with non-leadership.
6. Day 1: 3-hour leadership
7. Day1: 3-hour non-leadership
8. Day 2: 2-hour leadership follow-up
9. Day 2: 2-hour non-leadership
10. Day 1 & 2 much different for leadership. Day 1 & 2 same for non-leadership.
11. DISC (Dominant, Influential, Steadiness, Conscientious) Behavior Profile. This is the foundation for being more intuitive with oneself, understanding one’s style and other’s styles, be more adaptive, improve customer experience and relationships
12. Management takes DISC prior to training and ID4 is able to review the DSIC for each manager.
13. JB: This is going to be interesting. First, ID4 has an idea how he will present, but then gets DISC results and makes changes prior to the training. It will be a different approach for each dealership. Then, depending how day 1 goes, ID4 makes changes and he understands the teams and decided which activities he will use. Again, this is different for each dealership.
14. JB: ID4 used the word flexibility often. He has to be flexible. He has to be flexible between Day 1 and Day 2. He has to be flexible when a dealership insists that they can only do one day of leadership for 3 hours instead of two days for five hours.

Milestone Event	Completion Date (projected)	Completion Date (actual)
Dealership Training	11/26/13	11/26/13
Dealership Training	12/20/13	12/18/13

Reflective Journal

Week #1: Due - Saturday, November 9, 2013

For your dealership training process, reflect on the development of the instructional design problem-solution relationship.

As you understand the instructional design problem or opportunity, how are solutions evolving? How is the instructional design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

15. The biggest design problem/opportunity is how can we assure the design will have the greatest impact on each dealership to whom it's delivered.
16. Accordingly, the design methodology needs to be adaptable to the specific group. Each group to whom it's delivered has different dynamics, different needs and desires different outcomes. Thus, the basic integrity of the design must stay in tact, but allow the facilitator leverage in how the design is delivered to the specific audience.
17. JB (11/12/13) So, the solution (design methodology) must be adaptable because the problem will change from dealer to dealer. There is problem-solution co-evolution here. As the facilitator, ID4 needs to be able to come up with other solutions as he sees different problems at the different dealerships.
18. Solutions are evolving as I learn about each audience prior to a training event. Initially, I have a conversation with the owner of the dealership. Then I have the dealership leadership team members each take a personality profile to determine the makeup of the personality styles of the leaders. I assess the report generated from the collective personality profiles. Based on my preliminary meeting with the dealer and personality profile reports I determine how the design will need to be altered to allow the greatest training impact on the given dealership based on their specific needs.
19. JB (11/12/13) This is very interesting. So, there is a general goal (DISC training) that needs training. Training is designed around this. But, at each dealership, ID4 has to alter the design to fit what he gains from the preliminary meeting and personality profile. So, at each dealership, is ID4 seeing these opportunities and hence altering the design solution to meet these opportunities? Does ID4 sometimes have trouble figuring out the solution because there are so multiple opportunities? Is this a Kees Dorst situation where we could have gone 30 different ways?
20. The design will need to be further altered, "on the fly" during the training event to assure the intent of the design achieves desired results.
21. JB (11/12/13) Altering "on the fly"; is this the ultimate reflection-in-action? Is ID4 changing the instructional design to better understand the unique situation; and then allowing understanding to make further changes as he is facilitating? This is remarkable. In essence, ID4 never stops designing. He has to be reflecting-in-action all the time. There is no other way for him to pull it off. He is taking stock all the time. His design

frames/spaces are continuous and just blur into one another. Definitely, need elaboration here. Reflection-in-action, moving the design forward, and the problem-solution co-evolving are not measured in days, weeks, or months, but in minutes and seconds. Is this an exaggeration, or is this the way it is?

Week #2: Due - Saturday, November 16, 2013

For your dealership training process, reflect on the outside experiences, images, and other items that you draw from as you work through the instructional design. In other words, what do you draw from that is not part of the dealership training process (for example a project you did in the past)?

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the Hyundai project (for example, a DISC Behavior Profile or a very early instructional strategy)?

22. Outside experience/images I draw from for the dealership training process include previous knowledge I've gained from working with other clients on previous "customer experience" initiatives. For instance, in a previous training I asked participants to imagine what it would be like to be their customers and how those customers might feel being served by the participant. I want to incorporate that imaging process in the Hyundai design.
23. JB (11/27/13) ID4 pulls from his experiences.
24. I've also used powerful statistics in past initiatives to make strong points. I'm incorporating some of those statistics into the design. For instance, if a customer leaves your dealership and has service done elsewhere, 90 percent of them won't return to your dealership. I've also developed scenarios, in past initiatives, to illustrate the value of one lifetime customer to a dealership. I intend to map out an "on-the-fly" visual reference, perhaps on a flipchart, of the value of one customer to the particular dealership.
25. JB (11/27/13) This is interesting. ID4 pulls from statistics and lifetime customer scenarios. He pulls from things that he knows. He is pulling from things that he is confident in and has seen succeed. Validate this.
26. As for inside design experiences and images, I will use the following:
 - a completed sample management DiSC profile
 - actual completed DiSC reports for each participant (they will each have completed the DiSC assessment prior to the training event)
 - a cumulative DiSC report which combines the results from all leadership team members' Disc profiles, to be used to discuss the overall DiSC profile characteristics of the particular dealership's leadership team. (i.e. maybe there are six members of the leadership team, two have "D" behavioral styles, 2 have "i" styles, and 1 has an "S" style and one has a "C" style.) We will use the report to discuss the team's strengths and areas of opportunity
27. --videos to illustrate the various characteristics of DiSC
28. --Hand outs which describe the strengths and areas for improvement for each behavioral style

29. JB (11/27/13) ID4 has a rather unique situation. As he designs his facilitation he has all this information that impact the design. This is another example of how information is so vital to the participants. Like GD5 summed up the more information the better. For ID4 the results of the DiSC profile dictate the facilitation design. So, in essence, no two facilitations would ever be the same. Validate this.

Week #3: Due - Saturday, November 23, 2013

For your dealership training process, reflect on how you develop partial solutions to advance the design.

30. I have a variety of role plays to select from that can be inserted into the training, on-the-fly, as needed depending on the tenor, timing, interest level and responsiveness of the group.
31. I will gauge how and when various scenarios will be used. The scenarios are set-up as threesomes: a dealership employee, a customer and an observer. But the distribution of roles also needs to be flexible based on the size of the group, the specific group's receptivity of engaging in role plays and what I deem, in the moment, would best meet the training's objectives most effectively for the given group.
32. JB (11/27/13) ID4 is interesting as ID4 reflects-in-action while he is facilitating. Each facilitation is a unique situation. ID4 has information that when he understands it he can make changes going in. Those changes then affect how the facilitation goes. But then he has partial solution that he can draw from as he better understands the facilitation design as he is facilitating. He then changes things with the partial solutions. Really need to know how this is working.
33. Another partial solution involves sequencing the two days of training, based on whether dealership leaders can attend both days of training, or only one. For example, if some leaders can only come on day two, a partial solution for day 2 would involve reviewing the salient points from day 1 before beginning new material on day 2. Also, leaders who only attend day 2 would only be allowed to be observers for the first two role plays until they understand how the principles of DiSC are to be applied in the role plays.
34. JB (11/27/13) Again, real close relationship between partial solutions and information (can dealership leaders attend both days of training, or just one). This is ID4 reflecting-in-action again. ID4 faces a unique and uncertain situation. As he understands the situation (when leaders will be there) he makes changes. The changes then help him understand what the unique situation will involve. Then like above once the facilitation is going there is more reflection-in-action.
35. JB (11/27/13) What is very interesting here is this reflection-in-action moves the facilitation design forward to begin and once ID4 is facilitating. I can imagine that this is how a school teacher would use reflection-in-action.

Week #4: Due - November 30, 2013

For your Dealership training project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

36. One unique situation in the design calls for participants to break into groups to discuss what leaders with each prominent behavioral style discussed (D,i,S and C), need from their managers, their peers and their direct reports to be most successful in their jobs. As I assess each group's depth of understanding of the four styles, I may change the design to do the activity as a large group vs. breaking the large group into smaller groups. I may also choose to prompt the discussion with various examples.
37. JB (12/2/13) This is very interesting. Need clarification if this is happening prior to the session or during the session. ID4 understands what they know about the four styles and then makes changes small or large group. ID4 may understand the situation and choose to prompt the discussion with examples. Elaborate on what understanding of their knowledge depth of the four styles determines what activity.
38. If participants struggle to pinpoint what each style needs to be successful, I may call on one of the participants, have him/her reiterate to the group his prominent behavioral style, and share with the group what he/she would need from the other styles to be most effective. If necessary, I'll have others who represent each style follow suit.
39. JB (12/2/13) Okay, here is the explanation on how this would work.
40. Once participants have an understanding of what each behavioral style needs to be most successful, depending on time, interest and understanding, I may follow up by asking participants to share how each behavioral style could adapt their behavior to better accommodate the needs of the other three styles, in order to create more synergistic, successful relationships.
41. JB (12/2/13) This is very interesting. It all happens as he is facilitating. As he facilitates, he reflects-in-action. ID4's facilitation is his design. ID4's visual is the participants and their interactions. ID4 needs to reflect-in-action to move the workshop along. The workshop is the design. Need validation here.

Interview Meeting #1: Friday, December 6, 2013 12:30 P.M. – 1:05 P.M.

42. JB: There was an 11/26/13 milestone to be facilitating dealer training.
43. ID4 explained that 2 of 4 dealership trainings have been completed.
44. ID4 confirmed that all trainings going as planned.
45. ID4 explained that ID4 uses a facilitator guide for each training session.
46. JB: Asked ID4 if at each dealership ID4 has to alter the design to fit what he gains from the preliminary meeting and personality profile.
47. ID4: "In theory, it is true."
48. ID4 provided examples. In the first dealership, no one has completed the preliminary profiles.
49. ID4 explained that each dealership is unique. Last week (week of 11/24/13), the dealership did not, "have a clue that I was coming."
50. ID4 continued that the two-day session did not go as scheduled. For the leader portion, ID4 was told that there would be 5 leaders, but there were 10 leaders.
51. ID4 explained that the materials could not be found.

52. ID4: "From this, I knew what personality I had."
53. ID4: "I had to dig deep to figure out how to make it work."
54. ID4: "I had to explain it with finger puppets."
55. ID4 explained that this week (week of 12/1/13) the same thing happened where the assessment was not completed.
56. ID4: "In both cases, I did the profiles by the second day, and I had to back in to what should have been done."
57. Follow-up: Was this first time these situations had occurred or has ID4 experienced them before?
58. ID4 explained it has happened before. The "good news" is that the PowerPoint and handouts provide a foundation that allows ID4 to get into deeper if ID4 has to.
59. ID4: When I do not know styles, I cannot do some activities."
60. ID4 explained that this changes day 2.
61. ID4 explained that the lack of preparation could be that training in the past has not worked.
62. ID4: "I am getting the impression that training in the past was not helpful."
63. JB: Wanted elaboration on how ID4 reflects-in-action.
64. ID4 explained that yesterday (12/6/13) he was supposed to have 5 people from management team, but only 3 showed up. One person who was there on day 1 did not show up for day 2. One person (a high-up manager) was not there on day 1 and showed up for day 2.
65. ID4: "There were two constants and one variable."
66. ID4 continued that he did a review, but did not want to bore the two "constants."
67. ID4 explained that he used a couple of stories that he likes to give a 15-minute version of a 3-hour session.
68. ID4 continued that the higher-up was pulled out of the session and then another got pulled out so ID4 had one remaining participant.
69. ID4: "I turned it into a face-to-face coaching instead of facilitation."
70. ID4 explained that ID4 and the participant discussed what do styles mean in dealing with specific leaders. Both just sat there and went through it.
71. ID4: "The tone of the room changed. It was powerful and he really got into it."
72. ID4: In retrospect, this wouldn't have happened if I was facilitating."
73. ID4: "I threw the book out."
74. JB (12/8/13) This is interesting. When ID4 reflected-in-action (during the facilitation), ID4 came up with an impactful session. There was a unique situation – ID4 lost two of the three leadership participants. ID4 understood the unique situation and changed from facilitation to a coaching session. This change helped ID4 understand the impact that this made. ID4 had never done this before. This impact would not have happened if ID4 had continued the session as a facilitation.
75. JB (12/18/13) Interestingly, ID4 did throw out the book – the leader guide.
76. Follow up regarding if this was the first time ID4 had done this.
77. ID4 commented that this was the first time he had done this.

78. JB: Asked ID4 since he pulls from things that he knows, will he pull from this experience in the future?
79. ID4: “Absolutely, I will pull from this experience.”
80. ID4 explained that when everyone was in the room every other word was a swear word.
81. ID4 explained that when one person left everything changed.
82. ID4: “The most important thing for me is what is real and what will make a difference.”
83. JB (12/8/13) I find this very interesting. This has been a common theme with all the participants. There is this desire, need, focus to design toward something that is real. This helps move the design forward. It is all about the reality of the situation. Constraints certainly play a role, but it appears to be more than just hitting the milestones. The design is/will be used. The design is real and therefore the designers are designing in reality. They get real feedback. They get real direction. It is not design for design’s sake. Along the way, there are unique situations where the designers reflect-in-action.
84. JB: Asked ID4 to elaborate on that, in essence, no two facilitations will ever be the same.
85. ID4: “They aren’t, but it may be giving it too much glory.”
86. ID4 explained that it is the makeup of the group that makes the difference.
87. ID4 explained that each dealership is different but there are, “a bulk of factors.”
88. JB: Asked ID4 to elaborate on how he chooses activities based on dealership personnel’s understanding of the four styles.
89. ID4: “There are activities that are available and we rarely use all of them.”
90. ID4 confirmed that activities are used based on variables (e.g. time, interest level).
91. ID4: “I choose activities based on what will have the most impact on them.”
92. JB: Asked ID4 for his thoughts on the insight that his design visual is the participants and their interactions. What is happening in the workshop is the design and ID4 reflects-in-action on what happens.
93. ID4: “It is an interesting perspective. I have never thought of it like that.”
94. ID4 explained that next week (week of 12/8/13) he will be in North Carolina and will be viewed by someone regarding his training.
95. JB (12/8/13) ID4 has to deal with uncertainty.
96. ID4 expressed uncertainty on how this person will view that ID4 does not use the leader guide.
97. ID4: “So often, people want you to follow the leader guide word-for-word.”
98. ID4 explained that he doesn’t do this.
99. ID4 explained that he is not merely a facilitator.
100. ID4: “I am a change leader.”
101. JB (12/8/13) This is very important. With all the participants, they interact with visuals. For the other two instructional designers, they are interacting with their design documents, facilitator’s guide, participant guide, etc. For ID4, he interacts with the participants in the workshop. His visual is what is happening in the workshop. ID4’s “Give me something to react to and make it rich” is different. His something to react to is the workshop itself and making it rich is the leader guide and the results of the DiSC evaluations. So, his reflection-in-action during a workshop is based on the leader guide

and the evaluations. Even in uncertainty (like the examples provided by ID4) ID4 draws on his experiences and the evaluations to confidently make changes “on the fly”.

Reflection Journal

Week #5: Due - Saturday, December 7, 2013

For your Dealership training project, reflect on how you are moving the project along toward implementation.

102. The project is already being implemented as I've tested the design on two dealerships thus far. Each dealership has proven that the design requires great elasticity based on group preparation (or lack thereof), group size, group tenor, group needs and group interest level.
103. JB (12/16/13) Interesting, the “elasticity” can be based on group preparation and a lack of group preparation.
104. I've discovered that cherry-picking elements of the design and inserting them where they “feel” like they may work best, given the aforementioned group dynamics, lends the design the greatest strength and dynamics.
105. JB (12/16/13) Need elaboration on “feel”. What is meant here? Is this back to on-the-fly?
106. Whereas various design components may work well with certain dealerships, they may not with others. The integrity of the overall design objectives can still be met, even when elements are bypassed, streamlined or altered to suit the given group.
107. JB (12/16/13) Flexibility and tricks in the tool box help ID4 to keep it moving. Validate this.

Week #6: Due - Saturday, December 14, 2013

For your dealership training project, reflect on your opportunities for solution development.

Reflect on unanticipated problems and opportunities.

108. Opportunities for solution development are abundant. Every group has a different complexion, environment, interest level, size, manager make-up, experience with DiSC, and varying needs, so solutions have to be crafted, on-the-spot to best overcome obstacles presented in each setting.
109. JB (12/16/13) This is interesting. It is very Kees Dorst. Opportunities allow you to go in different directions. What is key here is the ID4 has a unique situation each time he steps into a dealership. ID4 reflects-in-action. His give me something to react to is his group. ID4 understands his unique group and makes changes. These changes then can help him understand more his group. What is interesting is if Day 2 is unique as compared to Day 1. In other words, are the days totally separate in their uniqueness and uncertainty or are they very close to one another? Need elaboration here.

110. Unanticipated problems include managers coming and going during session and having to determine how to set-up activities around changing numbers of participants. Then if they return, determining how deeply to review, and/or how to re-involve them back into the activities
111. JB (12/16/13) What is interesting here is that ID4 is always adjusting as he reflects-in-action. The unanticipated problems do not paralyze ID4. ID4 keeps moving along. Is it this “easy” or are there times when moving forward is in jeopardy? ID4 already shared a unique situation that he had never witnessed before and how we handled it. So, ID4 does not always have an experience to draw from but he always has information to draw from (DiSC, environment, size, etc.). Need elaboration. The problem-solution always develops together.
112. Another issue is the size and layout of the given room. Two weeks ago I had to make an intimate training session out of a giant showroom complete with cars and motorcycles, not desks or chairs, and windows on every wall. There was one small wall I had to use for showing my Powerpoint and video. This week I had to conduct the session for 11 people in a room that could comfortably seat four. So all breakout group sessions had to be scrapped and all activities had to be conducted as one large group.
113. The small room ended up providing a very conducive environment for intimate discovery and sharing. The close quarters seemed to keep everyone highly engaged. What looked like a difficult obstacle turned out to be an intimate learning setting.
114. JB (12/16/13) Need elaboration here. This is interesting. Was the difficult obstacle turning out to be an intimate learning setting something that just organically evolved or was it ID4 reflecting-in-action about the unique situation and making changes so it would work?

Interview Meeting #2: Friday, December 20, 2013 12:30 P.M. – 1:00 P.M.

115. JB: There was a 12/20/13 milestone to complete all four dealer training workshops. This milestone was completed.
116. ID4 confirmed that all workshops were completed.
117. Follow-up on how did it go with a person observing ID4 during a session.
118. ID4 explained that he was forced to not go by the playbook as the room was very small. The room was the size of a kitchen and there were 9 managers.
119. ID4: “I had to not play by the book.”
120. Follow-up on the intimate setting making for a good session.
121. ID4: “It did.”
122. ID4: “I didn’t know if it was the group or the setting.”
123. ID4: “Every person was highly engaged. It is very interesting.”
124. ID4: “I am not sure if it would have been as engaging with a larger room. It was like people sitting around the kitchen table and talking.”
125. ID4 noted that it was another real engaging session like the week before when he ended up with only one person.

126. JB (12/29/13) ID4 had two very distinct situations that did not go by the “playbook”. In both instances, ID4 was in a unique situation and had to make changes based on his understanding of what was going on. This was not haphazard. ID4 was always drawing on the material and his experience in facilitating many workshops. Reflection-in-action was very important in both situations. It kept the workshops moving forward. In both unique situations, there was every opportunity for the workshop to fall apart. But, it didn’t. In fact, it was quite the opposite as both were very engaging.
127. JB: Asked ID4 to clarify a journal reflection where he commented, “I’ve discovered that cherry-picking elements of the design and inserting them where they ‘feel’ like they may work...” Wanted to know what ID4 meant by “feel”.
128. ID4: “I think for me, I am constantly taking the pulse of the group.”
129. JB (12/29/13) This is ID4 reflecting-in-action.
130. ID4: “I watch their body language. I am always watching for it.”
131. JB (12/29/13) Watching body language is ID4 understanding the unique situation. From here, ID4 can make changes. His changes help him understand even more what is going on.
132. ID4: “I will shift gears when needed. If I just see them sitting back with their arms folded, I will shift gears.”
133. JB (12/29/13) ID4 reflecting-in-action.
134. ID4: “If it doesn’t feel right, I don’t care if the instruction guide says something else.”
135. ID4 explained at one site the managers completed the DiSC profile prior to ID4 arriving. ID4 was excited as they were prepared.
136. ID4: “Well, it was interesting. I didn’t find them engaging.”
137. JB (12/29/13) ID4 is always facilitating in a unique situation. Here, ID4 expected total engagement as the group was prepared. ID4 did not get the engagement. ID4 reflects-in-action to change and get the group engaged.
138. ID4 explained that the managers more than the team members were not looking at ID4. They were looking at the ceiling.
139. ID4: “I didn’t sense that it was me.”
140. ID4: “Ultimately, the first group had a lot of ‘i’ personalities. People bouncing off the walls. I thought it was falling flat, but I got the evaluation that people liked it.”
141. Follow-up regarding how flexibility and ID4’s toolbox keeps things moving.
142. ID4 explained how in the final session he has participants write their names and words to describe themselves on a nametag.
143. ID4 noted that the word chosen often parallels the results of DiSC.
144. ID4 described one gentleman who would not write his name or choose a word. He was a “D” personality.
145. ID4 described how late in the session when the group began to talk about styles he opened up.
146. ID4 explained how this gentleman had 19 years experience. As the gentleman began to contribute ID4 noted his appreciation for his contributions.
147. ID4: “He helped the whole tenor of the room.”

148. ID4: “What was cool was he made parallels to his style. He got into it. He became more candid. He became very insightful.”
149. ID4 explained how he used this exercise of pictures of people saying something and how to react to what is being said.
150. This gentleman was very vocal during the exercise.
151. JB (12/29/13) This is a good example of ID4 reflecting-in-action and drawing from his toolkit to facilitate an exercise that fits the unique situation. ID4 receives immediate feedback as he sees the participation. This is another example of the opportunity-solution developing together. In the Kees Dorst way, ID4 looks at his unique situations as opportunities, and not so much as problems. ID4 has his experience to draw from and he has his strong belief in the material. His experience shows him that if he gets through the workshops, the participants are going to find it valuable. There is an opportunity to go in different directions as long as ID4 holds true to the material.
152. Follow-up on clarification if day 2 is completely different than day 1.
153. ID4 explained that his angst is diminished in day 1.
154. ID4: “I get to know the managers in day 1.”
155. ID4: “There are still new dynamics in day 2. There may be new managers and afternoon group is new.”
156. ID4: “Some variables are lessened but some are fresh on day 2.”
157. JB: Wanted elaboration on how ID4 keeps moving it forward even when it appears too difficult to do so.
158. ID4: “My first training was close as a disaster as it could be.”
159. ID4: “My personal integrity makes me get through it.”
160. ID4: “Typically, by making adjustments and reading the group I can get through it.”
161. JB (12/30/13) In other words, ID4 reflects-in-action. This keeps it moving.
162. ID4: “I believe in the material. I know what I have in my back pocket that they don’t know yet.”
163. JB: Asked ID4 to validate that if he doesn’t have experience he always has something to draw from (DiSC, environment, class size, etc.).
164. ID4: “Yes, that is true.”
165. ID4: “For the dealership in New Jersey, if I didn’t find materials this would have been bad.”
166. ID4: “Videos are key. If I didn’t have these it would be really bad.”
167. ID4: “Experience is important too.”
168. ID4 explained that people realize that the training is valuable.
169. JB (12/29/13) This is interesting. If it is a unique situation (ID4 has never experienced it), then ID4 draws from the materials and the DiSC framework. ID4 moves forward because he has experience and/or the DiSC materials. ID4’s reliance on experience is a bit like A8’s reliance on experience. In both cases, ID4 and A8 know where the holes are. They know what can happen. By reflecting-in-action and understanding the unique situation, ID4 and A8 can go to their designer toolkit and make changes. Oftentimes, the solutions here are based on opportunities rather than problems. ID4 is very good at seeing the

opportunities – sitting around the kitchen table, two people chatting, real conversations with customers, etc.

Reflection Journal

Week #7: Due - Saturday, December 21, 2013

For your dealership training project, reflect on when “*what if*” turns to design decisions; exploration turns to design commitment.

170. An excellent “what if” example occurred the second time I conducted the training for the non-manager session, based on what didn’t work too well in the first session. The design calls for participants to break into groups and be assigned a particular DiSC style (i.e. “D”). Within their group they are to discuss how the “D” could adapt their style to the 5 key attributes customers’ desire from their dealership experience. (The five key attributes have been introduced prior to the group breakout activity). I found that the groups had too many things to ponder to be successful with the activity.
171. So, I decided to “explore” different routes to make the learning point (how can each style adapt to the 5 customer attributes) in a different way than the design called for. My exploration ultimately led to a design commitment that registers better with participants, doesn’t leave them confused and makes the point. As one large group, we now review the 5 customer attributes more thoroughly, irrespective of the DiSC styles. Once participants understand the 5 attributes, we explore one at a time, having them think about how a given DiSC style might adapt their behaviors to the specific attribute. I make sure everyone understands how that style can meet the customer needs, before moving on to the next attribute and how the DiSC styles can play into meeting that attribute.
172. JB (12/29/13) This is a great example of ID4 reflecting-in-action. It is important to view ID4’s design as the two-day workshop. ID4 reflects-in-action during day 1 and then makes changes to day 2. Again, ID4 looks at problems from either session from a different perspective which results in opportunities that turn into solutions as described here.

Week #8: Due - Saturday, December 28, 2013

For your dealership training project, reflect on design problems that are incomplete and have no predetermined solutions.

173. I don’t believe there are any incomplete design problems. I used the design enough times to learn “workarounds” for design areas that didn’t work particularly effectively during sessions.
174. JB (12/29/13) This is interesting. Again, the importance of ID4’s experience in moving the design forward.
175. Reflect on how you stepped back and took stock in your design situations.
176. As new situations arose (i.e. having to adapt to variables) and solutions were determined “on the fly” I would later analyze design considerations made to accommodate the issues

to determine if the chosen solutions could be incorporated into the design for future use. In some cases, I determined that the “on the fly” design alterations were worthy of incorporating into the design for future use.

177. JB (12/29/13) When ID4 uses “on the fly”, this is ID4 reflecting-in-action. It is interesting that ID4 shows how the problem-solution coexistence is happening for him. New unique situation arise and he reflects-in-action to design a solution. It is not black and white for ID4. It is grey a lot of the time.

APPENDIX K

PARTICIPANT GD5 REFLECTION JOURNALS AND INTERVIEW MEETINGS

GD5 Kickoff on 9/29/13 5:00 P.M. – 5:20 P.M.

1. A graphic designer for 24 years...Started in her dad's print shop when she was 10.
 2. We are waiting for a design good project to start.
-

Milestone Event	Completion Date (projected)	Completion Date (actual)
First Homepage Design Comp	11/4/13	11/4/13
Second Homepage Design Comp. First Interior Page Design Comp	11/15/13	11/18/13
Final Homepage and Interior Page Design Comp	11/25/13	11/26/13

Reflective Journal

Week #1: Due - Saturday, November 2, 2013

For your website design project, reflect on the development of the design problem-solution relationship.

As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

For your website design project, reflect on the outside experiences, images, and other items that you draw from as you work through the design comps. In other words, what do you draw from that is not part of the website design project (for example a non-legal website or a project you did in the past)?

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the website design project (for example, an earlier design element from an earlier comp or a very early sketch you made)?

3. For the initial design of lawyer homepage comp, I chose to take a simple and clean design approach. Their current site contained too many variants of green and not enough cell padding on elements which caused a hideously outdated appearance. In my comp I rectified this by creating enough spacing around elements so they could visually breathe better. Their current logo also did not look very professional so I chose to update it with something more impactful and strong. I chose a very bold extended serif font named Acknowledgement and centered the logo elements at the very top middle of the header. By incorporating an ampersand encapsulated in a solid black circle, I think it forces a pleasing amount of tension for the viewer.

4. JB (11/10/13) The solution, a simple and clean design approach, is in response to a, “hideously outdated appearance.” The problem, an outdated site, is leading to the solutions. The question is do the solutions, a simple and clean design approach, help better define the problem. Need reflection on this from GD5.
5. As with most of the website design comps I've done for the past few months, I've kept with the full width image slider appearance. I personally enjoy websites that utilize full width imagery because it gives the appearance of richness and professionalism whether it is true or not of the actual company. I chose to remove the color from that main slider image to solidify an overall duotone kind of look for the entire site. With a single rich darker green and gentle muted neutral creams, I think the contrast help the viewer's direction on where to go once they start scrolling below the fold.
6. JB (11/10/13) So, GD5 draws from design comps that she has designed in the past few months. Interesting that she states, “I personally enjoy websites...” How much does your personal “enjoyment” come into play in the design?
7. Instead of basic text links to highlight their services below the slider, I opted for icon-based links that stood out against a green background. At first I had trouble deciding whether the band of color should be green or black or a darker shade of cream but finally decided on the green so it would later tie into the footer design.
8. JB (11/10/13) What is going on when GD5 has trouble deciding, “...whether the band of color should be green or black...”? How is this resolved? GD5 takes stock in what she has and then makes changes. Is this reflection-in-action happening?
9. I chose to keep the content area simple and light with a dash of 3d shadowing on the contact/consultation form to stand it away from the background. The footer I made the green overlay a map of their location to promote their area as a map view. I think it's important to keep an address in the footer zone. Overall I think the design comp was quite successful in regards to reaching to a slightly younger business owner's generation.
10. JB (11/10/13) In regards to, “...reaching to a slightly younger business owner's generation.” Is this the problem-solution co-existing? Where did this information come from? Did this information help with changes as GD5 moved along?
11. JB (11/10/13) For this design, did GD5 draw from anything outside the website project? As GD5 worked through the design, did she draw from earlier sketches or initial designs?

Week #2: Due - Saturday, November 9, 2013

For your website design project, reflect on how you develop partial solutions to advance the design.

For your website design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

12. During the last round of revisions, it was asked of me to increase the height of the logo above the navigation bar. Since the logo overlaps the links area, I fought visually trying

to balance the header contents so it would all look professional and still function properly while not appearing to be cluttered. Through trial and error, I opted for only increasing the center portion circle of the logo that contains the ampersand. I let it overlap the navigation in a more dramatic way but kept the text of the logo at its original size. By doing this, I believe this created a solution that the client AND myself could both live with.

13. JB (11/12/13) Interestingly, GD5 noted in an earlier reflection that she was pleased to know that she could play with the logo. This was a unique situation. Usually, logos are off limits in a design. But, as she “trial and errors” the logo ampersand (partial solution), GD5 better understands how she can make it work and makes changes that results in a solution that the client and she can live with. Need validation on this. Also, why is it important that GD5 can live with it?

Week #3: Due - Saturday, November 23, 2013

For your website design project, reflect on how you are moving the project along toward implementation.

For your website design project, reflect on your opportunities for solution development. Reflect on unanticipated problems and opportunities.

14. This week’s edits were somewhat problematic. The client requested that the logo be put into a less bold serif font which tips the balance of the header design and the richness of the encapsulated ampersand. To resolve this I made the font much larger and added a highlight at 120 degrees to bring the whole thing more forward.
15. JB (11/25/13) Why is it problematic? How did you come up with the solution? Is this reflection-in-action working? This is a unique and uncertain situation to design around a logo. Did the changes earlier help you understand these edits? And with these edits are you able to understand to make the changes?
16. Some final photography touches were made to the black and white main slide image to enhance contrast and to bring the faces of the lawyers away from the stark brightness of the sky behind them.
17. JB (11/25/13) How did these changes happen? Were these changes a request from the client or were these changes that came about after the changes made above? In order to understand how GD5 is moving the project along, where does the updated design now stand?

Interview Meeting #1: Tuesday, November 26, 2013 12:00 P.M. – 12:36 P.M.

18. JB: GD5 has had a unique situation. She has had to take time off due to a pregnancy. This affected an interview around an 11/5 milestone. It also affected reflective journals due on November 9 and November 16.
19. JB: GD5 had an 11/15 milestone of a second homepage design and a first interior page design. The second homepage design was completed the week of 11/18 and was approved. The interior page design began on 11/26/13.

20. JB: Wanted clarification on reflection journal comment, "I think it forces a pleasing amount of tension for the viewer."
21. GD5 in referring to the design comp, noted, "I like how the header is a light band sitting on something that is heavy."
22. JB: Wanted GD5 to reflect on the idea that an outdated site is leading to the solutions.
23. GD5 explained that going into the design, she knew that the site had to be, "...one that targets a slightly younger audience."
24. JB (11/27/13) GD5 is designing with information. This information was very important as it helped in coming up with a simple and clean design approach.
25. JB: GD5 mentioned, in a reflection journal, that she enjoys a full width image homepage. Wanted elaboration on this.
26. GD5: "For the main hero image, I imagined that it would stay 100% of the screen."
27. GD5: "This fits in with a simple and clean look. I put the image in black and white and made it more simple."
28. GD5: "I like the big image and I wanted it to be simple so I made it black and white."
29. JB: In a journal entry, GD5 mentioned the trouble she had deciding what color a band should be. Wanted elaboration on what is happening here.
30. GD5: "Typically, what I will do is make duplicates of the same thing."
31. GD5 explained that she plays one off one to see the affect. In this case, GD5 had four versions.
32. GD5: "I turn them on and off so it is a quick peek-a-boo."
33. GD5: "It is literally a process of elimination."
34. JB (11/27/13) This is very interesting. This is reflection-in-action at its best. GD5 has a unique situation - giving a lawyer site a younger feel. GD5 understood an approach that could work and made changes for that approach. As GD5 understood where she was going, she made changes to the color band. Then GD5 took stock in what she had designed. But, GD5 does it really fast. It takes her 60 seconds as she can quickly go through each to see which works best with the rest of the comp. All four versions were good solutions. The problem – site with a younger feel – drives the solutions that are viable.
35. Follow-up on how she eliminates.
36. GD5: "Honestly, there could be a lot of reasons, but what it ends up being is what makes sense with the rest of the comp."
37. GD5 explained that all four comps were a possibility. All the colors were used in the design comp.
38. Follow-up on how long it takes to decide.
39. GD5: "The process is less than 60 seconds. It is a big decision, but a quick decision."
40. JB: Wanted clarification regarding where information came from regarding reaching a slightly younger audience.

41. GD5 explained that she received the information at the very beginning as the law firm represents car dealerships and many dealerships now have younger managers.
42. JB: Wanted GD5 to elaborate on drawing from outside and inside the design project.
43. GD5: "I did 15 minutes of my own benchmarking. There have been lawyer websites with a younger, fresher approach."
44. GD5: "I have done this a couple of times for lawyer sites."

45. JB: Follow-up on drawing from early sketches.
46. GD5 explained that she does not sketch.
47. GD5: "I can already see where it is going in my head so I start."
48. GD5 stated that for this design she wanted to keep it current information and highlight a few things.

49. Follow-up regarding if information is good or not.
50. GD5: "The more information the better. If either a simple or complex site, knowing the content is essential."
51. GD5: "It helps with seeing what they want to call out. You have a great situation here."
52. JB (11/27/13) This is a theme running through all the participants. GD5 wants information. The more information GD5 has the better. It helps moves the design process along. She is able to design to what it will actually be. GD1 called it designing to reality.

53. JB: Wanted GD5 to elaborate on the unique situation where she was able to tweak the logo which is usually a no-no.
54. GD5 explained that the logo was outdated and unprofessional and she asked if she, "...could play with it."
55. GD5: "It needed some love to it."

56. JB: Follow-up regarding what would have happened if she could not play with it.
57. GD5: "I would have had to do a different design because the old logo was stacked."
58. GD5 explained that an idea to change the logo helped validate that the site was outdated.
59. JB (11/27/13) Here, the solution (update the logo) better defines the problem – an outdated site. If GD5 could not change the logo, the design would have been different.

60. JB: Wanted clarification on why the edits were problematic as noted in a reflection journal.
61. GD5 explained that the font she used was very heavy and the font that the client wanted was not heavy.
62. GD5: "It was not as strong so I made the font larger."
63. GD5 stated that if she had not done this she would have had to go back and change other things.
64. GD5: "It was the best solution I came up for the revision. I like it better the other way but it is the best solution."
65. JB (11/27/13) GD5 is moving the design along. She makes edits to the first design comp quickly so it can go back to the client for approval. GD5 is satisfied that she came up with the best solution even though GD5 prefers the other version better. Design in not

perfect. GD5 designs within the constraints (get a homepage design comp approved) and moves on. It is good considering the circumstances.

66. Follow-up regarding why she had to change it.

67. GD5: It was too different for what they had.”

68. JB: GD5 mentioned in a journal that final photography touches had to be made. Wanted GD5 to elaborate.

69. GD2: “When the comment was made (about the image) and I looked backed I agreed. It may have been an overlook by me.”

70. GD5 explained that she made the edits within an hour.

APPENDIX L

PARTICIPANT ID6 REFLECTION JOURNALS AND INTERVIEW MEETINGS

ID6 Kickoff on 10/04/13 12:35 P.M. – 1:10 P.M.

1. An instructional designer for five years.
2. ID6 explained that this is an instructional design project that has received a grant. Based on a grant from the College of Engineering. Using Twitter and problem-solving...Solving problem of bullying...This is for 11-18 year olds...It will be a week-long training in January at a girls' camp.
3. ID6 explained that this project is different than her previous instructional designer projects. First, ID6 does not use twitter. So, she has to learn it. Since she has been an instructional designer, this will mark the first time that she will take the lead instructional designer role. There are two others overseeing the grant, but ID6 will be the lead instructional designer. In the past, she has always worked in conjunction with other designers.
4. JB: ID6 admitted some uncertainty and being a bit uncomfortable. This is the first time she has been a lead instructional designer.

Milestone Event	Completion Date (projected)	Completion Date (actual)
Complete content outline	11/15/13	11/15/13
Complete design document	11/25/13	11/25/13
Complete instructional design	12/16/13	12/16/13

Reflective Journal

Week #1: Due - Saturday, October 12, 2013

For your instructional design project, reflect on the development of the design problem-solution relationship.

As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

5. Over this past week or two I have been working on getting all the content and materials together that will be needed to even think about how to design this. The content which for this project is bullying has been supplied by the client. I have been tasked to create

instruction or an intervention in the STEM area that has to do with social media and girls ranging 14-18 and bullying.

6. First challenge: Limited experience with Social Media
7. I am only familiar with Facebook and even then I rarely interact online or visit the site. I have only used Facebook to reconnect with past friendships. I started looking at this by researching all types of social media and their relationship to adolescents as GSSEM said social media was to be used but did not indicate which one. Even just a quick Google Search using the terms “social media use” girls provided quite insightful information. I was able to find that Twitter, Instagram and Facebook are common social media platforms for my age group so I was able to narrow my focus even more.
8. JB (10/14/13) Okay, so a solution to use must be social media, but which one is not defined by the problem. Interesting here, is it a problem or opportunity? Get feedback from ID6.
9. Second challenge: How to incorporate social media, STEM curriculum and bullying content.
10. At a preliminary meeting one of the other team members of the project indicated that the Arab Spring idea might be something that we could look to here. I was able to do a little bit of research on ‘Arab Springs’ and it sounds like something that would be very difficult to replicate as this just emerged naturally and for a cause. So if my cause is bullying, but it is being replicated with 14-18 year old girls, I am not sure if that will work.
11. JB (10/14/13) So, here a potential solution will not work. Is the problem/opportunity defining that this solution will not work? Or, is the no-good solution better defining the problem/opportunity?
12. Third challenge: Research team schedules
13. I am the lead designer on this grant, however there are five other members to the design team. Two of the team members live out of state (in different timezones) and one is an extremely busy professor. So finding meeting times to review the initial research findings have been difficult. On a good note we were able to schedule a Google Hangout session time. Which was something that was new and fun to me. Once in the Google Hangout I was happy to see that the meeting experience was similar to meeting face to face. The research team was able to communicate and work together even though we were not all in the same space.
14. Fourth challenge: Instruction Length. The girls will be at camp for one week. So as I think about the research design and the instruction/intervention there really won't be a way for me to know if the instruction/intervention that I design impacted girls perceptions on bullying. So I really have to dig in and figure out what I am aiming to do and what I am going to measure.
15. I think as I work toward figuring this problem out research has been a comfort to me.
16. JB (10/14/13) Interesting, right now the problem is not figured out. When will it be figured out? It is still evolving as ID6 researches solutions.
17. Just looking to see what is out there, what is being done has been helpful to lead me in the right direction. Secondly, presenting the initial research findings to the research team was helpful in two ways.

18. The first in that I had to explain everything that I found and was looking at, so it was helpful just for me.
19. JB (10/14/13) There is reflection-in-action here. Explaining what ID6 found helped here reflect on it.
20. And then it was helpful to hear thoughts, comments and responses to what I had found.
21. Now that I have figured out I am going to replicate an arab spring scenario, using twitter (as decided by the group) and bullying content (as decided by GSSEM), I am going to work on the research design as I am hoping to figure out as a researcher what my overall goal is and also begin working through the instruction/intervention.
22. JB (10/14/13) Need clarification here. Are you using the Arab spring scenario or is it still a bad solution? How has the Arab Spring scenario help define the problem/opportunity? Twitter? The Bullying Content? How has the problem/opportunity lead to the solutions? What is happening here?

Week #2: Due - Saturday, October 19, 2013

For your instructional design project, reflect on the outside experiences, images, and other items that you draw from as you work through the instructional design. In other words, what do you draw from that is not part of the instructional design project (for example a documentary on bullying you watched in the past)?

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the instructional design project (for example, a learner characteristic or a very early instructional strategy idea you had)?

23. I have been thinking about the general concept of girls' organization over the past week. I used to be a girls' organization and I have fond memories of the meetings I used to go to and the projects we worked on. I remember most specifically having fun and enjoying myself. I also think about going to Girl Scout camp which was not as much fun. I just remember being really hot and bugs everywhere. I don't remember any fun parts just the 'bad' parts of it. In addition to this, I have another member of our team who has vividly horrible memories of being in Girl Scout camp, I certainly was thinking about this as I was working on the project.
24. JB (10/26/13) This is interesting. ID6 has had both good and not so good experiences as a GS. It provides context for her. She is drawing on memories of being a GS. Remember Starck drew on his love of science fiction and retro rocket ships as a child.
25. Another image that came to me right away was thinking about a time in middle school where I had a bullying experience. At the time I did not define the moment as bullying, and just thought it was "girls being girls". In comparison to what girls/kids have experienced today I think my experience was minimal, but it's still important because it reminded me how sensitive and important the issue of bullying is. Remembering my own sensitive feelings at that same age with the same topic constantly encouraged me to be very thoughtful about moving forward with this issue.
26. JB (10/26/13) Very interesting. "...but its still important because it reminded me how sensitive and important the issue of bullying is." Drawing on this bully situation, she remembers her own sensitive feelings at that same age and this is encouraging her to be

very thoughtful about moving forward with this topic.

27. So one of the ideas that came to mind really quickly with this project is the idea of trying to replicate the 'Arab Spring' situation overseas. I have been able to do some research on the subject and found that Twitter and Facebook were the most used social media to get organized and to get the word out about major meetings and events for the cause. I need to research Twitter, Facebook & Instagram or even Vine to find out what our learners are using. My guess is Instagram, but even if that's the case I will still need to meet with the research team to make a final decision on what social media to use. We have a meeting coming up so once that happens, I will know what media I am moving forward with and can really begin to design. At first glance I am thinking of tweeting out a problem to the campers and having them work together over a social media to solve it or discuss it. Not sure though. This is somewhat difficult as I am not currently using any social media except Facebook and even then my participation is limited. I am going to explore all these media on a personal level this week as well.
28. JB (10/26/13) So early on, ID6 is drawing on the fact that social media is part of this design. She just doesn't know what type of social media it will be. A constraint is coming up again...ID6 is not wired to all the different social media. She is going to explore these social media. This will probably develop a bit more as she moves forward. Once she has a good feel of all the social media platforms, she may draw from these to validate that she is designing with the right social media platform. This will be interesting to see.

Week #3: Due - Saturday, October 26, 2013

For your instructional design project, reflect on how you develop partial solutions to advance the design.

29. This week as I have been going through the bullying content provided by the girls' organization I noticed many holes. In most cases, the information just touches upon bullying and does not really offer solutions or ways for girls to get out of bullying situations. Or even how to move past a situation when you have been bullied. So in this case I have started looking at how other non-profits or schools addressed the major issue of bullying for young girls ages 14-18.
30. JB (10/31/13) Interesting...ID6 realizes that she has no solutions to work with. So, she goes and draws on other non-profit and schools to find solutions. So, she advances the design by realizing that she has nothing to work with and that she has to go elsewhere.
31. The research team has agreed to move forward with Twitter with supportive resources from YouTube and surveymonkey.com. This is a design-based research project and even if I launch tweets out on twitter, if the Girls do not answer those tweets I will still need to find something that will get them back to tweeting.
32. JB (10/31/13) So, Twitter is a partial solution, but ID6 is taking a design-based research approach. So, this is a solution to her instructional design project. What will a design-based research project approach do to advance the design?
33. One option that I know faculty use in the classroom is a iclicker system, now this is not something that I can use for the girls project, but the idea came to me that I could possible poll the girls from time to time while they are at camp. Kind of like a check-in moment. I am thinking that maybe the girl will respond to something really short if they

do not have the time to respond to some of the other tweets. I am going to look into polleverywhere or something like that to see if it is an option.

34. JB (10/31/13) What is an iclicker system? So, a partial solution to advance the design is to poll the girls from time to time. ID6 seems to need to ensure that the girls respond. Is ID6 anticipating that this is going to be a problem? She is looking for partial solutions to make sure it doesn't happen. Need ID6 to elaborate.

Week #4 Due - Saturday, November 2, 2013

For your instructional design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

35. The first thing that came to mind when I read this was that design with social media is new to me. So I am working on figuring out how many tweets to prepare to send out to the campers. On the one hand, I want the study to be successful of course, but on the other hand I do not want to overload them. In this situation I am thinking back to literature and to my own experience. I think what I am going to do to solve this situation is to have 5 tweets be the 'normal' amount of tweets that will go out during the day... then I will prepare additional tweets to be used as scaffolding tweets. Or I guess you could say, as needed tweets. I think the best way to accomplish this would be to schedule a daily meeting with the design team to determine what tweets have been retweeted or sent out by campers and then decide if the campers are in the right direction so that the decision could be made to 'tweet' the supportive or scaffolding tweets.
36. JB (11/10/13) So, the uncertain situation is that social media is new to ID6. She draws on the literature and her own experience to understand and then make changes to "normal" amount of tweets and the "scaffolding" tweets. So, ID6 has to design with some flexibility as the number of scaffolding tweets will be determined on the fly. Interesting. Get validation on this.
37. To really work through this idea, I decided to 'pilot' this idea on a friend of mine. I mentioned that I am working on a project and something that I was trying to figure out is how many tweets are too many or too little. I asked my friend if she would be interested in helping me out with something that would provide insight as to how my design should move forward.
38. JB (11/10/13) Interesting. Here is reflection-in-action at work. Trying to understand what works to make changes. What is really interesting here is that ID6 is looking for insight as to how her design should move forward.
39. I didn't tell her anything about the design or what I was doing just that it involved tweeting. At the start of the next day I sent a motivational tweet (if you will) to my friend. It said "Be Inspired, Be Inspiring". I checked and my friend retweeted the tweet I sent out. About an hour later I sent out another tweet on motivation, this time I attached a picture with a motivation quote. In this situation not only did my friend retweet what I sent, I noticed that other 'twitter' participants retweeted the information as well. So I continued this throughout the day collecting information from my friends tweet. At the end of the day I sent a total of 5 tweets to my friend. So I asked a couple of questions

about what it felt like get the tweets all day, did she feel pressured to respond etc. I learned that she did not feel pressured to respond and in fact she felt it was like a little motivator throughout the day. At least from this little pilot, I have an idea of one persons perspective on tweets. I am not sure how all the campers will feel, but at least I know that I will start with 5 tweets, watch the twitter feed throughout the day and then send additional supportive or scaffolding tweets as necessary.

40. JB (11/10/13) This is very cool! ID6 created a design space. In that design space or frame, ID6 reflected on the tweets to understand what may work. From this pilot design frame, ID6 now knows how many tweets she will start with. Reflection-in-action is really working.

Week #5: Due - Saturday, November 9, 2013

For your instructional design project, reflect on how you are moving the project along toward implementation.

41. Right now, I have completed the bullying content outline. Really, I am right where I want to be however, I did have to do a lot more research about bullying than I originally anticipated as the bullying content provided by GSSEM was not as in-depth as I thought it would be. I think a few things that have been helpful to move the project along have been my organizational skills and my own experiences working on projects. I know that I have a lot of time left and when I design the part that takes the longest for me is the ‘getting together of content’ phase. Once I have a grasp on the content I am going to use, usually, once I sit down meaning once I have a good hour I can begin to design. And I think that works so well because I know that when I am working on a project I need to be constantly in contact with the information. So even if I know that I have no time on my schedule to work on a particular project that I have a deadline coming up on, I will work to do something every other day or so, so that I am ‘connected’ to the material. This small task allows me to keep the project on my mind so in my opinion, I am somewhat designing in my head or thinking about it throughout the day.
42. JB (11/29/13) This is interesting. Is ID6 writing down anything or “sketching” or is it just in her head. How do these thoughts make it to the instructional design? Does ID6 produce some type of visual?
43. This really boils down to efficiency. Because I do this, when I sit down for that first hour or chunk of time, I am able to make that really productive. I think if I didn’t do this I would have to take additional time to sit down, review my notes, materials, content etc., and then begin designing. But I know myself and I really think my best work comes out of the first 20-40 minutes of my time when I am really focused on something.
44. The other side to this is that after that first 20-40 or when all the good ideas come out, I stop designing (if I can). I just know that all my ‘good’ stuff is out and I will have to wait until I am fresh again. Many times I continue to work, but I just do kind of lower level things that might not take as much energy (or brain power if you will)
45. JB (11/29/13) ID6 works in small chunks at least every other day. This keeps her going effectively and efficiently. Is she reflecting-in-action during this time? Does reflection-in-action happen in the first 20-40 minutes? What is happening here?

46. My next steps which will be this weekend will be to create a design document. I am not expecting a final product here. My goal actually before I even design the tweets and to look into and determine what other ‘things’ I can use in the design. I spoke about polling or iclickers, so one of the tweets might require the campers to act on the tweet by going to a survey to answer a question. Their answer will give us more information so that we will choose from a couple different follow-up tweets to send out when this project goes live. So I want to figure out what other instructional strategies can be used within twitter. Youtube, perhaps I include a video of a bullying event or something like that.
47. JB (11/29/13) Will the idea here be that a survey is sent out regarding a unique situation. Then, there will be reflection on the survey responses and from the reflection a follow-up tweet will be sent. Will the potential follow-up tweets be set in advance or will they be tweeted on the fly? Is this part of ID6’s design-based research approach which aligns very well to reflection-in-action?

Interview Meeting #1: Friday, November 15, 2013 1:30 P.M. – 2:05 P.M.

48. JB: Where are you at with the instructional design project? Are you where you need to be?
49. ID6: “I am moving along very well. I am moving forward the way I want to.”
50. ID6: “I wanted my content outline done, and I wanted a better understanding on which social media to use.”
51. ID6 explained that, in addition, she has had communication with the research team as they have to agree with what she is doing.
52. ID6 explained that to date she had produced a 10-page content outline, a one-page problem statement and learning outcomes document.
53. ID6 has also done research on how nonprofit organizations handle bullying.
54. ID6 explained that to date she has had to be accountable to the research team. She noted that the HIC forms set her back a bit.
55. ID6: I am getting better at organizing the project, and I am getting better with experience.”
56. ID6 explained that the next milestone will be a first draft of the design.
57. ID6: I think that it will go fast from here.”
58. JB: For ID6 a solution for the instructional design is that it must use social media. The instructional design project does not define which one to use. I wanted follow-up to see if ID6 views that as a problem or opportunity.
59. ID6 noted that it is really opportunities rather than a problem.
60. ID6: “Twitter was actually the runner-up. In my research, Instagram was number one and Twitter was second.”
61. ID6: “I thought it would be better to use Twitter since the Girl Scouts already had Twitter.”
62. JB: I wanted clarification from ID6 that she could use the “Arab Springs” model and replicate it.
63. ID6 explained that connection to Arab Springs could be people coming together for change by using social media.

64. ID6 noted that she looked for literature on Arab Springs. With no literature found, she had some self-doubt that it could work. She explained that she wants to make the biggest impact and the Arab Springs model could do this.
65. ID6: "I am still moving forward in some uncertainty. This is okay as I am forced to grow."
66. ID6 explained that it is so big and fascinating to have an uprising in change.
67. ID6: "I am not sure if it will work but we will go with it."

68. JB: What will a design-based research project approach do to advance the design?
69. ID6: "My first thought is that it gives me leeway with the product when it launches."
70. ID6 explained that she will see tweets and this will take pressure off her as she can revise.
71. ID6 explained that a design-based research approach helps her.
72. ID6: "I have to walk through uncertainty and design-based research means that I do not have to have the answers right away."

73. JB: I wanted clarification on an iclicker system and how this is a partial solution for her instructional design.
74. ID6 explained that it is a polling system where one can determine where you are at right now. It is a way to get feedback right now. She can poll the tweets.
75. ID6 explained that if nobody responds she may have to put out a tweet or a link to Survey Monkey.
76. ID6 explained that the perception in educational gaming in the age group that she is designing for is that games are, "not that awesome."
77. ID6 noted that there is much literature on games that have already worked, but there is not a lot of literature on taking social media learning to the next level.

78. JB: I wanted elaboration on ID6 faces an uncertain situation with using Twitter as educational social media.
79. ID6 explained that there will be a pre-survey to collect information to ensure that the participants have access to the information.
80. ID6 noted that as far as she knows, there is no educational tweeting for this age group.

81. JB: I wanted ID6 to elaborate on the prototype design frame for tweeting that she implemented.
82. ID6: "This has helped."
83. ID6 explained that she was challenging the whole design.
84. ID6: "I wanted to see how it would work with 140 characters. It was fun to find out."
85. ID6 explained, "I know motivation so I used it."
86. ID6 explained, in implementing the prototype, "It made me feel really good."

Reflection Journal

Week #6: Due - Saturday, November 16, 2013

For your instructional design project, reflect on your opportunities for solution development.

Reflect on unanticipated problems and opportunities.

87. One of the big things I was reminded about last night was copyright issues. I was looking into the idea of sending tweets to the campers that included pictures or videos for them to react or respond to.
88. In faculty development where I work, one of the aspects of teaching that I talk to faculty about all the time is a concept of universal design. See traditionally the instructor would cover a subject area maybe one or two ways like talking or presenting on a topic and then maybe they would have a handout or even a chapter for students to read. So one thing that we need to consider is providing different ways for student to view the same information. Such as posting a powerpoint online that is just the slides, then maybe the next time the instructor teaches the class they record a video (on Camtasia, Captivate, etc.) of the same powerpoint/information and then provide access to students on both methods of instruction. As I was originally designing this, I was thinking of sending out tweets that are words.
89. JB (11/29/13) ID6 is very conscious of her different opportunities to present information. There is more than one way to present information.
90. *To me and in the instruction field words are not all that attractive I would say engaging, but the concept of twitter (which is mainly 140 character tweets all words) is in itself 'engaging' to participants, so the instructional design rules that I know of with motivation, message design, engagement etc. are not so applicable here.
91. JB (11/29/13) This is interesting. So, what ID6 would draw on, instructional design rules, do not apply. As a designer, what ID6 would naturally draw from will not work. Confirm this.
92. Here though what other modes of communication are engaging on twitter. So if I send a link to a Youtube video, will the campers open and watch it, can I even track that? If I send out a picture of someone in a bullying situation, will campers respond to that more? As I am thinking these ideas, I have run into a copyright concern. I didn't go into this design thinking that I would be hiring students to act in a short film on bullying or that I would be taking pictures of bullying situations. I figured I would find these supportive materials online for free. Well I am learning that is not so much the case.
93. JB (11/29/13) Very interesting unanticipated problem that has come up.
94. I'm still running searches on Google, as they have an option to only include 'free' material. It appears right now that that is trustworthy. I am writing/emailing website owners for permission to use their media on their sites and I learned that if someone posts something on Youtube it is "free to the world".
95. So again, my overall future concern will be preparing enough tweets that are engaging and enticing for campers to participate without overloading them. I am not sure I have time to replicate my personal pilot with pictures, videos and polls as time is of the essence now. I am going to dive into the literature again this weekend and see if anything recent has come out using Social Media in this way, it's so new that I try to look at least every other week.

96. JB (11/29/13) This is interesting that ID6 is thinking about doing another pilot. Is it just a time concern? Or, are there other reasons for not doing another pilot?

Week #7: Due - Saturday, November 23, 2013

For your instructional design project, reflect on when “*what if*” turns to design decisions; exploration turns to design commitment.

97. The last meeting I had with our research team I provided a copy of the first design document and had the team review the ‘tweet plan’ and all of the initial tweets and the supportive tweets. Once the meeting started I reviewed the document via Google Hangout and asked everyone to go through it with me step by step so that we could make decisions as we go along.
98. The first major theme of having the tweets, was great with everyone. My ‘what if’s’ consisted of what each of the tweets was made of. So for example I had been exploring the idea of sending the initial tweet, if that tweet didn’t get any response from campers, I would send out the next tweet. After research I knew that I had an idea of what that next tweet would be, but I needed the buy in from the rest of the research team before moving on. My thought on this is to send the first tweet at 8:00am which sounds early for 14-18 year olds, but breakfast is going to be at 7:00am, so I think this will work. But I want them to get the first tweet about 8:00am. this tweet will lead them to the Girl Scout Website that a website designer will create where the students can read more information. The thing is that you can only use 140 characters when tweeting, so if I am going to have campers try to solve something, I will need a space that gives them more information to use in order to solve. So, if the first tweet is “SOS, a fellow camper needs your help! Go to (insert website here) to help her! Then of course the website will have further instructions. I told the research team that I think that it would be helpful to see if there are differences between the online (twitter) response and the face to face response. Such as once campers are directed to the website they will respond online hopefully but then we can also ask them to do something in the mess hall like sign something to take a stand for the camper. I don’t really know that yet, what I do know is that the research team liked this idea. So now, I have to work on what will be tweeted, what will go on the website and what we will ask them to do face to face.
99. JB (11/29/13) ID6 went to the research team with her “what ifs” and from the feedback from the research team ID6’s idea on tweets turned to design decisions.
100. Other benefits from this meeting includes we would also have to be prepared to teach the campers how to use twitter if some of them have not used twitter before which is something that I didn’t think we would need to do. One of the research team members mentioned that if you are using twitter, not all campers would be ‘trained’ on how to use twitter because they have never used it. To me it was pretty easy to figure out, but I am so glad that this came up as it would have put us in a difficult spot if some campers wanted help. So the ‘what if’ with twitter is that we need a short instruction such as a handout explaining how to sign up and use twitter. In addition as we explored ways to get bullying content to the campers, we determined that we would need a website or a

space to house more bullying content than what twitter would offer with only 140 characters.

101. JB 11/29/13) What ifs have turned to design decisions. Exploration has turned to commitment. How does this coincide with ID6's design document and keeping the design moving forward? Are the decisions and commitments late or is the timing good to keep things moving? Need elaboration here.

Week #8: Due - Saturday, November 30, 2013

For your instructional design project, reflect on your interaction with drawings, sketches, and models.

102. One way that I used any kind of drawing would be to try to image what any or every tweet that might sent to students would look on their side when they receive it. This is important as Message Design literature suggests that if it's too much to read, too wordy, etc., the participants are less likely to read it all.
103. JB (11/29/13) Earlier ID6 mentioned that it was difficult to draw on instructional design principles. Here, she is able to draw on message design. Need elaboration here.
104. Considering the most a camper would receive is a 140 character tweet. To work through this I found a free website that allowed me to type in what a few of the tweets would read and I was able to see it on a cell phone type image. I happened to use an iphone image because that is the type of phone that I am most familiar with. I think it was helpful to do this as it reminded me that even 140 characters can look long on a small screened cell phone.
105. JB (11/29/13) This is very cool. ID6 is getting a visual of the tweet. Her "sketch" is how the tweet looks on the mock iPhone screen. ID6 gained a lot from this – the realization that 140 characters looks long on a small screened cell phone.
106. The only other thing that I did was to take the information collected from when I piloted sending tweets to my friend about motivation and mapped them (or charted them) out so that I could begin to get my head around when I should be sending out tweets. I do like to see things on paper, so this was helpful.
107. JB (11/29/13) ID6 provided an opportunity to see something and then react to it. Does this complement or contradict her earlier reflection that she designs in her head. Need elaboration here.
108. I also looked at as much social media literature as possible to see if there were certain times in Education that it is better to send a tweet out or not. I did find that the most prevalent time that this age group 14-18 prefers to tweet is in the evenings. I am still hoping to have many of the tweets out before the evenings and am hoping that when they settle for the evening, they might tweet about our earlier tweets.

Interview Meeting #2: Friday, December 6, 2013 1:15 P.M. – 1:45 P.M.

109. JB: ID6 had an 11/25/13 milestone to have a design document completed. This milestone was completed.
110. ID6 explained that she has completed a first draft of the design document.

111. Follow up on why she was able to reach the milestone.
112. ID6: "I had people counting on me, and I had to get it done."
113. ID6: "It got exciting. Once I had an idea what I was going to do, it was fun to do."
114. ID6 explained for the final design document she may have to change the order of the tweets, but it should not be too difficult.
115. ID6 confirmed that she has produced a 10-page detailed design document that provides, "a play-by-play."
116. ID6 described the design document as linear mind map or decision tree. It is a word document that uses colors for timing on tweets.
117. JB (12/8/13) The design document has very visual features – linear mind map or decision tree.
118. JB: Asked ID6 to elaborate on how her thoughts make it to the instructional design. Does ID6 produce some type of visual?
119. ID6: "I do. It is kind of like waking up from a good dream and wanting to write it down."
120. ID6 explained that she used a note feature on her smart phone.
121. ID6: "I have to do this. It is like quick snap shots."
122. JB (12/8/13) I love the quote regarding like a good dream.
123. JB: Asked ID6 to explain how her reflection-in-action happens in the first 20-40 minutes?
124. ID6: "It starts one of two ways. I start something new or I revise with a set of fresh eyes."
125. ID6: "After 40 minutes, I will return emails related to the project."
126. ID6 explained that if it is something new she will go back to it.
127. ID6 commented that she will begin to look at the screen and then realize she needs to move along.
128. JB: Asked ID6 if the potential follow-up tweets will be set in advance or will they be tweeted on the fly?
129. ID6 explained that there are two reasons why there may be follow-up tweets. There may be tweets back, but they may be going in the wrong direction. So, a follow-up tweet will bring them back.
130. ID6 continued that the other reason is that no one is tweeting.
131. ID6: "It is sort of like a decision tree. If they are going in the wrong direction then this, or if no one is tweeting go this way."
132. ID6 explained that two people from the research team will decide when scaffolding tweets will go out.
133. ID6 explained that these two reasons are only her foreseen situations.
134. ID6: "There could be others. There are a ton of things that could happen."
135. ID6 explained that she had put together a face-to-face aspect like having girls put their Twitter handles on a poster board in the mess hall.
136. ID6: "My overall goals are does learning occur with social media and what type of tweets is needed to learn."
137. ID6 confirmed that she believes that visual elements will need to be added along the way.

138. JB (12/8/13) What is interesting here is that ID6 is preparing for what ID4 is doing. There could be a unique situation during the actual training (no tweets, wrong direction tweets, or some other tweet issue). ID6 and team will have to understand what is happening in this unique and uncertain situation and then make a change (scaffold tweet). Then, the change will help better understand what is going on and then more changes (scaffold tweets) can happen.
139. JB: Asked ID6 to clarify that drawing on instructional design rules did not apply?
140. ID6 confirmed that the fact that Twitter uses 140 characters pulls her out from what she knows about instructional design.
141. ID6: "I know that more re-tweets occur when a picture is included."
142. ID6: "What makes me more uncomfortable is the grammar. It drives me crazy."
143. JB (12/8/13) It is interesting that ID6 has such a unique situation that drawing from her instructional design principles is difficult.
144. JB: Asked if ID6's decision not to do another pilot is due to a time concern?
145. ID6: "It is a time situation. It is why I am backing off."
146. ID6: "I don't think that it will impede my design too much."
147. ID6: "I just want to wrap it up."
148. JB: Wanted to confirm that design decisions are timely to keep the design moving forward.
149. ID6 confirmed that design decisions are moving the design forward.
150. JB: Asked for elaboration that earlier ID6 stated that it was difficult to draw on instructional design principles, but then she is able to draw on message design.
151. ID6 explained that she does find herself drawing from message design.
152. ID6 explained that she thinks of it in regards to an image of four kids getting bullied.
153. JB: Asked ID6 to elaborate on getting the visual of a tweet on the mock iPhone screen.
154. ID6: "I am going to use this again. I may have welcome bags with a welcome message printed on a cell phone screen."
155. JB: Asked ID6 to elaborate on how she sees something visual and then reacts to it.
156. ID6: "My perceived definition of models, sketches, and drawings is literal, but I am reflecting in different ways."
157. ID6 admitted that she has visualized in a lot of different ways. ID6 looked at tweets on the mock iPhone screen. ID6 charted/mapped her pilot regarding sending out tweets regarding motivation. ID6 uses the note feature on her smart phone.
158. JB (12/8/13) This is really important. ID6 interacts with different visuals. When she is reflecting-in-action, she uses the note feature on her smart phone. In order to deal with the message design issues, she took stock in tweets on a mock iPhone screen. To take stock on her pilot, she charted/mapped out the pilot. ID6 has created a design document that resembles a mind map or decision tree.

159. When ID6 described her meeting the design document milestone, ID6 mentioned, “It got exciting. Once I had an idea what I was going to do, it was fun to do.” The design document helps keep the design moving forward.
160. One item that comes up in the interview that was not discussed directly is the problem-solution co-evolution. ID6 is preparing the scaffolding tweets. She is coming up with solutions that will help define potential problems. She has a scaffold tweet (solution/partial solution) if the tweets go the wrong way. She has scaffold tweets if no one tweets.
161. ID6 does not know if girls will learn about bullying via tweets or what are the best tweets to learn from. The problems that arise will define the solutions and the solutions will help define the problems. The problem-solution evolves together.

Reflection Journal

Week #9: Due - Saturday, December 7, 2013

For your instructional design project, reflect on design problems that are incomplete and have no predetermined solutions.

162. Well I think in my situation I can anticipate a few things that might come up if the campers do not tweet. If campers do not tweet, that will be somewhat of a ‘bust’ to this project. But overall, it will provide more information about using twitter for education.
163. Another part of this project is looking at the networking that has occurred before campers come to camp and how their social networks grow while at camp. For example before camp, the campers will be asked ‘of the campers attending camp, how many of them do you know, even if you just know their first name’. Then towards the end of the camp, campers will be asked the same question. We are hoping to be able to look at the information they provide and what tweets they send out to determine what or how the social networks are built.
164. As a person that likes to see the ‘finish line’ this is somewhat of a constraint to me as a designer. I have to keep working to be okay in not knowing how the projects will fair. Because of this I am constantly trying to predetermine a Plan A, Plan B, Plan C etc. And in most cases, I can’t prepare for everything and I just need to accept that there is no “predetermined solution”.
165. One challenge we just learned of is that even though this camp is advertised as a leadership camp that will incorporate social media. We found out recently that the COO of GS is somewhat old school and only wants campers to be able to tweet during certain times of the day. The important point about this is that she does not want the campers to be able to tweet in the evening. This is quite a problem because the research we have looked at indicates that most 14-18 year olds tweet in the evenings. Most of our tweets will go out during the day, but this was designed this way thinking that campers would possibly go back and tweet about our earlier tweets once the day settles down and they are laying in bed.
166. JB (12/29/13) What is interesting here is that ID6 is reflecting on information. For her design, ID6 draws on research about young women tweeting and how tweeting can be

used as an educational tool. ID6 has designed solutions that she does not know if they will work. But, this is part of her design-based research. ID6 will reflect-in-action when tweeting begins. She will understand the unique situation and make changes. This is a real good example of the problem-solution coexisting. At this point, ID6 cannot have all the solutions because she does not know the unique problems/opportunities.

167. The interesting thing about this is that the COO is doing this because she wants the campers to interact face to face. Our design team wants the campers to be able to interact online at night so that they can ‘interact’. We both have the same goal, it just looks a little different.

Week #10: Due - Saturday, December 14, 2013

Reflect on how you stepped back and took stock in your design situations.

168. I think taking a step back or looking back is something that I have learned to value when I am designing anything or even when I am writing. I like to get something on paper, try to pilot it if I can and then evaluate or assess where everything is at, then move forward. I do this through the project that I am working on and I also find that I do it afterwards.
169. Ways that I take stock while “in the project” would be to work on the design for awhile, and then step away for a length of time anywhere from 3-10 hours. When that happens, I keep the design on the ‘tip’ of my mind and then when I start working on it again, I might research a certain area more or talk to someone about it.
170. JB (12/29/13) It is interesting that reflection-in-action can be immediate and it can be 3-10 hours. The time of reflection-in-action is arbitrary. Even when ID6 walks away, she is still reflecting-in-action (“I keep the design on the ‘tip’ of my mind...”).
171. I find that very helpful. I like to find someone who knows nothing about the project (usually my mom) and I just talk to her about what I am doing. What’s important about this is not what my mom might say afterwards, but what I think of when I say it outloud. I equate it to people that wake up with an idea, that certainly happens to me sometimes, and you feel like you have to write it down quickly...well for me, talking, describing, saying things out loud allows me to think about what I am doing from another perspective and will often provide a window or space into an idea that I didn’t think of before.
172. JB (12/29/13) It is very interesting that ID6 uses the term “space”. This is what reflection-in-action is all about. ID6 designs in spaces and each space helps the next space.
173. The other thing that I like to do is talk to other designers. I come from the perspective that I can and love to learn from anybody. So I like to throw an idea or have one throw out at me unexpected. I often did this during this project with Monica. As she was quite comfortable with anything that I designed, I liked to bring the idea of where I was at and other times, she would immediately think of something to enhance my ideas. She does this with me as well. So I guess I would say I wouldn’t do this with any designer, just the

designers I have established a collaborative environment with. That I have a history with.

174. After the project... I often find myself continuing to design and thinking of ideas when I am supposed to be done. I am at the point though where I have to say enough is enough and I can not make any additional changes to the design. Instead, what I do is write notes down for future projects as lessons learned that can be included into similar projects.
175. JB (12/29/13) The design has an end. It is not a design spiral where ID6 keep designing for the sake of design. The instructional design needs to be launched. The design has to be moved forward to an end – "...enough is enough..."

Interview Meeting #3: Friday, December 20, 2013 1:30 P.M. – 1:50 P.M.

176. JB: ID6 had a 12/16/13 milestone to have the instructional design completed. This milestone was completed.
177. ID6: "It is done. Aside from that this is a design-based research, the initial design is good."
178. ID6 explained that the research team approved the instructional design.
179. Follow up on what the deliverables are.
180. ID6 explained that there is a:
181. Design document (design outlined in detail)
182. Specification of people's responsibilities
183. One-page handout for Twitter training
184. Welcome package to initiate collaboration
185. Communication schedule
186. ID6: "I could not be prepared any better at this point."
187. JB: Asked ID6 to validate if this is the best possible design or is just good enough.
188. ID6: "It is really. I think that it is a great design."
189. ID6: "I have affirmation, not that other stuff could come about."
190. ID6: "I made decisions with what I have right now."
191. ID6: "I will write things down for future. It could be beyond Twitter or the subject of bullying."
192. ID6: "I am very confident in what comes out. I feel good."
193. ID6: "This is what I had in front of me at the time."
194. JB (12/29/13) Of the participants who have completed their designs (all but A8), only ID6 and ID4 appear to like their designs. For the rest of the participants, the feeling is more that the design is good enough.
195. JB: Asked ID6 to elaborate on her journal reflection: "As a person that likes to see the 'finish line' this is somewhat of a constraint to me as a designer. I have to keep working to be okay in not knowing how the projects will fair."
196. ID6: "If I could I would be happy in a world where I go online and read about a movie and then go see the movie."

197. ID6: "I like the convenience in the design world. I like when it happens before."
198. ID6: "I hate and love it that I don't know what will happen."
199. Follow-up on how ID6 gets through not knowing what may happen.
200. ID6: "From experience. Not in the design world but in my current position."
201. ID6 explained that she was part of a collaboration team that came up with a new mission and vision.
202. ID6: "We were done, but one member said let's start over. He was awesome."
203. ID6: "Just because we came up with something does not mean it will be the end-all."
204. ID6: "After Arab Springs, I started another design document."
205. ID6: "I pitched it to one research team member. She said it was a great idea for another project." ID6: "I started from scratch, but didn't spend a lot of time."
206. JB (12/29/13) This is very interesting. ID6 designed another approach to the instructional design. This is ID6 seeing other opportunities and reflecting-in-action to see if it could work. It is an exercise in "what if" and exploration. Eventually, ID6 had to commit to a design. This is what moving forward is all about.
207. ID6: "Event if you think it is the greatest idea, hold on. It wasn't a 'no' but why did you think this."
208. ID6: "It came early on and now with the design document I see that it is a help."
209. ID6: "I am okay because this is educational research."
210. ID6: "My favorite part is the research part. It is fun to go in and say what does this all mean."
211. ID6: "This will contribute to the integrity."

APPENDIX M

PARTICIPANT ID7 REFLECTION JOURNALS AND INTERVIEW MEETINGS

ID7 Kickoff on 10/07/13 6:30 P.M. – 7:15 P.M.

1. An instructional designer for over five years.
2. ID7 explained that National Health Care Reform has taken over her life. Provides instructional design for customer service representatives. Right now completing Phase 1 of training regarding an overview, enrollment, taxes and fees, general benefits, and specific benefits.
3. ID7 has focused on enrollment and taxes and fees. Phase 1 has been all about what was needed for October 1. Phase 2 will be everything else needed for January. So Phase II goes to December 31.
4. ID7 explained that this project is different than her previous instructional designer projects. First, National Health Care Reform is brand new and is changing all the time. This is all new territory. Second, they are designing on the fly.
5. ID7 explained that she does not always know what she will be doing and what is next to do. It is a bit of a moving target. Each day it is something new trying to figure out what is needed for the customer reps.
6. JB: I sense some uncertainty with ID7. She appears to be a bit uncomfortable with what is happening.

Milestone Event	Completion Date (projected)	Completion Date (actual)
Completed nine units for individual business units	11/1/13	11/5/13
Push all training to the trainers	11/15/13	11/15/13
Clean up Phase 2 instruction	12/6/13	12/31/13

Week #1: Due - Saturday, October 19, 2013

For your instructional design project, reflect on the development of the design problem-solution relationship.

As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

7. The clock is ticking for Phase 2 of NHR training. I'm getting more nervous by the minute. I am not consciously thinking about the design process, I'm just designing as fast as I can and revising my design as more information becomes available.
8. JB (10/19/13) So, there is uncertainty here. Interesting, she is not consciously thinking about the design process. She is designing as fast as she can and revising her design as she receives more information. First, she is a designer. So, is it necessary to be conscious about the design process? Need ID7 to elaborate on this. Second, there is reflection-in-action as she revises as she receives more information. The circumstances are providing the context to reflect-in-action. Need ID7 to elaborate. Is this her getting more information which helps her understand more and then she makes changes? Gets more information and makes more changes.
9. We just completed Phase 1 of NHR training so that the Customer Service Representatives (CSRs) would be ready by Oct 1 for calls regarding changes to enrolling in healthcare coverage and the Health Insurance Marketplace. Phase 2 of NHR training needs to be completed before Jan 1 so that CSRs know the new information regarding bills, claims, benefits etc. To get all the CSRs trained by Jan 1, we will need to start training by mid-November. In order for the trainers to be ready by mid-November, I will need to design and develop the training materials by Nov 1. I will need to conduct a Train the Trainer session and send my files to Reprographics shortly (very shortly) thereafter.
10. The NHR workgroup lead for the Customer Service area has been attending the meetings from the different work tracks. She provided me with a "design document" that listed about 15 different topics that would require between half an hour and 2 hours of training each. Some of these topics had absolutely no information listed under them. Unfortunately, I only am familiar with one topic (changes to the Underwriting Policy).
11. JB (10/19/13) ID7 is receiving topics that she is not familiar with. She continues to design knowing that she has deadlines quickly approaching. The project moves forward as she reflects-in-action as she receives information. Is this supported by the above elaboration?
12. On Oct 14 the NHR workgroup lead finally started including me in NHR meetings. This is the first time that I've heard anything about most of these topics and yet they expect training to be designed, developed by Nov 1. I should have been assigned to this project sooner, so that I would have a better understanding of the information.
13. JB (10/19/13) ID7 is dealing with major constraints, but she keeps moving forward.
14. One of our other problems is that that the customer service areas have not determined the all the processes that CSRs should follow regarding these 15 different topics. I informed the workgroup lead that it is impossible for me to develop training materials, when I don't have any content.
15. It has become obvious that we will not be able to train the CSRs on all the topics by January 1. We will need Phase 3 of NHR training sometime in January-February (This is the first major change to our design.)

16. JB (10/19/13) In this dynamic, moving target NHR training, a major change has occurred – there will be a phase 3.
17. The workgroup lead has given the Business Readiness team from the servicing areas and the documentation team a deadline of 10/22 to determine what the CSRs need to know and document it. If decisions and documentation are not complete by 10/22, the topics will have to wait until Phase 3. By Wednesday morning, I will start crossing topics of the “design document”.
18. JB (10/19/13) So, this is interesting. There is an understanding here that not everything can be done on January 1, 2014, so phase 3 will develop. Topics are being crossed off the design document. Need to confirm that these decisions were a result of the reflection-in-action. It is a bit different as the lack of understanding (not getting the content) results in changes (cross out topics in phase 2) and now there is a better understanding of phase 2. So, the inability of coming up with all solutions in phase 2 has defined what is phase 2.
19. How are potential solutions better identifying the problem?
20. On Thursday, the workgroup lead called a meeting and listed all the topics that Business Readiness identified for Phase 2 training. We all went through the hundreds of sub-topics (similar to a learning objective level of information) to determine what information we had, what we didn't have, when did we think we could get, who was responsible for making these decisions, can we push this to Phase 3, or is it essential to train by Phase 2. At least now we know what we don't know.
21. JB (10/19/13) This is what is happening. The solutions based on what information they have, what they don't have, when they can get it, who can make the decisions have better defined phase 2, and phase 3.
22. That is our design problem on a project level. I can also speak to design issues at the unit level. For each of the topics in the design document, I plan to create a unit of information.
23. Underwriting Unit
24. I was already familiar with the Underwriting topic, so began to design and develop that unit. I have a contractor Instructional Designer assigned to help me. Unfortunately she has very little experience and is creating more work for me.
25. I had decided that I wanted to present the changes to the Underwriting policy as a workbook. CSRs already were familiar with the previous underwriting policy, I wanted to asked specific questions comparing the previous policy to the new policy. CSRs would have to find the information in the newly revised manual. I assigned this to my assistant and showed her how I wanted a table set up with the old policy on one side and questions regarding the new policy on the other side.
26. It was actually helpful that she had such a poor grasp of the underwriting concepts and asked such poorly worded questions. When I couldn't determine what she was asking, I was forced be to search the manual. I had been studying the manual for weeks and still

had trouble finding the information. It was at this point, that I realized I was going to have to change two things regarding the design of this unit:

27. We could not have one long workbook. We were going to have to split the workbook into sections that corresponded to each section of the underwriting manual. As we introduced each section of the workbook, we would direct the trainees to a specific section of the underwriting manual, thereby focusing their search. Also, we included a trainer debrief after each section, rather than at the end. This will allow trainees to make sure that all their questions regarding each section of the manual are answered before moving to the next section.
28. This approach was just too long and boring!!! I decided to only cover about half the information as a workbook. The rest of the information is covered through a lecture/discussion format.
29. JB (10/19/13) Reflection-in-action with the assistant resulted in changes to the design. The assistant asked questions and when ID7 could not determine what the assistant was asking, ID7 searched the manual. ID7 began to understand that the manual did not easily provide the information. She took stock in the situation and changed two things in the design.
30. Contract Maintenance Unit
31. Contract maintenance is the changes that are made to members' contracts (for example: name change, address change, add a member, delete a member, cancel a contract.) With NHR, there major changes to the CSRs job functions related to contract maintenance.
32. The workgroup lead informed me that I was in luck, because the instructional designer who had been assigned to the Membership and Billing training already had material that I could use for the CSRs.
33. JB (10/19/13) Opportunity to draw on something inside the phase 2 design.
34. Since the Membership and Billing instructional designer had been assigned to the project since last January, she had a wealth of knowledge. When I read her materials, I was excited because I learned so much.
35. However, as I started to read more closely I realized that I had major issues with the design. Although it was great for Membership and Billing training, CSRs do not perform the same job functions as M and B processors.
36. JB (10/19/13) Lots of reflection-in-action going on here. ID7 took stock in what she received and realized that CSRs do not perform the same job functions as Membership and Billing processors.
37. I still hoped that I could use much of what was developed. I started my design by going through the training materials and deleting objectives that I knew that CSRs didn't need. Then I went through the training materials again, and deleted partial information in the objectives... CSRs need this part of this objective, but not this part.
38. I was left with very disjointed, confusing training materials.

39. As I drove home that night, I realized my folly. I was starting with the M and B job functions not the CSR job functions. I determined that CSRs needed to know four basic things. The next morning, I made a very general design document that identified four main tasks, and several sub tasks.
40. JB (10/19/13) There is so much reflection-in-action going on here. She took stock and realized that what she had was very disjointed and confusing. This design frame informed a new design frame. She better understood that she was starting with M and B job functions not the CSR job functions. The she made changes – CSRs need to know four basic things. Now, she is working in a new frame.
41. This helped me focus on what I could borrow from the M and Billing training materials and what I still needed to develop. I was able to attend the next meeting with Business Readiness and ask specific questions regarding how they want CSRs to handle these calls. This lead to Business Readiness setting up additional meetings in order to determine the answers to my questions. They now have until 10/22 to get me the information that I need to develop Contract Maintenance training from a CSR job function perspective.
42. Thank goodness, I ignored the workgroup lead who told me just to use the M and B training material.
43. JB (10/19/13) Like to know why this happened. Was it the problem-solution evolving? Was it because ID7 kept reflecting-in-action and taking stock in what she was doing? Did trying to find solutions help define that she could not just use M and B training? Was it taking stock in where she was?

Week #2: Due - Saturday, October 26, 2013

For your instructional design project, reflect on the outside experiences, images, and other items that you draw from as you work through the instructional design. In other words, what do you draw from that is not part of the instructional design project (for example a journal article on rapid prototyping)?

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the instructional design project (for example, a learner characteristic or a very early instructional strategy idea you had)?

44. Outside Experience
45. This is actually from a paper that I wrote, but it is a very accurate description of what is happening on this design project.
46. Since I always have to design quickly and without having all the information available, I use a variation of the ADDIE process and continually visit and revisit any step of the model in any sequence that I find necessary. As state by Cennamo & Kalk in Real World Instructional Design (2005), “Where traiditonal instructional design models include discrete stages for Analysis, Design, Development, and Evaluation act ivies, we find that most projects do no unfold in a linear fashion. Instead, instructional designers refiner their understanding of learners, outcomes, assessment, activities, and evaluation

throughout the design process. This process of development aligns with the rapid prototyping models “where you move in iterative cycles from a vaguely defined vision to a concrete product...” (p.7).

47. Thank goodness for this process. I originally started with about 15 different topics that I needed to include in the design. I have since dropped several topics due to lack of content and have added a few others as more information became available.
48. JB (10/28/13) This is very interesting. ID7 draws on a variation of the ADDIE process. She has taken the ADDIE process and combined it with a rapid prototype variation presented by Cennamo and Kalk. She is thankful for this process as it is helping her design.
49. Inside Design Experience
50. One of the main issues we had with design for this project was lack of information from the workgroups regarding various topics.
51. Originally NHR training was set up in two phases:
52. Phase 1: Training by October 1 to be ready for the Health Insurance Marketplace
53. Phase 2: Training by Jan 1 for everything else for NHR
54. Since I have to be done with materials by November first in order to train all the CSRs by January 1, we had to add another phase to training to pick up the remaining topics. Phase 3 will be conducted sometime in January/February.
55. My prior knowledge of learner characteristics is driving my design. Since this is an implementation, trainees are expected to have a level of prerequisite knowledge. I have to identify what they already know, what is changing due to NHR, how this affects their job functions, and what they now need to know to do their job. Gap analysis is crucial to my design. In fact, as I uncover more detail, I am constantly questioning the workgroups, revising my understanding of the problems, and revising my design.
56. JB (10/28/13) ID7 draws on gap analysis and learner characteristics which in a traditional instructional design process happen early in the design process. Drawing on gap analysis has ID7 constantly asking questions to the work groups as she is designing.
57. I am also leveraging everything that I possibly can to complete this project by the deadline:
58. I am using pre-formatted templates for developing materials.
59. I am revising previously used accelerated/active learning activities so that I don't have to spend time trying to come up with new and creative ways to present/review the information. Since we just completed Phase 1 of NHR training, I asked one of the trainers for feedback regarding which activities worked well and which didn't.
60. JB (10/28/13) This is very interesting. With a looming deadline, ID7 draws on previous templates and previous accelerated/active learning activities. This is almost drawing both from outside and inside the design experience. I would be interested to see if ID7 still sees this as part of the design or is it “cheating” a bit. Is this being efficient and effective or is it taking the easy way out? Is this her design tool box to draw from? Need follow-up here.

Week #3: Due - Saturday, November 2, 2013

For your instructional design project, reflect on how you develop partial solutions to advance the design.

61. Partial solutions are all I usually have. I constantly just have to move forward with the information that I have available at the time. As more information becomes available, I revise my design based on the new information. What I wrote last week directly refers to this process. Quite frankly, I'm not quite sure what else I can say.
62. JB (11/3/13) Is this the way it always is? Need elaboration on this. Elaborate on, "As more information becomes available, I revise my design based on the new information." Want to know if this is reflection-in-action.

Interview Meeting #1: Monday, November 4, 2013 8:00 P.M. – 8:35 P.M.

63. JB: There was an 11/1/13 milestone to complete nine units for individual business units. In regards to having all nine done, ID7 states, "Almost". On 11/1/13, there were 6 of 9 units completed and by 11/4/13; there were 8 of 9 units completed.
64. ID7: "Tomorrow (11/5/13), we will fix the last unit. We cannot use it the way it was done."
65. ID7 concluded, "It will have to be done as we have a train-the-trainer set up for Wednesday (11/6/13)."
66. JB: Why didn't you complete everything on 11/1/13?
67. ID7: "I had to rewrite a contractor's unit while another contractor's unit was unusable." ID7 concluded that she has to complete it by Wednesday, November 6.
68. ID7 explains that the design artifacts are a trainer and a trainee guide. ID7 is directly responsible for the underwriter, contract, and enrollment pieces. Each unit uses a similar template.
69. JB: Elaborate on your design process. Are you consciously thinking about the design process?
70. ID7 states, "I don't know. On the one hand, no. I am throwing things so fast I am not following any process. It is not important. On the other hand, I am following the basic rules that I have internalized."
71. ID7 explains how on Friday afternoon (11/1/13) her boss looked at what was produced by a contractor. It didn't make sense. So, ID7 spent Friday night and Saturday rewriting it.
72. ID7 continues "At some point, I had to follow some process. What do I really need to know? I have to internalize enough about instructional design so I can pull pieces together that I need."
73. ID7 continues, "It is a very frustrating way to work. I am trying to hit deadlines, but I don't know all the information. I keep pushing the design forward."
74. ID7 explains that she spent quite a bit of time designing an activity for the class. The activity involved people getting up and interacting. She finally got it done and the SME

changes the procedures. Looking back, ID7 admits that she should have scrapped the whole idea. She did not have to do the activity. She decided to revise the activity to match the procedure changes.

75. JB: Asked for confirmation that crossing off topics and starting to design for a phase 3 was reflection-in-action in the sense that a lack of understanding (not getting the content) results in changes (cross out topics in phase 2).
76. ID7: "Very true." "One of the things that defined phase 2 was the person running it could not get a handle on it. She made a list of subtopics; a couple hundred."
77. ID7 explains as they started going through what they had and didn't have, they started to see that they didn't have anything on something specific so they can't train on what they don't have.
78. ID7 concludes, "Once I got an understanding of what the work groups didn't have, we scratched it off."
79. ID7 explains that when she received information she knew she had to include it somewhere. She had to figure out where it would fit and where she can put it so it is covered. The list helped break things out into units. She began to group things together, "...these items go to enrollment and these go to underwriting."
80. JB: Elaborate on how once ID7 better understood that she was starting with M and B job function and not the CSR job function; she was able to see the four basic things CSR needs.
81. ID7: "In fact what happened was that work groups just used their stuff (M & B). But, M & B is different. I was trying to make it work but it didn't work because CSR changed. CSR is not longer aligned with membership and benefits (M & B). It is different."
82. JB: ID7 reflected in a journal that she ignored the work group lead who told her to just use the M & B material. Elaborate on this. Was this an example of the problem and solution developing together?
83. ID7: "Yes, this is what happened. The problem and the solution were developing together."
84. JB: With the looming deadline, ID7 drew on previous templates and previous accelerated/active learning activities. Elaborate on if this is just being efficient or is it "cheating" a bit?
85. ID7 explains, "It is what is happening. But, on the other hand, I design this way. This is always how I have to design. This is the only way I know how to do it."
86. ID7 continues, "Can I come up with a great experience? No, I have to get it done quickly. It is always just a race."
87. ID7 explains, "I always have very limited time to design and train. We were at a meeting trying to figure it out. We have one day to train 7 hours worth of material. What would take one hour had to now take 15 minutes."
88. JB: Asked ID7 to elaborate on this sentence from a reflection journal, "As more information becomes available, I revise my design based on new information."

89. ID7: “What is giving me an edge is I know why I cannot use certain information because it is not related to the job function. I cannot relate the piece of information to what a CSR has to do.”
90. ID7 explains that the ADDIE model and Cennamo and Kalk are a strength for her. She explains that she could never just use ADDIE to make changes. Cennamo and Kalk are such a relief because as she gets more information she has to change and move along.

Reflection Journal

Week #4: Due - Saturday, November 9, 2013

For your instructional design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

91. Hi John-
92. Just to put some context around this—
93. We were supposed to done with all or our units by Nov 1. On November 4, I was supposed to compile all the units, make a cover page, tabs, trainer prep information and a course overview and send it out to all the trainers. The trainers and I would then have a chance to review the information before the T3 on Nov 6.
94. Instead, I finished everything and sent it to the trainers at 7 pm on Nov 5.
95. I conducted two different T3s on Nov 6. The T3s were for different audiences, each requiring a different version of the materials (One audience required 9 of the 11 units; another required only 4 of the units.)
96. Since I had no time for SME review prior to the T3s, I invited the SMEs to the T3s (I also made sure that they were there in case I needed help explaining anything.) They also received a copy of the materials and were told to please review and provide sign off by 12:00 pm Nov 7. I needed to make the revisions and send the material to Reprographics by 12:00 on Nov 8. Needless to say, I was still getting a few last revisions Friday morning.
97. However, Friday afternoon, I completed the materials and the trainers can now order it for their classes.
98. One last thing. Late Friday afternoon, the Membership and Billing Instructional Designer told me a few things that are changing. ☹ They will just have to wait until Phase 3 of training.
99. I feel like I've been to war and the dust is now settling after the battle. The battlefield is littered with draft upon draft of design documents and training materials.
100. JB (11/12/13) Great quote.

101. I am looking back trying to understand what happened so that we don't repeat the same mistakes. However, I don't think that it will be possible. Our difficulty lay in that we were trying to hit a moving target. Information was constantly changing, thus the demands of the work groups constantly changed.
102. I am not sure how much I tried to understand the situations by trying to change them, as much as I just constantly tried to adapt to the changes that were dictated by the constantly evolving information.
103. JB (11/12/13) So, reflection-in-action was making changes as information evolved. It was not so much understanding the unique situation (which it is was unique) and making changes, but it was get information and then making changes. Where the understanding of the unique situation and then making changes came into play is when decisions about scratching the information is phase 2 and moving it to phase 3 happened. Need validation on this. This is where the real taking stock of the situation happened.
104. However, I think I can come up with an example of me driving the change. I was originally given a "design document" that was developed by one of the work group members. This design document listed about 15 general topics that would be developed into units of information for our NHR course. As I continued to go to meetings, we ended up going through lists of hundreds of items that different workgroups wanted trained. Some of these items would be listed several times with slightly different wording because they were submitted by different workgroups. In order to gain some kind of understanding of what actually needed to be included in training, I went through the lists highlighting items related to various topics with different colors. For example, all topics related to Enrollment were highlighted in yellow, topics related to Underwriting in orange, topics related to Contract Maintenance in blue, etc.
105. By putting this kind of structure around my problem, I changed the design. I now had a design that included 11 different units of information. Some of these units were not identified in the initial design document that I started with; other units were deleted because the workgroups could not provide the necessary information by the date that we needed.
106. JB (11/12/13) This is a great example of reflection-in-action. This is how it all works. So, reflection-in-action did work beyond just getting information and making changes. Here ID6 really reflected on the unique situation and made changes. The changes then helped ID6 to better understand and develop units that could work.

Interview Meeting #2: Tuesday, November 19, 2013 8:30 P.M. – 9:00 P.M.

107. JB: There was an 11/15/13 milestone to push all training to the trainers. Was this milestone met?
108. ID7: "I guess. At the moment, everything has gone to the trainers and trainers started training yesterday (11/18/13)."
109. ID7: "Tomorrow (11/20/13) starts phase three."
110. Follow-up on if trainers were good to go.
111. ID7: "I was getting texts because she (trainer) was not getting the content. Contractors were hired and they do not have a background."

112. What did ID7 create?
113. ID7: "I created a trainer guide and a trainee guide."
114. ID7 explained that she made two versions. One version (9 units) is for individual business unit. One version (4 units) is for larger business unit.
115. ID7 explained that they use Word and hide text so that there are two versions: trainer version with notes and trainee version.
116. ID7 noted that she does not write scripts as her director doesn't like it. She explained that she writes key notes.
117. ID7 explained that they want trainers to use the ~~internet~~ company's intranet because information changes.
118. JB: Asked ID7 to elaborate on how she adapted to changes that were dictated by evolving information.
119. ID7: "We were trying to get things done so fast and things kept changing and changing."
120. ID7 explained that she didn't have time to get things to the subject matter experts before the T3.
121. ID7 explained that the subject matter experts had to get things back to her at noon (the day after the T3) so she could rewrite the individual business orientation which was 150 pages long.
122. ID7 noted it was a scramble to get everything printed with the changes from the subject matter experts.
123. ID7: "There were some things that I did not quite understand so I got clarification."
124. ID7: "I made a list of all the revisions and what changed. I put in all the changes and worked through material to get ~~them (SMEs) back the changes~~ the SMEs changes to the trainers. I sent the revised trainer and trainee guides to the trainers. They would have struggled to read through the 150+ pages and find the revisions. So I attached a list of the revisions to the email that I sent out with the revised trainer and trainee guides.
125. JB (11/29/13) There is reflection-in-action here. ID7 had a unique situation (evolving information). ID7 understood the evolving information and made changes. This went to the SMEs. SMEs made changes to the information. ID7 then made changes based on the new information. ID7 was always moving the project forward. ID7 really did not have a choice.
126. ID7 created an interesting visual to help the trainers to know where the changes were made.
127. ID7 explained that she reflected on material and figured out where it goes.
128. ID7: "I misinterpreted one thing. Information was late. I just glossed over it and the SME clarified it for me."
129. ID7: "When I got information, I found a place for it."
130. ID7 noted that she would highlight in yellow outstanding document needs and she would find a list to document. She got with experts to remind them not to forget to get her information.
131. ID7: "We were coming down to the wire."
132. JB (11/29/13) ID7 kept the project moving. The constant reflection-in-action helped.

133. Follow-up on misinterpreted information
134. ID7: “Sometimes, it was correct. I knew I was not sure and that a SME would clarify. Other times, I just misinterpreted things because they were not clear.”
135. ID7 explained misinterpretation happened once because the underwriter manual is very vague. Another time was with the new drug list which again was vague.
136. JB: Elaborate on your reflection-in-action in taking lots of information and designing 11 different units of information?
137. ID7: “I pulled together huge lists of information. We were in meetings and people would say they want this included.”
138. ID7 noted that the team went through the list twice in about four hours and then she brought it home to go through the list.
139. Follow-up on if ID7 had used the highlighting approach before.
140. ID7: “I don’t know if I have ever done it before. They were on Excel spreadsheets.”
141. ID7 explained that some information was small snippets to remember and other information was full units.
142. ID7 admitted that she does not think that she ever used this approach before in design.
143. ID7: “I needed to see things. I needed to label it. I needed to see it in different colors.”
144. ID7: “I was able to see visually what I had to do.”
145. JB (11/29/13) This is very interesting. ID7 needed to see things. When ID7 could see it, ID7 could react to it. ID7 took stock in the information and reflected-in-action to come up with 11 different units.

Reflection Journal

Week #5: Due - Saturday, November 16, 2013

For your instructional design project, reflect on how you are moving the project along toward implementation.

146. See the first part of week#4 entry for how we are moving toward implementation. We are starting to train Phase 2 of NHR on Monday.
147. I know that when the training begins, there will be a lot of questions coming out of training. In Phase 1 of training, we set up a log on a SharePoint site. The trainers sent us questions from their classes, we went back to the workgroup for answers, and posted the answers on the log. We then had to have a sort of a Phase 1b training, where the trainers went out to the line areas and rolled out the additional information to the CSRs (approximately 1 hour). We’ll probably do that again.
148. JB (11/29/13) This is interesting. Reflection-in-action is always happening. Here, the trainers send back questions. The work groups provide information. ID7 understands the information and makes changes. Through this whole design, the problem and solution definitely evolved together.

149. I also know that the President's announcement yesterday is going to have major impacts. We already had closed down all our old health insurance plans and created new Qualified Health Plans (QHPs) that had the required 10 Essential Health Benefits.
150. We're probably going to have to pass out an addendum that we can just add to this phase of training and make major changes in Phase 3. I'm not really sure what's happening yet, because I don't know the company's response to the situation.
151. JB (11/29/13) Talk about working in uncertainty.
152. Since the project keeps changing, we just keep implementing whatever we have at the time and moving forward the best that we can.
153. JB (11/29/13) It is all about reflection-in-action.

Week #6: Due - Saturday, November 23, 2013

For your instructional design project, reflect on your opportunities for solution development.

Reflect on unanticipated problems and opportunities.

154. Probably our biggest unanticipated problem was that the workgroups were not finished with developing new processes and procedures. Our original training plan was to have two phases of Training: Pre-October training and Pre-January training. Since we had no choice but to start training on certain dates, we could only train the changes that the workgroups had completed to that date. We resolved this problem using three methods:
155. For questions that came up in class and we were able to quickly find the answers, we put a log on SharePoint. The Trainers could access this log and see the types of questions that other classes had asked and find additional information that had not been included in the original training materials.
156. We then had to have a sort of a Phase 1b training, where the trainers went out to the line areas and rolled out the additional information to the CSRs (approximately 1 hour).
157. Finally, we had to add an entire Phase 3 of training that will be rolled out sometime the end of January/beginning of February.
158. We will probably continue with this approach for the rest of our training. In fact, I don't see this training has having a finite end date for quite a while. As things continue to change, we will continually have to add more training events.
159. JB (11/29/13) Interesting that this training does not have a definite end date. Interesting that the unanticipated problems drove more solutions. This was late in the game. The problems and the solutions evolved together. The Phase 3 solution is helping to define the problem – this is going to be ongoing for awhile. The fact that the workgroups could not finish developing new processes and procedures defined the solutions and the solutions (the three bullet points) to the solutions.

Week #7: Due - Saturday, November 30, 2013

For your instructional design project, reflect on when “*what if*” turns to design decisions; exploration turns to design commitment.

160. Hmmm.....I'm having trouble with this one. Our biggest "what ifs" relate to changing information. I've already discussed how I handled this by adjusting my design based on the information that the workgroups provided or didn't provide.
161. JB (11/29/13) For ID7, the line when what ifs turned to decisions, and exploration turned to design commitment is a bit blurry. There has been constant reflection-in-action. Instructional design was pushed out as quickly as it could be finished. At points, it was here is the information push it out. Need feedback from ID7 on this.
162. But we also have to provide additional information as it becomes available, we can't wait for Phase 3 of training for everything. We are having a meeting on Monday morning with the trainers to let them know about a few significant changes that we want included right away. But now I have a dilemma...
163. Do we just tell the trainers what is changing and inform them to add/delete certain information in the Trainer/Trainee guides? (Remember, the bulk of the information is on our intranet, so I just have to tell them to reference the new topics.) Or do I revise the Trainer/Trainee Guides? Most of the trainers ordered the Trainer/Trainee Guides well in advance of their classes. If I change the information now, we'll have two different versions of the Trainer/Trainee Guides being used at the same time. (so some trainers will still have to inform their class regarding the revisions.)
164. What if this keeps happening and every week I need to send out a revision?
165. This becomes an issue from a tracking and compliance standpoint. We have to have documents available to show the government what we trained, but what we trained is always changing.
166. JB (11/29/13) Need follow-up from ID7 regarding what happened. Two constraints coming up here – tracking and compliance. Were these constraints realized early on in the design? Need elaboration here.

Week #8: Due - Saturday, December 7, 2013

For your instructional design project, reflect on your interaction with drawings, sketches, and models.

167. For this particular project I didn't use any drawings, sketches, or models. The closest I came to using some kind of visual representation was when I color coded the list of workgroup topics so that I could put some structure around the training.
168. This is from my week #4 journal: "In order to gain some kind of understanding of what actually needed to be included in training; I went through the lists highlighting items related to various topics with different colors. For example, all topics related to Enrollment were highlighted in yellow, topics related to Underwriting in orange, topics related to Contract Maintenance in blue, etc."
169. By using the different colors to identify various topics, I was able to chunk information and a new design emerged.

170. JB (12/8/13) The color coding is very interesting. By highlighting, ID7 was able to understand what was needed in the training (the unique situation). From here, ID7 was able to chunk information (make changes). ID7 was reflecting-in-action.

171. However, I often use flowcharts/problem solving models to help design training. Particularly if I have to train some kind of analysis. I break the analysis into steps that I diagram, so that trainees have a visual representation of the problem solving process. Usually, the training design will follow the steps in the model, too.

Interview Meeting #3: Tuesday, December 10, 2013 8:30 P.M. – 8:50 P.M.

172. JB: There was a 12/6/13 milestone. This milestone was a bit fluid because it would be either cleaning up phase 2 or beginning phase 3. Asked ID7 which one it was?

173. ID7: “Phase 3 writing will not begin until January 2014. The work groups are still in meetings.”

174. ID7: “We are still cleaning up Phase 2.”

175. ID7 explained that Phase 2 training will continue through the end of December.

176. ID7: “What we are doing is keeping two different logs.”

177. ID7: “People ask questions in class that never came up. Someone is collecting questions, tracking down the answers, and posting in a log.”

178. ID7: “What I am doing with my log is trainers are sending things to me asking, ‘are you sure this is right?’”

179. ID7 continued that she looks back to the materials to see if she could have expressed it differently. ID7 goes through the answer and puts it in the log.

180. ID7: “I go back and make changes in the materials for future new hire training.”

181. ID7: “I am making changes in my files, but we are not republishing so there will not be multiple versions.”

182. ID7 explained that trainers check the log on a SharePoint site. The log is an Excel file.

183. ID7: “Today, I was logging some information regarding page 10.”

184. JB: Asked for elaboration regarding a journal entry where ID7 discussed the President’s November 15 announcement and how that created uncertainty in the company’s response to the announcement.

185. ID7: “Well, nothing happened. We are keeping the plans closed except one.”

186. ID7 explained that people will need to move to another plan and anyone who has not selected will be moved automatically.

187. ID7: “This was sent as an alert to all CSRs.”

188. ID7 explained that it was a very long alert and CSRs are getting calls right now on it. So, it will not be part of Phase 3 training because it is happening right now.

189. JB: Asked for elaboration on ID7’s journal entry, “...I don’t see this training having a finite end date for quite awhile. As things continue to change, we will continually have to add more training events.”

190. ID7: “For right now it is.”

191. ID7 explained that one of two things will happen. They will keep rolling out alerts and when they hit something that an alert will not help then there will be more training post phase 3.
192. JB: Asked ID7 if my reflection that the line when what ifs turned to decisions, and exploration turned to design commitment is a bit blurry. There has been constant reflection-in-action.
193. ID7: “Right, that is exactly true.”
194. JB: Asked ID7 to elaborate on the dilemma of adding/deleting information in the trainer/trainee guides knowing that there are tracking and compliance standards.
195. ID7 explained that management decided to handle this using the logs to track changes.
196. ID7: “Right now, this is how we are showing that we are tracking things.”
197. JB: Asked ID7 to elaborate on she interacted with highlighting with different colors to identify various topics.
198. ID7: “I don’t know if I ever did it before in designing instruction. But, in college, when I would work on papers I would use highlighting.”
199. JB: Asked ID7 to validate that she has completed her part in the NHR training.
200. ID7: “I have been pulled off NHR to finish another project by the end of the week (12/13/13).”

Reflection Journal

Week #9: Due - Saturday, December 14, 2013

For your instructional design project, reflect on design problems that are incomplete and have no predetermined solutions.

201. We have completed the design and development of Phase 2 of NHR training and are close to completing rolling out training. Since we are this far along in the project we had no choice but to come to some sort of resolution for our design problems.
202. Most of our design problems were caused by constantly changing content. Last night we discussed how we are handling this issue:
203. We are keeping SharePoint log for questions that arise from training, that we don’t know the answers too. We contact the workgroups to find out additional information. Trainers can check the log to find the answers to their questions. (Note that at this time there is no plan to have extra sessions to clarify this information. If we need clarifications, they will be included in Phase 3 training.)
204. We are keeping a log of revisions that need to be made to the training materials. The trainers can check the log to see the revisions. Although we are revising the word files, we are not republishing the training material.
205. We are sending out Alerts for information that CSRs need immediately.
206. We are continuing to gather information for Phase 3 of NHR training. (due to be rolled out in Jan/Feb)

207. Any additional information after Phase 3 training will probably be rolled out via Alerts, unless there is enough content to warrant classroom training.
208. Finally, I will roll all the new content into the New Hire training curriculum. This will be a huge undertaking because so much of the new hire content is no longer valid.
209. JB (12/16/13) This is very interesting. ID7 reflected-in-action to take care of incomplete problems and problems that have no predetermined solution. ID7 has to work under the constraints that tracking and compliance are very important. Therefore, updating materials becomes very problematic because of version control. So, reflection-in-action, as a group, determined how to take care of this unique situation.

Week #10: Due - Saturday, December 21, 2013

Reflect on how you stepped back and took stock in your design situations.

210. Everything happened so fast that I never really took stock of the situation until everything was completed. Between 10/14 and 11/8, I had to design, develop, conduct a T3, revise materials based on SME feedback (poor timing with the SME feedback; but I didn't have time for a SME review before the T3), advise trainers of the revisions, and send the materials to Reprographics for printing. And, don't forget that I was designing for two different audiences: one that required 1.5 **days** of training and one that required 2.5 **hours** of training. Thank goodness we were able to leverage a couple of units between the different audiences.
211. JB (12/17/13) This is interesting. As ID7 looks back, she does not see that she took stock in the design situations. But, we discussed in interviews that she was constantly reflecting-in-action as she kept receiving information. Reflection-in-action was immediate. It happened constantly. In fact, for ID7, it was the only way she could design as the information kept coming at her. She would receive and then immediately incorporate it. This created unique situations as described above where ID7 did not have time for a SME review before T3. Stepping back and taking stock did not occur in the sense as there was this big sign and ID7 assumed the Thinking Man position. It was stepping back and taking stock of a unique situation in between getting more information thrown at ID7.
212. When I reflect upon this experience the "lesson learned" was that I want to be included in projects from the beginning. I don't want to come in late in the game and have to play catch up. It is too difficult to learn new material and design and develop under such tight timeframes.
213. JB (12/18/13) This is a recurring theme. ID7 like the other participants wants information. Bringing herself up to speed with information late in the game is really tough. Information is important to moving the design forward. Information is important in understanding the problem-solution relationship. Information is important to draw on something within the design project.
214. I was hoping that with NHR Phase 3 training, I would be included from the start. I would be able to attend workgroup meetings, set up tentative designs and revise the designs as information became available, etc. Unfortunately, I have been pulled for another project.

The goal is to finish this new project quickly so that I can jump back into NHR Phase 3 training. However, that will put in the same position that I was in for both NHR Phase 1 and Phase 2 training. I'll be coming in at the last minute and the race to the finish line will begin again.

215. JB (12/18/13) Very telling point here. ID7 would like to be involved with NHR Phase 3 training early so reflection-in-action (“...set up tentative designs and revise the designs as information became available etc.”) does not have to take place at such a high pace. Interestingly, ID7 finds herself set up for the same pace she experienced in Phase 1 and Phase 2.

APPENDIX N

PARTICIPANT A8 REFLECTION JOURNALS AND INTERVIEW MEETINGS

A8 Kickoff on 11/09/13 12:40 P.M. – 1:20 P.M.

1. A degreed architect working as a roof consultant since 1996...
2. By the end of December, complete design development for roof systems of 6 U.S. Post Offices
3. Florence, AL – Main Post Office
4. Tuscaloosa, AL – Main Post Office
5. Coffeyville, KS – Main Post Office
6. Shownee Mission, KS – Branch Office
7. Wichita, KS – Post Office Station
8. Lynchburg, VA – Distribution Center

9. This project is different because each site is different. For example, one site is a historical one so there can be no changes to the exterior. Each one will be different because heating and cooling comes into play.
10. There is a challenge to strictly designing for one piece. A8 is used to getting his own notes. Now, he has to work off other people's notes and photos. You can have contradictory information which is a big challenge.

Milestone Event	Completion Date (projected)	Completion Date (actual)
Complete talking to all sites for all six post offices	11/30/13	12/13/13
Half way point to complete design developments for all six offices	12/15/13	12/15/13
Complete design developments for all six post offices	12/31/13	12/31/13

Reflective Journal

Week #1: Due - Saturday, November 16, 2013

For your design development project, reflect on the development of the design problem-solution relationship.

As you understand the design problem or opportunity, how are solutions evolving? How is the design problem or opportunity leading to solutions? How are potential solutions helping to better define the problem?

11. Every design decision has pros and cons to it. I review the pros and cons and make design decisions with the input of the client, code criteria, industry standards, personal experience. These decisions are ultimately done to achieve the overall objective which is to protect the inside of a facility from the weather. Each decision affects the next design problem. They are woven together or stacked like building blocks. An example of this might be the wind calculation for Tuscaloosa indicated wind speeds of 100 mph . This affects the uplift pressures and indicates the number of insulation fasteners required.
12. JB (11/29/13) A8 notes, "Each decision (solution) affect the next design problem." A8 sees these as, "woven together." The problem (wind speeds of 100 mph in Tuscaloosa) affects the solution (number of insulation fasteners required).
13. JB (11/29/13) A8 draws on a lot to make decisions. Is this because every design decision has pros and cons? Need elaboration here.

Week #2: Due - Saturday, November 23, 2013

For your design development project, reflect on the outside experiences, images, and other items that you draw from as you work through the project. In other words, what do you draw from that is not part of the design project (for example a past project)?

Reflect on the inside design experiences and images that you draw from. In other words, what do you draw from that is part of the design project (for example, an initial design element or preliminary data you have received)?

14. Reflecting on my outside experience I think example might be which roof membrane we select at a particular site. For Tuscaloosa we are in zone four mandating a reflective membrane. My past experience tells me that giving the amount of mechanical equipment and foot traffic that this roof might see we will need a multi ply membrane rather than a single ply membrane. Thicker being stronger and more puncture resistant. This roof is perfect for a two ply modified asphalt membrane with a reflective coating.
15. JB (11/29/13) A8 draws from past experiences. Follow-up for A8: Would a single ply membrane satisfy the requirements but A8's experience leads him to the multi ply membrane?
16. Reflecting on my inside experience I think an example might be at the same site Tuscaloosa we have existing light weight insulating concrete over the existing metal deck. Typically we would remove everything down to the existing decking, and start our new roof assembly. On this location the light weight concrete is not practical to remove. We will leave the lightweight insulating material in place and fasten through it into the existing metal deck.
17. JB (11/29/13) A8 draws from the existing structure. Although it is not typical, A8 will fasten through the lightweight insulating material. A8 draws on the fact that it is not practical to remove the lightweight concrete. Is this A8 drawing on his experience or is this input from others?

Week #3: Due - Saturday, November 30, 2013

For your design development project, reflect on how you develop partial solutions to advance the design.

18. Initial design solutions consisting of wind, energy comparisons, membrane selection and, climate zone are made and reviewed with the owner. After approval of these partial design solutions, field gathered information will be reviewed. Based on this information and the initial design solutions we begin to build our final design. Each perimeter edge, drainage component, equipment and projection will be looked at. Details will be design on our initial design recommendations.
19. JB (12/3/13) There is an initial design frame where partial solutions are designed using wind, energy comparisons, membrane selection and climate zone. Then, more information is gathered via the field. Need elaboration on this field information. With this information, changes are made to the initial design and the final design is built. There is definite reflection-in-action occurring here. Validate how A8 takes stock in the situation. Each perimeter edge, drainage component, equipment and project is looked at. Can changes happen again? So, A8 appears to be moving from design frame to another design frame. Details are continuously added to the initial design recommendations.

Interview Meeting #1: Friday, December 6, 2013 7:30 P.M. – 7:54 P.M.

20. JB: There was an 11/30/13 milestone to complete talking to all sites for all six post offices. This milestone was not met.
21. A8: “Not quite. We made initial dialogue with each site.”
22. A8: “We are still waiting for field information.”
23. A8 explained that one consultant was fired and that the Lynchburg site is the most behind.
24. A8: “I expect next week we will get all the information.”
25. A8 confirmed that it is required that field information is sent in a specific format. Field information is sent electronically and includes plan drawings, sketch details, and photos.
26. JB (12/11/13) A8 is in a unique situation as he must rely on field consultants to provide him the necessary information to move forward with his design development. This is a constraint for him. He has to continue to move forward within these constraints.
27. JB: Asked A8 to elaborate on that he uses a lot of information to make decisions. Is this because every design decision will have pros and cons?
28. A8: “This is part of it. Based on my experience of the pros and cons, I want to convey the pros and cons to the owner (e.g. facility manager) so he can make decisions.”
29. JB (12/11/13) A recurring theme with all the participants is the need for information. Participants want information. The more information the better. A8 requires a lot of information in his design development. His information comes from many sources – blueprints, preliminary stats, field information, photos, measurements, etc.
30. JB: Asked A8 to elaborate on his journal example. Would a single ply membrane satisfy the requirements but A8’s experience leads him to the multi ply membrane?

31. A8 explained that a single ply membrane would satisfy the requirements. However, A8's experience leads him to look at the amount of traffic that the roof will receive.
32. A8 used an example of a restaurant that has a lot of equipment on top and traffic to clean out grease traps.
33. A8: "There is a cost difference. Both can work, but you want to convey the pros and cons."
34. A8: "Typically, single ply is cheaper but it doesn't have the durability."
35. JB (12/11/13) This is quite interesting. A8 draws on his experiences. He has done this before and he can draw on what he knows to make a decision regarding single and multiply.

36. JB: Asked A8 to elaborate on a journal example involving fastening through the lightweight insulating experience. Is this A8 drawing on his experience or is this input from others?
37. A8: "It is my experience having seen trying to remove down to the decking. I have seen the extreme cost in just removing it."

38. Follow up on what is A8 looking at to make these decisions.
39. A8: "All I am seeing is a photo of a test cut."
40. A8: "If the information is not accurate, it gets tough."
41. JB (12/11/13) A8 is not physically at the sites. He has to use the information that he receives. This may be a reason why he draws on his experience so much. It is as an important piece of information as anything else he receives.

42. JB: Asked A8 to elaborate on how he reflects-in-action using the example he provided in his journal.
43. A8: "Everything is built on one another."
44. A8 explained that wind calculation and climate for reflection can tell you what the membrane choices should be.
45. A8 continued then you look at details. You look at the site specifics like a facility may have a lot of mechanical equipment.
46. A8: "What do we do at this perimeter edge? I will sit down with photos and plan."
47. A8: "What are we going to do on this side? What are we going to do on that side? This may change what we do."
48. A8 explained that flashing height is one example of something that can change things.
49. A8: "Given the conditions, we may switch membranes."
50. A8: "Every decision builds on every other decision."
51. A8: "Sometimes we go back and change decisions that we made earlier."
52. A8: "There are times that you have to make decisions and keep the project moving."
53. JB (12/8/13) There was a very interesting exchange with A8. I was describing how I perceive that he reflects-in-action. He commented that it doesn't seem to happen in such detail as I explained. I quipped that obviously it does because I do not know the first think about putting a roof on and all this membrane jazz, but I am able to explain what is going on and somewhat impress A8. The literature (believe Cross and Schon make a point of it) points out that designers are really bad describing how they design. A8

reflects-in-action quite naturally, but he doesn't see it as reflection-in-action, he sees it as him designing. This is intriguing. All the participants do this so much that it is just second nature. It just happens. They don't realize that they are doing it, but know it is how they get things done realistically and keep the design moving forward.

54. JB (12/8/13) In one case in particular, ID4 thought I was giving too much glory to reflection-in-action. It is what is happening. But to the participants it is just what they do.
55. JB (12/11/13) It is an interesting comment from A8 that "Every decision builds on every other decision." When designing and reflecting-in-action in spaces, one space informs another space and this is how the design keeps moving forward. A8 confirms, "There are times that you have to make decisions and keep the project moving."

Reflective Journal

Week #4: Due - Saturday, December 7, 2013

For your design development design project, reflect on your own reflection-in-action during the design. In other words, reflect on how you understand unique and uncertain situations by trying to change them; and change them through attempts to understand them.

56. The Coffeyville, KS site is a historical site. This means no visual changes to the exterior. This limits changes I would like to make and forces me to figure new solutions. The stone on the perimeter edge ideally should be covered with sheet metal. This is not an option as this would change the appearance so I will be forced to restore the existing stone and redo the existing stone joints. This may require an additional contractor.
57. JB (12/11/13) A8 is not physically at the sites. He has to use the information that he receives. This may be a reason why he draws on his experience so much. It is as an important piece of information as anything else he receives. Need elaboration on this.
58. JB (12/11/13) A8 has a unique and uncertain situation, the Coffeyville site is a historical site. Here, technically, A8 cannot change the situation (no visual changes to the exterior). This pushes A8 to look at the problem in a different way and figure new solutions (the problem-solution is co-existing). Sheet metal is what is needed (the change) but it cannot be done (understanding it is a historical site) so A8 must use what exists and redo the existing joint.
59. JB (12/11/13) A small but significant detail here is that A8 may have to bring in an additional contractor. Does this affect moving the project along? Need elaboration here.
60. JB (12/11/13) Also, it is interesting that A8 just doesn't stop and say what am I going to do? A8 and the participants always keep the design moving. They reflect and keep it moving forward.

Week #5: Due - Saturday, December 14, 2013

For your design development project, reflect on how you are moving the project along toward implementation.

61. It seems more of an organization issue. Juggling six projects at once. Daily communication with our field representatives to make sure all the information needed is being collected. Also making sure that the information makes sense. The two Alabama sites came back with contraindications. The provided information needs clarifications. Each day more decisions are made to meet my personal goal of final design by January 10th. Decisions are made to be forward moving. Less Decisions that make major changes at this point.
62. JB (12/18/13) Again, the common theme is information. Need information to move the project forward. Need information to make design decisions. Need elaboration on the contradictions from the Alabama sites. Is it the information that they sent is contradicting or is the information that they sent contradicting what A8 already has?

Interview Meeting #2: Wednesday, December 18, 2013 7:50 P.M. – 8:20 P.M.

63. JB: There was a 12/15/13 milestone to be at the halfway point in the design development for all six locations. This milestone was met.
64. A8: "I am actually ahead of the halfway point."
65. A8: "For some information, the data does not make sense. I have questions for them."
66. A8 explained that for one site there is contradictory information. It involves a previous study where there is a question regarding wood versus concrete. A8 believes that it is a transcription error.
67. A8 noted that for another site there is a question regarding the deck style. Samples and cores lead A8 to think one thing while the field study says something different.
68. Follow-up on if this is A8's experience coming out.
69. A8: "It is all experience with post offices and the trouble spots."
70. A8: "This is what I have seen with third parties. Sometimes the asbestos sampler takes the roof notes."
71. A8 explained that these samplers may not be qualified and A8 knows right away that there may be some questions.
72. JB (12/29/13) A8 needs information for the design development. However, it is impractical for him to be on-site at six different locations. So, A8 relies on the field people for information. A8 draws on his experience knowing that there will be trouble spots. This allows A8 to ask the right questions and look for inconsistencies.
73. JB: Asked A8 to elaborate on if these are the types of reasons that make him draw so much from experience.
74. A8: "Right, This is a type of experience for me. There is a weak spot in the data collection."
75. JB: Asked A8 to elaborate on the unique situation regarding the historical site.
76. A8: "With post offices, we have 1 out of 10 that are historical. Post offices have been around so long."
77. A8 explained that one team member said he has a historical site and if you change the exterior you have to go through channels to do this.

78. A8: "I was trying to restore what is there. This is above and beyond what a roof guy can do."
79. A8: "I knew fairly early on that this site was historical."
80. A8: "A lot of times you can see that it may be historical. When I see the occupancy before 1919, I tell them look into it."
81. JB: Asked A8 to elaborate that with obstacles like a historical site, he keeps moving forward.
82. A8: "This is part of the problem solving."
83. A8: "Like with a historical site, first we confirm it. Then, we see if we can do it. If not, then we get a local guy on board."
84. JB: Asked A8 to elaborate how all the reflection occurs to see that information that was sent may be wrong or contradictory to what A8 has.
85. A8: "They are my eyes."
86. JB (12/29/13) This is very interesting. In order to move the design development, A8 needs the field teams. But, A8 draws on experience that there will be inconsistent data. There has been a consistent theme regarding information. Within the information, there are constraints. Across all participants, information and constraints are closely tied together.
87. A8: "It has to make sense. It is my experience in reading the data."
88. A8: "Show me, take pictures of it."
89. A8 explained that pictures will show wood versus concrete. If he has a report that he does not share with a field guy and it shows a wood deck, then he will have the field person take photos.
90. A8: "Some guys take short cuts."
91. Follow-up on when does A8 have confidence that he has all the correct data.
92. A8: "We try to move forward."
93. A8 noted that even though at one site he has contradictory information at another site he is already typing up the specifications.

Reflective Journal

Week #6: Due - Saturday, December 21, 2013

For your design development project, reflect on your opportunities for solution development.

Reflect on unanticipated problems and opportunities.

94. I think the solutions have been developing nicely. We are getting to the point where we need to keep things moving forward. So as we wait for answers from the field I need to make the decisions that I can to keep each project advancing. Sometimes that means leaving holes in my design and other times I'm making assumptions based on experiences. I will fill in the missing pieces at the end and hopefully we won't have major changes.
95. JB (12/29/13) This is very interesting. Is this the problem-solution coexisting? In other words, A8 leaves holes and makes assumptions. All the solutions are not figured out yet

because all the problems/opportunities have not been looked at. A8 will fill in the “missing pieces” at the end. This is all done to keep the design development moving forward. Need elaboration here in regards to the problem-solution coexisting and what reflection-in-action is going on.

Week #7: Due - Saturday, December 28, 2013

For your design development project, reflect on when “what if” turns to design decisions; exploration turns to design commitment.

96. I think what ifs come about when you run into particular design situations where your experience does not present a solution. What ifs is like thinking outside the box. I like to run my ideas past other designers to see if my solution is possible and reasonable.
97. JB (12/29/13) Need elaboration here. Are these other designers local or are they in the field?
98. JB (12/29/13) If they are in the field, then is A8 back to trying to reconcile the information and his experience?
99. JB (12/29/13) Need elaboration on A8’s thoughts behind “what ifs”. This is different than other participants. Other participants treat “what ifs” as opportunities. A8 looks at “what ifs” happening when his experience does not present the solution.

Week #8: Due - Saturday, January 4, 2014

For your design development design project, reflect on your interaction with drawings, sketches, and models.

100. I like to work the written word and drawings together. Flipping back and forth between the two. I feel this allows for the best complete design. It is a double check. If something is drawn then it must also be described in the specification. Describing the product and how that product should be installed.

For your design development design project, reflect on design problems that are incomplete and have no predetermined solutions.

101. As of right know the issues I have are with clarifications to my design questions. At some point soon if I do not have answers I will have to design off best guess assumptions. If this happens it could lead to changes during construction and changes to the overall budget.
102. JB (1/7/14) Will A8 have to work off assumptions because the project has to move forward? Or, is this a situation where the answers cannot be determined at this point? The stakes are high. Is A8 concerned with all six sites or is it just a few sites?

Reflect on how you stepped back and took stock in your design situations.

103. I think it just made me realize these are questions I’m already going through just often times don’t realize I’m doing it. More of a formal process.
104. JB (1/7/14) Need clarification and elaboration.

Interview Meeting #3: Tuesday, January 7, 2013 7:30 P.M. – 7:50 P.M.

105. JB: There was a 12/31/13 milestone to complete design development for all six post offices. This milestone was met.
106. A8: "All six were completed."
107. JB: Follow-up on what were the final deliverables.
108. A8: "It is a report that is signed off."
109. A8: "Once they do that we provide a full specification."
110. A8 explained that this will not be done for all six as for one location A8 has not received a go ahead. This location is still reviewing the report for budget considerations.
111. JB: Asked A8 to elaborate on, "Sometimes that means leaving holes in my design and other times I'm making assumptions based on experiences."
112. A8: "I am hoping not to have to make assumptions as they lead to holes in the specification."
113. A8 explained that contractors want this as it leads to change controls.
114. A8 explained that some assumptions are because he is still waiting for information. But, it is important to move forward with the design.
115. JB: Follow-up on does A8 uses his experiences to make assumptions.
116. A8: "Right or I will make conservative assumptions so if they change they work to our benefit."
117. JB: Asked A8 to elaborate on, "I think what ifs come about when you run into particular design situations where your experience does not present a solution."
118. A8 explained that at times he will go outside his experience and use colleagues.
119. A8 explained that he asks, "Will this work or not?"
120. JB: Follow-up on if there are situations where A8e has no experience.
121. A8: "Yes, situations do happen."
122. A8 explained that in one out of six projects this will happen where the project is completely out of A8's norm.
123. A8 provided an example where there may be a green roof with vegetation. He has no experience with this.
124. JB: Follow-up on if any of the six are causing this.
125. A8: "These six are pretty standard even the historical site."
126. A8: "In my next group, there is one outside of my experience."
127. A8: "It has pulp paper decking and I am starting to research it."
128. JB: Asked A8 to elaborate on, "At some point soon if I do not have the answers I will have to design off best guess assumptions."
129. A8: "Certainly, clients are not understanding of delays."
130. A8 explained that delays can only go so far.
131. A8 explained that he has to move things along. The schedule dictates this.

132. JB: Asked A8 to elaborate on how he stepped back and took stock in his design situations.
133. A8: "I don't think that I ever sit there and have a formal process."
134. A8: "I subconsciously do what we are talking about."
135. JB (1/8/13) What we are talking about in essence is reflection-in-action.
136. A8: "It is part of the process. I don't think about the process. I just do the process."
137. JB (1/8/13) A8 may not think about the process, but he definitely reflects on the design.
138. A8 explained that he struggled with some of the reflection questions because to him, "It is just a process."

APPENDIX O

WORKING CATEGORIES AND THEMES

RQ1 – What is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete?

Participants reflected in action. Their reflection-in-action made a real impact on the design. In specific cases, their reflection-in-actions were great examples of what it means to reflect-in-action.

GD1WJ3(168) Another small change was the search form fields used to be rounded, as were some of the buttons. It would be easy for our developer to do this using CSS3, but it isn't fully supported in all browsers (even IE 7,8, & 9). Since this client usually likes everything to look the same in all browsers, and because it would be easier for the developer in Drupal, I changed the rounded buttons and fields square. It changed the visual affect but with some tweaking it looked fine and will help the developer save lots of time too.

GD1WJ3(169) JB (10/14/13) Interesting...Reflection-in-action on buttons resulted in changes to the buttons. This in turn will help the developer save time and move the project forward. Interesting, the button change to help the developers affected GD1's desired look, but with some tweaking it looked fine. This is real reflection-in-action making a difference. What would possibly happen if GD1 did not do something, stayed true to her design? The button problem would probably not come up until testing in different browsers. But, reflecting on it now and making the change prior to the build will save time later and make everything more efficient. This is a great example.

GD1WJ4(175) Second, the developer showed me how the find a doctor section was coming along and we both noticed how weird the results list looked when it included doctors without images, so we decided to make a generic 'no photo' image to replace the gaps and keep consistency in the layout. It was nice because we decided, I made the image and it was executed. There was no consultation with the client or a PM. We just knew it would be something easy to do that would solve a problem we discovered.

GD1WJ4(176) JB (10/22/13) This is definitely reflection-in-action – “It was nice because we decided, I made the image and it was executed.” GD1 is in a design frame with the developer. They see something, reflect on it (“...noticed how weird the results list looked when it included doctors without images...”)

GD5IM1(29) JB: In a journal entry, GD5 mentioned the trouble she had deciding what color a band should be. Wanted elaboration on what is happening here.

GD5IM1(30) GD5: “Typically, what I will do is make duplicates of the same thing.”

GD5IM1(31) GD5 explained that she plays one off one to see the affect. In this case, GD5 had four versions.

GD5IM1(32) GD5: “I turn them on and off so it is a quick peek-a-boo.”

GD5IM1(33) GD5: “It is literally a process of elimination.”

GD5IM1(34) JB (11/27/13) This is very interesting. This is reflection-in-action at its best. GD5 has a unique situation - giving a lawyer site a younger feel. GD5 understood an approach that

could work and made changes for that approach. As GD5 understood where she was going, she made changes to the color band. Then GD5 took stock in what she had designed. But, GD5 does it really fast. It takes her 60 seconds as she can quickly go through each to see which works best with the rest of the comp. All four versions were good solutions. The problem – site with a younger feel – drives the solutions that are viable.

E3IM1(49) E3 explains that the car is set up with a combination of all the calibrations. Drive the vehicle and the instruments set up triggers. Collect data and analyze it later.

E3IM1(50) E3: “In vehicle, I can change things on the fly and see how it responds to change. I have this ability.”

E3IM1(51) E3 explains that often he sees something, grabs data, analyzes it, and then makes changes for the next day. E3 continues, “Today, I was out and tried something; changed a parameter.”

E3IM1(52) JB (10/22/13) This is reflection-in-action. For E3, his reflection-in-action takes place driving the vehicle. He has data to help him understand and from the data he can make a change for the next day. The process is not two steps forward, one back. He keeps moving forward. He takes stock in what he does. Within his design frame (a day’s worth of driving), the calibration takes on a life of its own. Today’s frame influences tomorrow’s frame after the reflection-in-action.

E3IM1(62) JB: Wanted validation that this is a discovery. E3 used discovery in his journal reflection.

E3IM1(63) E3: “You have an expected result. But, when you don’t get it you get more information then you change.” E3 explains that this is a discovery process. He makes one change and sees what happens. He then makes more changes.

E3IM1(64) E3: “The more you understand the more tools you have.” E3 explains that as time goes on, the variables grow rather than shrink. New things come up as you move forward.

E3IM1(65) JB (10/22/13) This is almost reflection-in-action by definition. E3 uses “discovery”. He works in a design frame and he is discovering as the calibration within that design frame becomes alive. He moves to the next design frame.

E3WJ4(86) A unique and uncertain situation has been trying to develop an SPI calibration for my engine. SPI is stochastic preignition, a phenomenon in turbo engines. I have to develop a calibration that will detect when SPI occurs and react to it appropriately. SPI is a fairly new phenomenon and it’s not completely understood how or why it occurs. The current thought is that oil droplets enter the combustion chamber and spontaneously combust under the immense pressure and temperatures that occur during turbocharged conditions. The thing about trying to calibrate a detection algorithm for SPI is that you need to get an SPI event. These events don’t occur regularly, and there is even question as to the mechanism that causes SPI. Thus, I have to try to induce SPI without knowing exactly how to do that. So as I try different speed/load, temperature, spark timing, etc. conditions, I am gaining better understanding as to how SPI occurs in an engine. And while I try to get SPI to occur several times on an engine, SPI is damaging to the engine, so I don’t want to overdo it. So to reiterate, I am trying to induce SPI, which I don’t know exactly how to induce it because I don’t completely understand the phenomena. Then I am trying to induce enough SPI events so I have a good dataset with which

to characterize an SPI event and then hopefully gain enough understand that I can keep the engine from having an SPI event occur at all, as opposed to just waiting for it to happen and reacting to it.

E3WJ4(87) JB (10/28/13) Wow! This is reflection-in-action! It is a unique and uncertain situation that E3 is dealing with. Taking stock in the situation and understanding the unique and uncertain situations of SPI by trying to induce SPI (change the unique and uncertain situation); and by inducing SPI (change) attempt to understand how to keep an engine from having an SPI event.

E3WJ4(88) JB (10/28/13) E3 is proactive here, "...as oppose to just waiting for it to happen and reacting to it." Elaborate on this. E3 is pushing the reflection-in-action. He is making it happen. It just doesn't occur. It is an active process.

ID4WJ1(20) The design will need to be further altered, "on the fly" during the training event to assure the intent of the design achieves desired results.

ID4WJ1(21) JB (11/12/13) Altering "on the fly"; is this the ultimate reflection-in-action? Is ID4 changing the instructional design to better understand the unique situation; and then allowing understanding to make further changes as he is facilitating? This is remarkable. In essence, ID4 never stops designing. He has to be reflecting-in-action all the time. There is no other way for him to pull it off. He is taking stock all the time. His design frames/spaces are continuous and just blur into one another. Definitely, need elaboration here. Reflection-in-action, moving the design forward, and the problem-solution co-evolving are not measured in days, weeks, or months, but in minutes and seconds. Is this an exaggeration, or is this the way it is?

ID4IM1(63) JB: Wanted elaboration on how ID4 reflects-in-action.

ID4IM1(64) ID4 explained that yesterday (12/6/13) he was supposed to have 5 people from management team, but only 3 showed up. One person who was there on day 1 did not show up for day 2. One person (a high-up manager) was not there on day 1 and showed up for day 2.

ID4IM1(65) ID4: "There were two constants and one variable."

ID4IM1(66) ID4 continued that he did a review, but did not want to bore the two "constants."

ID4IM1(67) ID4 explained that he used a couple of stories that he likes to give a 15-minute version of a 3-hour session.

ID4IM1(68) ID4 continued that the higher-up was pulled out of the session and then another got pulled out so ID4 had one remaining participant.

ID4IM1(69) ID4: "I turned it into a face-to-face coaching instead of facilitation."

ID4IM1(70) ID4 explained that ID4 and the participant discussed what do styles mean in dealing with specific leaders. Both just sat there and went through it.

ID4IM1(71) ID4: "The tone of the room changed. It was powerful and he really got into it."

ID4IM1(72) ID4: In retrospect, this wouldn't have happened if I was facilitating."

ID4IM1(73) ID4: "I threw the book out."

ID4IM1(74) JB (12/8/13) This is interesting. When ID4 reflected-in-action (during the facilitation), ID4 came up with an impactful session. There was a unique situation – ID4 lost two of the three leadership participants. ID4 understood the unique situation and changed from facilitation to a coaching session. This change helped ID4 understand the impact that this made.

ID4 had never done this before. This impact would not have happened if ID4 had continued the session as a facilitation.

ID4IM1(75) JB (12/18/13) Interestingly, ID4 did throw out the book – the leader guide.

ID4IM2(120) Follow-up on the intimate setting making for a good session.

ID4IM2(121) ID4: “It did.”

ID4IM2(122) ID4: “I didn’t know if it was the group or the setting.”

ID4IM2(123) ID4: “Every person was highly engaged. It is very interesting.”

ID4IM2(124) ID4: “I am not sure if it would have been as engaging with a larger room. It was like people sitting around the kitchen table and talking.”

ID4IM2(125) ID4 noted that it was another real engaging session like the week before when he ended up with only one person.

ID4IM2(126) JB (12/29/13) ID4 had two very distinct situations that did not go by the “playbook”. In both instances, ID4 was in a unique situation and had to make changes based on his understanding of what was going on. This was not haphazard. ID4 was always drawing on the material and his experience in facilitating many workshops. Reflection-in-action was very important in both situations. It kept the workshops moving forward. In both unique situations, there was every opportunity for the workshop to fall apart. But, it didn’t. In fact, it was quite the opposite as both were very engaging.

ID6WJ4(37) To really work through this idea, I decided to ‘pilot’ this idea on a friend of mine. I mentioned that I am working on a project and something that I was trying to figure out is how many tweets are too many or too little. I asked my friend if she would be interested in helping me out with something that would provide insight as to how my design should move forward.

ID6WJ4(38) JB (11/10/13) Interesting. Here is reflection-in-action at work. Trying to understand what works to make changes. What is really interesting here is that ID6 is looking for insight as to how her design should move forward.

ID6WJ4(39) I didn’t tell her anything about the design or what I was doing just that it involved tweeting. At the start of the next day I sent a motivational tweet (if you will) to my friend. It said “Be Inspired, Be Inspiring”. I checked and my friend retweeted the tweet I sent out. About an hour later I sent out another tweet on motivation, this time I attached a picture with a motivation quote. In this situation not only did my friend retweet what I sent, I noticed that other ‘twitter’ participants retweeted the information as well. So I continued this throughout the day collecting information from my friend’s tweet. At the end of the day I sent a total of 5 tweets to my friend. So I asked a couple of questions about what it felt like to get the tweets all day, did she feel pressured to respond etc. I learned that she did not feel pressured to respond and in fact she felt it was like a little motivator throughout the day. At least from this little pilot, I have an idea of one person’s perspective on tweets. I am not sure how all the campers will feel, but at least I know that I will start with 5 tweets, watch the twitter feed throughout the day and then send additional supportive or scaffolding tweets as necessary.

ID6WJ4(40) JB (11/10/13) This is very cool! ID6 created a design space. In that design space or frame, ID6 reflected on the tweets to understand what may work. From this pilot design frame, ID6 now knows how many tweets she will start with. Reflection-in-action is really working.

ID7WJ1(37) I still hoped that I could use much of what was developed. I started my design by going through the training materials and deleting objectives that I knew that CSRs didn't need. Then I went through the training materials again, and deleted partial information in the objectives... CSRs need this part of this objective, but not this part.

ID7WJ1(38) I was left with very disjointed, confusing training materials.

ID7WJ1(39) As I drove home that night, I realized my folly. I was starting with the M and B job functions not the CSR job functions. I determined that CSRs needed to know four basic things. The next morning, I made a very general design document that identified four main tasks, and several sub tasks.

ID7WJ1(40) JB (10/19/13) There is so much reflection-in-action going on here. She took stock and realized that what she had was very disjointed and confusing. This design frame informed a new design frame. She better understood that she was starting with M and B job functions not the CSR job functions. Then she made changes – CSRs need to know four basic things. Now, she is working in a new frame.

GD2WJ9(147) Now how did I step back? I literally stepped back and also stopped and stared and thought real hard while comparing the design with other designs, benchmarking mats and previous experience. If I saw an issue I addressed it.

GD2IM3(200) JB: Asked GD2 to elaborate on how his reflection-in-action happened. Was it one step back, understand, what is going on and make changes, or was it multiple step backs.

GD2IM3(201) GD2: "The first one sounds more mechanical. For me it is more organic."

GD2IM3(202) GD2: "If I step back, I may just see one thing and change and then this may allow me to see something else than can be changed."

GD2IM3(203) GD2: "At first, I didn't have the big image. I was much plainer. Then, I stepped back and saw it was plain."

GD2IM3(204) GD2: "When I changed the background image, other things had to be changed."

GD2IM3(205) GD2: "My dream would have been to have an image that had space for text, but it didn't happen this way."

GD2IM3(206) GD2: "Instead of typography and image working together, they just exist together."

GD2IM3(207) GD2 explained that his design is utilitarian.

GD2IM3(208) GD2: "With big companies, they put constraints on everything. Like the car companies, this car has to be cropped this way. The car has to be at this angle."

GD2IM3(209) GD2 explained that design has purpose.

GD2IM3(210) GD2 used a light bulb example. The constraints are that the light bulb has to make light and screw into a socket. There are multiple ways to make this light bulb with these constraints.

GD2IM3(211) JB (12/29/13) GD2 used "organic" to describe he design spaces more than once. GD2 uses reflection-in-action by moving from one space to another space. As GD2 understood his unique situation, he made changes. These changes helped him understand his situation more and then he made more changes.

GD2IM3(213) JB (12/29/13) GD2's comment about the light bulb in very Kees Dorst like.

Here is the flip side. GD1 expressed her frustration regarding not being able to reflect-in-action.

GD1WJ1(70) The owners and some PMs went to present all our findings and work, including the designs, to the client and all the various teams involve. During this time I sat in a meeting where the “creative” owner explained my designs. This bothered me greatly because:

GD1WJ1(71) No one talked with me about the designs, the thoughts behind them, what the goals were, about the content in them or anything. Yet, he presented them with statements like “we did this for this reason” and “designed it this way because.” It is horrible pouring your soul and energy into something and not being asked about it, so people talking about don’t have a full idea about it. It was also bad being allowed to sit in on the meeting over the phone, but not being able to introduce yourself or have people even know you exist. Finally, the worst part was all the questions and things clients were raising that I knew the answers to or could proposed ideas for, but couldn’t. I used to meet with clients at my old job, so I found that by answering questions and consulting during the meetings, we saved time and money dealing with it earlier on.

GD1WJ1(72) JB (9/29/13) Is this reflection-in-action or lack of to GD1?

When participants reflected-in-action, they took stock an reacted to something. This something was rich in that it was designed for a reason based on information and constraints.

GD1IM1(114) GD1: “The circle is real big in the beginning. I know there will be several iterations internally.” GD1 explained that in her position with this organization, the approach is that it needs to be seen before discussing what needs to be done.

GD1IM1(115) JB (10/8/13) Again, reflecting-in-action.

E3WJ2(32) So a cal (short for calibration) ends up being a series of tables and values essentially. Some tables are two-dimensional, other tables are three-dimensional. So a two-dimensional table can be plotted and it would be a line. And even if I can’t think of a fundamental engineering reason for why the line should have some sort of form (linear, exponential, parabolic, etc.), I always tend to want to have the calibration take some sort of form because I assume an engine operates according to a set of physical laws even if I don’t know what laws they are. The same goes for three-dimensional tables. But instead of being plotted as a line, these are plotted as a surface. And I literally say, “oh that is ugly”.

E3WJ2(33) JB (10/14/13) What a great quote! Talking about the ugliness and beauty of calibration! Need to have E3 elaborate on this.

E3IM1(69) JB: Wanted clarification on E3’s journal reflection, “I draw on some innate sense of symmetry, pattern, and beauty when creating a calibration.”

E3IM1(70) E3 asked me to imagine a table. Imagine an Excel spreadsheet with the x and y axis. The top is engine speed and the left column is the pedal position. The table is expected to have a pattern.

E3IM1(71) E3: “I expect it (table) to move and be smooth and symmetrical.” E3 explains that what you end up with jagged edges. “It’s ugly.” Now, E3 is dealing with outliers.

E3IM1(72) E3: “I don’t understand everything on the engine. I have to rely on data.”

E3IM1(73) Follow-up to, “it’s ugly.”

E3IM1(74) E3 explains that the spreadsheet visualizes calibration, “just like a design or painting.”

E3IM1(75) JB (10/22/13) Making calibration a visual. This is remarkable. This is how he takes stock in what he is doing. He has something to react to. This is such a great image.

E3WJ8(186) Finally, sketches are typically used during informal technical discussions. Usually when one engineer is trying to explain to another engineer how something works, sketches are quickly drawn up to serve as aides. The saying that pictures are worth a thousand words is very true. But honestly in the technical realm, sketches are more clear and deliver the necessary information faster. Don’t get me wrong, some verbiage is needed to convey thoughts, but for the most part, a sketch goes a much longer way.

E3WJ8(187) JB (11/27/13) This is very interesting. The visual is key. The visual delivers the necessary information faster. It keeps things moving. Validate this.

ID4IM1(92) JB: Asked ID4 for his thoughts on the insight that his design visual is the participants and their interactions. What is happening in the workshop is the design and ID4 reflects-in-action on what happens.

ID4IM1(93) ID4: “It is an interesting perspective. I have never thought of it like that.”

ID4IM1(101) JB (12/8/13) This is very important. With all the participants, they interact with visuals. For the other two instructional designers, they are interacting with their design documents, facilitator’s guide, participant guide, etc. For ID4, he interacts with the participants in the workshop. His visual is what is happening in the workshop. ID4’s “Give me something to react to and make it rich” is different. His something to react to is the workshop itself and making it rich is the leader guide and the results of the DiSC evaluations. So, his reflection-in-action during a workshop is based on the leader guide and the evaluations. Even in uncertainty (like the examples provided by ID4) ID4 draws on his experiences and the evaluations to confidently make changes “on the fly”.

ID4IM2(127) JB: Asked ID4 to clarify a journal reflection where he commented, “I’ve discovered that cherry-picking elements of the design and inserting them where they ‘feel’ like they may work...” Wanted to know what ID4 meant by “feel”.

ID4IM2(128) ID4: “I think for me, I am constantly taking the pulse of the group.”

ID4IM2(129) JB (12/29/13) This is ID4 reflecting-in-action.

ID4IM2(130) ID4: “I watch their body language. I am always watching for it.”

ID4IM2(131) JB (12/29/13) Watching body language is ID4 understanding the unique situation. From here, ID4 can make changes. His changes help him understand even more what is going on.

ID6WJ8(104) Considering the most a camper would receive is a 140 character tweet. To work through this I found a free website that allowed me to type in what a few of the tweets would read and I was able to see it on a cell phone type image. I happened to use an iPhone image because that is the type of phone that I am most familiar with. I think it was helpful to do this as it reminded me that even 140 characters can look long on a small screened cell phone.

ID6WJ8(105) JB (11/29/13) This is very cool. ID6 is getting a visual of the tweet. Her “sketch” is how the tweet looks on the mock iPhone screen. ID6 gained a lot from this – the realization that 140 characters look long on a small screened cell phone.

ID6WJ8(106) The only other thing that I did was to take the information collected from when I piloted sending tweets to my friend about motivation and mapped them (or charted them) out so that I could begin to get my head around when I should be sending out tweets. I do like to see things on paper, so this was helpful.

ID6WJ8(107) JB (11/29/13) ID6 provided an opportunity to see something and then react to it. Does this complement or contradict her earlier reflection that she designs in her head. Need elaboration here.

ID6IM2(155) JB: Asked ID6 to elaborate on how she sees something visual and then reacts to it.

ID6IM2(156) ID6: “My perceived definition of models, sketches, and drawings is literal, but I am reflecting in different ways.”

ID6IM2(157) ID6 admitted that she has visualized in a lot of different ways. ID6 looked at tweets on the mock iPhone screen. ID6 charted/mapped her pilot regarding sending out tweets regarding motivation. ID6 uses the note feature on her smart phone.

ID6IM2(158) JB (12/8/13) This is really important. ID6 interacts with different visuals. When she is reflecting-in-action, she uses the note feature on her smart phone. In order to deal with the message design issues, she took stock in tweets on a mock iPhone screen. To take stock on her pilot, she charted/mapped out the pilot. ID6 has created a design document that resembles a mind map or decision tree.

ID7IM2(139) Follow-up on if ID7 had used the highlighting approach before.

ID7IM2(143) ID7: “I needed to see things. I needed to label it. I needed to see it in different colors.”

ID7IM2(144) ID7: “I was able to see visually what I had to do.”

ID7IM2(145) JB (11/29/13) This is very interesting. ID7 needed to see things. When ID7 could see it, ID7 could react to it. ID7 took stock in the information and reflected-in-action to come up with 11 different units.

ID4WJ4(40) Once participants have an understanding of what each behavioral style needs to be most successful, depending on time, interest and understanding, I may follow up by asking participants to share how each behavioral style could adapt their behavior to better accommodate the needs of the other three styles, in order to create more synergistic, successful relationships.

ID4WJ4(41) JB (12/2/13) This is very interesting. It all happens as he is facilitating. As he facilitates, he reflects-in-action. ID4’s facilitation is his design. ID4’s visual is the participants and their interactions. ID4 needs to reflect-in-action to move the workshop along. The workshop is the design. Need validation here.

Participants reflected-in-action knowing the purpose and reality of the design project. This impacted how they took stock in the design.

E3IM4(223) E3: “When I look at a sketch it can help in the short term. It saves, maybe, an hour. This is small in terms of my deadline.”

E3IM4(224) E3 explained that visuals are more of a preference.

E3IM4(225) E3: “It is more a preference thing. I like to take a minute then get back to reality.”

E3IM4(226) JB (12/11/13) Two things here. First, E3 likes to react to visuals. This is a personal preference. It is the space he likes to be in. Second, there is the continuous theme across all participants about the reality of design. It is design for a purpose not design for design’s sake.

E3WJ1(19) Now at the same time, I have to prep for our altitude development trip. Truth be told, it is not crucial that I go on the trip. The altitude specific portion of the calibration is already developed. So I am going on the trip as support for other engineers (if they have questions or issues with my calibration) and to make sure nothing goes wrong with my previously developed calibration. At the same time, the vehicle/vehicles that I need to use to continue my own development work will be on the trip, so I need to go, just to get in-vehicle development time. The trip also provides valuable real driving time in the vehicle as opposed to just driving on a track. And this is where you discover many problems and opportunities.

E3WJ1(20) JB (10/11/13) Interesting, he is able to reflect-in-action with real driving time instead of driving on a track. Is this where reflection-in-action takes place?

GD1WJ1(56) The thing that also frustrated me is the fact that I am not like some of other designers. Reality doesn’t scare me or stop me from being creative. In fact, I tend to do better with more information, goals, and restraints of the build/technology because anyone can be creative without limits, but when tested by fire (in this case reality) the real problem solving and creativity comes out. If I’m included in the process, all the better :)

GD1WJ1(57) JB (9/29/13) Love, “This made me extremely frustrated, because I wanted to design with reality in mind, so the designs could be used.” Want more on this. Okay, this is all really good...Bubbling with Gordon Murray stuff! Need to dig deeper with GD1 on this!

ID4IM1(82) ID4: “The most important thing for me is what is real and what will make a difference.”

ID4IM1(83) JB (12/8/13) I find this very interesting. This has been a common theme with all the participants. There is this desire, need, focus to design toward something that is real. This helps move the design forward. It is all about the reality of the situation. Constraints certainly play a role, but it appears to be more than just hitting the milestones. The design is/will be used. The design is real and therefore the designers are designing in reality. They get real feedback. They get real direction. It is not design for design’s sake. Along the way, there are unique situations where the designers reflect-in-action.

ID7WJ4(101) I am looking back trying to understand what happened so that we don’t repeat the same mistakes. However, I don’t think that it will be possible. Our difficulty lay in that we were trying to hit a moving target. Information was constantly changing, thus the demands of the work groups constantly changed.

ID7WJ4(102) I am not sure how much I tried to understand the situations by trying to change them, as much as I just constantly tried to adapt to the changes that were dictated by the constantly evolving information.

ID7WJ4(103) JB (11/12/13) So, reflection-in-action was making changes as information evolved. It was not so much understanding the unique situation (which it is was unique) and making changes, but it was get information and then making changes. Where the understanding of the unique situation and then making changes came into play is when decisions about scratching the information is phase 2 and moving it to phase 3 happened. Need validation on this. This is where the real taking stock of the situation happened.

GD1WJ3(166) I was able to make changes to the wireframes in all to make them more consistent with other sections on the site (which made me feel good). Also, through clearing ideas with the developer and then the PM before designing, I was able to make changes that would greatly impact the user's experience and not affect development too much. For example, the news on the current site is displayed in a 3 column table. The left column shows the date the article was posted, the middle is the article title (just text), and the left column is filled with "Read More" links. Since the list is laid out this way, more attention and focus is given to the dates and read more links. This makes it more difficult for the user to visually scan through article titles and I imagine based on what I have been told about the back end that it is hard for screen readers as well because they will read the table left to right as well. To fix this, I replaced the table layout with one column. The article title is shown first and is now a blue link and below it in a light gray is "posted on" and the date the article was posted. This small change will put the focus on the articles themselves and make it easier for people to visually scan what they are looking for.

GD1WJ3(167) JB (10/14/13) So, the partial solution of the article title and the blue link helped to impact the user's experience and not have an adverse affect on development (two of the bigger goals that they are trying to reach).

GD1WJ3(170) Finally, another adjustment made was brought on by the clients request. After approving colors, they contacted us stating that the buttons felt too prominent for them and they wanted the style and colors changed. They were a bit vague in the way they worded the request, so I decided to keep the style the same, but switched the button text from white to the buttons color and the button's color to a light gray. The light grey gave hint that it is a button and the darker colored text looks like a link. It isn't as nice as it looked before and the buttons blend into the page more than I would like now. But the user can still tell they are buttons, the style was maintained for the most part, and the client was made happy by fulfilling part of their request because the goal they want done was achieved without doing everything they asked for/suggested. Changing only the Colors also meant that I didn't have to change as much in all the designs created before the one the client requested it on. So a lot of time was saved.

GD1WJ3(171) JB (10/14/13) Again, GD1 is moving the design forward with partial solutions. While reflecting-in-action, there seems to be negotiating going on with the client and the developer. It is early in the game which is good, but GD1 appears to be making compromises. Is this okay? Follow up on this. Is this what happens when you reflect in action?

GD1IM2(209) GD1: "I am making compromises and I am okay with that."

GD1IM2(211) GD1: "But what is nice (with this design project), the conversation is happening now instead of later. It is nice to have this in the forefront."

GD1IM2(212) JB (10/28/13) When GD1 reflects-in-action she negotiates and makes compromises. But in these design frames where compromises are made, GD1 is okay with the compromises. The compromises do not go against the design look and feel.

GD2IM3(176) GD2: “Designers are just not designing.”

GD2IM3(178) JB (12/29/13) GD2 feels that designers do more than just design. For GD2, it means that he has to reflect on assets, content, and fonts before he can actually begin to “design.” What is interesting is that GD2 makes a distinction between the two, but GD2 knows both are part of design. GD1 also spoke to this. Interestingly, GD2 rolled all into design where GD2 speaks to them separately.

E3WJ1(12) I can either change the rate with which the noise signal is averaged or adjust the thresholds that determine if the signal-to-noise level is indeed knock. Based on previously collected data, I determined the appropriate rate to average the noise signal. This then put me down the path of surgically adjusting the thresholds. I say surgically because I am only adjusting the thresholds in speed/load zones that appear to be experiencing false knock. Now this process is a bit back and forth. So when I move the thresholds up, now I probably won’t detect real knock as well. So then I might want to adjust the thresholds back down a little. But then I might false knock again. So essentially I will go back and forth until I reach some happy... or unhappy medium.

ID6IM2(128) JB: Asked ID6 if the potential follow-up tweets will be set in advance or will they be tweeted on the fly?

ID6IM2(129) ID6 explained that there are two reasons why there may be follow-up tweets. There may be tweets back, but they may be going in the wrong direction. So, a follow-up tweet will bring them back.

ID6IM2(130) ID6 continued that the other reason is that no one is tweeting.

ID6IM2(131) ID6: “It is sort of like a decision tree. If they are going in the wrong direction then this, or if no one is tweeting go this way.”

ID6IM2(132) ID6 explained that two people from the research team will decide when scaffolding tweets will go out.

ID6IM2(133) ID6 explained that these two reasons are only her foreseen situations.

ID6IM2(134) ID6: “There could be others. There are a ton of things that could happen.”

ID6IM2(135) ID6 explained that she had put together a face-to-face aspect like having Girl Scouts put their Twitter handles on a poster board in the mess hall.

ID6IM2(136) ID6: “My overall goals are does learning occur with social media and what type of tweets is needed to learn.”

ID6IM2(137) ID6 confirmed that she believes that visual elements will need to be added along the way.

ID6IM2(138) JB (12/8/13) What is interesting here is that ID6 is preparing for what ID4 is doing. There could be a unique situation during the actual training (no tweets, wrong direction tweets, or some other tweet issue). ID6 and team will have to understand what is happening in this unique and uncertain situation and then make a change (scaffold tweet). Then, the change will help better understand what is going on and then more changes (scaffold tweets) can happen.

ID7WJ5(147) I know that when the training begins, there will be a lot of questions coming out of training. In Phase 1 of training, we set up a log on a SharePoint site. The trainers sent us questions from their classes, we went back to the workgroup for answers, and posted the answers on the log. We then had to have a sort of a Phase 1b training, where the trainers went out to the line areas and rolled out the additional information to the CSRs (approximately 1 hour). We'll probably do that again.

ID7WJ5(148) JB (11/29/13) This is interesting. Reflection-in-action is always happening. Here, the trainers send back questions. The work groups provide information. ID7 understands the information and makes changes. Through this whole design, the problem and solution definitely evolved together.

ID7WJ4(99) I feel like I've been to war and the dust is now settling after the battle. The battlefield is littered with draft upon draft of design documents and training materials. The reality of reflection-in-action sometimes feels like this.

During design, participants looked to and relied on information while they reflected-in-action. This impacted how they took stock in the design.

GD1WJ4(173) First, Drupal is not user friendly. I say this because it's very structure requires that all pages are unique or it adds numbers to the page's URL and may affect the actual structure if the site. For example, say two sections on the website contain a services page. Both pages cannot be named services or it will require more work/time to make it work. So to fix this, the PMs decided that we would place the name of the section before it. So 'Services' becomes 'Ortho Services' or 'Cardiovascular Services.' This would be fine, if: 1) The User wasn't already clearly in the "Cardiovascular" section (for example); 2) all the other links in that section didn't have to be called out the same way (Ortho Doctors, Ortho Services, Ortho Locations, etc.) I started off trying to propose ideas on how to work through this, but after being told 'No' to each idea, I decided to let it go and do it as requested so I could move on to working on comps for other groups. That said, I was able to change a few page names to be shorter/easier to understand and did have some influence in how some of the specialties section navigation was structured. I think this was the result of talking with the PM working in the navigation and giving feedback. They said they were happy to hear feedback and to be able to talk it over with another person, since it was mainly them working it at that point. So it was nice that They were open to my thoughts, but even better that I could have, what I hope what will be, a positive effect on the project and the users experience.

GD1WJ4(174) JB (10/22/13) GD1 has spent a lot of time understanding Drupal. This has helped her make changes to her design. When she makes changes, she goes back to a developer to validate that Drupal will allow these changes. Remember, this design project started with little direction. It was almost – just design! Now, the designer takes stock in what she is doing and makes changes based on her continuing understanding of Drupal. Validate that I am seeing this correctly.

A8WJ3(18) Initial design solutions consisting of wind, energy comparisons, membrane selection and, climate zone are made and reviewed with the owner. After approval of these partial design solutions, field gathered information will be reviewed. Based on this information and the initial design solutions we begin to build our final design. Each perimeter edge, drainage component, equipment and projection will be looked at. Details will be design on our initial design recommendations.

A8WJ3(19) JB (12/3/13) There is an initial design frame where partial solutions are designed using wind, energy comparisons, membrane selection and climate zone. Then, more information is gathered via the field. Need elaboration on this field information. With this information, changes are made to the initial design and the final design is built. There is definite reflection-in-action occurring here.

ID4WJ3(31) I will gauge how and when various scenarios will be used. The scenarios are set-up as threesomes: a dealership employee, a customer and an observer. But the distribution of roles also needs to be flexible based on the size of the group, the specific group's receptivity of engaging in role plays and what I deem, in the moment, would best meet the training's objectives most effectively for the given group.

ID4WJ3(32) JB (11/27/13) ID4 is interesting as ID4 reflects-in-action while he is facilitating. Each facilitation is a unique situation. ID4 has information that when he understands it he can make changes going in. Those changes then affect how the facilitation goes. But then he has partial solution that he can draw from as he better understands the facilitation design as he is facilitating. He then changes things with the partial solutions. Really need to know how this is working.

ID4WJ3(33) Another partial solution involves sequencing the two days of training, based on whether dealership leaders can attend both days of training, or only one. For example, if some leaders can only come on day two, a partial solution for day 2 would involve reviewing the salient points from day 1 before beginning new material on day 2. Also, leaders who only attend day 2 would only be allowed to be observers for the first two role plays until they understand how the principles of DiSC are to be applied in the role plays.

ID4WJ3(34) JB (11/27/13) Again, real close relationship between partial solutions and information (can dealership leaders attend both days of training, or just one). This is ID4 reflecting-in-action again. ID4 faces a unique and uncertain situation. As he understands the situation (when leaders will be there) he makes changes. The changes then help him understand what the unique situation will involve. Then like above once the facilitation is going there is more reflection-in-action.

ID4WJ3(35) JB (11/27/13) What is very interesting here is this reflection-in-action moves the facilitation design forward to begin and once ID4 is facilitating. I can imagine that this is how a school teacher would use reflection-in-action.

ID6WJ9(165) One challenge we just learned of is that even though this camp is advertised as a leadership camp that will incorporate social media. We found out recently that the COO of GS is somewhat old school and only wants campers to be able to tweet during certain times of the day. The important point about this is that she does not want the campers to be able to tweet in the evening. This is quite a problem because the research we have looked at indicates that most

14-18 year olds tweet in the evenings. Most of our tweets will go out during the day, but this was designed this way thinking that campers would possibly go back and tweet about our earlier tweets once the day settles down and they are laying in bed.

ID6WJ9(166) JB (12/29/13) What is interesting here is that ID6 is reflecting on information. For her design, ID6 draws on research about young women tweeting and how tweeting can be used as an educational tool. ID6 has designed solutions that she does not know if they will work. But, this is part of her design-based research. ID6 will reflect-in-action when tweeting begins. She will understand the unique situation and make changes. This is a real good example of the problem-solution coexisting. At this point, ID6 cannot have all the solutions because she does not know the unique problems/opportunities.

ID7WJ10(212) When I reflect upon this experience the “lesson learned” was that I want to be included in projects from the beginning. I don’t want to come in late in the game and have to play catch up. It is too difficult to learn new material and design and develop under such tight timeframes.

ID7WJ10(213) JB (12/18/13) This is a recurring theme. ID7 like the other participants wants information. Bringing herself up to speed with information late in the game is really tough. Information is important to moving the design forward. Information is important in understanding the problem-solution relationship. Information is important to draw on something within the design project.

E3WJ2(38) So whenever I make an updated calibration, I literally compare it to a previous calibration. I do this both as a check that I made the intended changes but also as a sense check that what I am doing now is correct based on the new information I have.

At times, participants did not realize that they were reflecting-in-action. It is just what they do without consciously knowing it.

A8IM1(42) JB: Asked A8 to elaborate on how he reflects-in-action using the example he provided in his journal.

A8IM1(43) A8: “Everything is built on one another.”

A8IM1(44) A8 explained that wind calculation and climate for reflection can tell you what the membrane choices should be.

A8IM1(45) A8 continued then you look at details. You look at the site specifics like a facility may have a lot of mechanical equipment.

A8IM1(46) A8: “What do we do at this perimeter edge? I will sit down with photos and plan.”

A8IM1(47) A8: “What are we going to do on this side? What are we going to do on that side? This may change what we do.”

A8IM1(48) A8 explained that flashing height is one example of something that can change things.

A8IM1(49) A8: “Given the conditions, we may switch membranes.”

A8IM1(50) A8: “Every decision builds on every other decision.”

A8IM1(51) A8: “Sometimes we go back and change decisions that we made earlier.”

A8IM1(52) A8: “There are times that you have to make decisions and keep the project moving.”

A8IM1(53) JB (12/8/13) There was a very interesting exchange with A8. I was describing how I perceive that he reflects-in-action. He commented that it doesn't seem to happen in such detail as I explained. I quipped that obviously it does because I do not know the first think about putting a roof on and all this membrane jazz, but I am able to explain what is going on and somewhat impress A8. The literature (believe Cross and Schon make a point of it) points out that designers are really bad describing how they design. A8 reflects-in-action quite naturally, but he doesn't see it as reflection-in-action, he sees it as him designing. This is intriguing. All the participants do this so much that it is just second nature. It just happens. They don't realize that they are doing it, but know it is how they get things done realistically and keep the design moving forward.

A8IM1(54) JB (12/8/13) In one case in particular, ID4 thought I was giving too much glory to reflection-in-action. It is what is happening. But to the participants it is just what they do.

A8IM3(132) JB: Asked A8 to elaborate on how he stepped back and took stock in his design situations.

A8IM3(133) A8: "I don't think that I ever sit there and have a formal process."

A8IM3(134) A8: "I subconsciously do what we are talking about."

A8IM3(135) JB (1/8/13) What we are talking about in essence is reflection-in-action.

A8IM3(136) A8: "It is part of the process. I don't think about the process. I just do the process."

A8IM3(137) JB (1/8/13) A8 may not think about the process, but he definitely reflects on the design.

A8IM3(138) A8 explained that he struggled with some of the reflection questions because to him, "It is just a process."

ID4IM1(84) JB: Asked ID4 to elaborate on that, in essence, no two facilitations will ever be the same.

ID4IM1(85) ID4: "They aren't, but it may be giving it too much glory."

ID4IM1(86) ID4 explained that it is the makeup of the group that makes the difference.

ID4IM1(87) ID4 explained that each dealership is different but there are, "a bulk of factors."

ID7WJ10(210) Everything happened so fast that I never really took stock of the situation until everything was completed. Between 10/14 and 11/8, I had to design, develop, conduct a T3, revise materials based on SME feedback (poor timing with the SME feedback; but I didn't have time for a SME review before the T3), advise trainers of the revisions, and send the materials to Reprographics for printing. And, don't forget that I was designing for two different audiences: one that required 1.5 **days** of training and one that required 2.5 **hours** of training. Thank goodness we were able to leverage a couple of units between the different audiences.

ID7WJ10(211) JB (12/17/13) This is interesting. As ID7 looks back, she does not see that she took stock in the design situations. But, we discussed in interviews that she was constantly reflecting-in-action as she kept receiving information. Reflection-in-action was immediate. It happened constantly. In fact, for ID7, it was the only way she could design as the information kept coming at her. She would receive and then immediately incorporate it. This created unique situations as described above where ID7 did not have time for a SME review before T3. Stepping back and taking stock did not occur in the sense as there was this big sign and ID7 assumed the

Thinking Man position. It was stepping back and taking stock of a unique situation in between getting more information thrown at ID7.

RQ2 – What effect does reflection-in-action have on keeping a design project moving forward toward implementation?

While reflecting-in-action, participants received and gathered information and constraints which kept the design project moving forward toward implementation.

GD1IM1(146) GD1 clarified if I am not given the right information and do not know what I am designing for, then I will make my best guess as to the goals to fill in the blanks, so I can continue to process and do my job. Ideally, I would be briefed on the project and kept in the loop on changes. Unfortunately, this doesn't always happen.

GD1IM1(147) JB (10/8/13) Her clarification really helps to understand how she keeps the project moving forward. She wants information, but if she doesn't have the information, she makes her best guess as to the goals and keeps moving along. It doesn't always happen that she gets all the information so she keeps moving.

GD2WJ3(48) Hearing how progressive the clients were, how open they were, and how friendly and good humored they were gave me the confidence to pursue certain design and strategy concepts.

GD2WJ3(49) JB (11/5/13) Earlier in the design process GD2 was coming up with ideas that fit a “me” and “hip” approach. There were early solutions. Early opportunities from what GD2 knew at the time. Now, GD2 is getting more information. How does this keep the opportunities going?

GD5IM1(23) GD5 explained that going into the design, she knew that the site had to be, “...one that targets a slightly younger audience.”

GD5IM1(24) JB (11/27/13) GD5 is designing with information. This information was very important as it helped in coming up with a simple and clean design approach.

GD5IM1(50) GD5: “The more information the better. If either a simple or complex site, knowing the content is essential.”

GD5IM1(51) GD5: “It helps with seeing what they want to call out. You have a great situation here.”

GD5IM1(52) JB (11/27/13) This is a theme running through all the participants. GD5 wants information. The more information GD5 has the better. It helps moves the design process along. She is able to design to what it will actually be. GD1 called it designing to reality.

E3IM2(99) E3 explains that when he looks at an ugly table he may try to smooth a jagged edge. However, he could look at a fairly smooth table and the partial solution could make it uglier because he may move up the threshold and make a jagged edge. E3 notes, “I am making the table uglier, but I am coming up with a partial solution.”

E3IM2(100) JB (11/13/13) Partial solutions are crucial for E3. Interestingly, the partial solution may make the table uglier as it may result in another jagged edge. In reality, the table will always be jagged. What is important to E3 is that he is always moving the design forward. You do not have time to start from scratch, so E3 is reflecting-in-action often. His approach to partial solutions is all reflection-in-action.

E3IM2(101) E3 adds, “You don’t go back to the whole table. If you change things too late then there could be consequences.” “Realistically speaking, the table will always be jagged. You have to move forward and you don’t have time to start from scratch.” “You never completely revisit the table and you never start from scratch.”

E3IM2(104) E3 explains that there are 20 calibrators who can be contributing to one calibration. E3 explains, “If I don’t get them a mini solution, then they can get stuck with their calibration.”

E3IM2(105) E3 states, “Mini-solutions are needed along the way to make the whole solution.” Striving toward RPR (100% calibration), but if something is wrong then he will need to update it later.

E3IM2(106) E3 confirms that without a mini-cal the design does not move forward. E3 continues, “You can’t just try things out. I am dependent on other calibrators.”

E3IM2(107) JB (11/11/13) Another example of E3 moving the design forward. There is a lot of reflection-in-action that happens with mini-solutions. This reflection-in-action on mini-solution keeps the design moving forward.

A8IM1(27) JB: Asked A8 to elaborate on that he uses a lot of information to make decisions. Is this because every design decision will have pros and cons?

A8IM1(28) A8: “This is part of it. Based on my experience of the pros and cons, I want to convey the pros and cons to the owner (e.g. facility manager) so he can make decisions.”

A8IM1(29) JB (12/11/13) A recurring theme with all the participants is the need for information. Participants want information. The more information the better. A8 requires a lot of information in his design development. His information comes from many sources – blueprints, preliminary stats, field information, photos, measurements, etc.

A8IM2(68) Follow-up on if this is A8’s experience coming out.

A8IM2(69) A8: “It is all experience with post offices and the trouble spots.”

A8IM2(70) A8: “This is what I have seen with third parties. Sometimes the asbestos sampler takes the roof notes.”

A8IM2(71) A8 explained that these samplers may not be qualified and A8 knows right away that there may be some questions.

A8IM2(72) JB (12/29/13) A8 needs information for the design development. However, it is impractical for him to be on-site at six different locations. So, A8 relies on the field people for information. A8 draws on his experience knowing that there will be trouble spots. This allows A8 to ask the right questions and look for inconsistencies.

A8IM2(84) JB: Asked A8 to elaborate how all the reflection occurs to see that information that was sent may be wrong or contradictory to what A8 has.

A8IM2(85) A8: “They are my eyes.”

A8IM2(86) JB (12/29/13) This is very interesting. In order to move the design development, A8 needs the field teams. But, A8 draws on experience that there will be inconsistent data. There has been a consistent theme regarding information. Within the information, there are constraints. Across all participants, information and constraints are closely tied together.

A8WJ6(94) I think the solutions have been developing nicely. We are getting to the point where we need to keep things moving forward. So as we wait for answers from the field I need to make the decisions that I can to keep each project advancing. Sometimes that means leaving holes in my design and other times I'm making assumptions based on experiences. I will fill in the missing pieces at the end and hopefully we won't have major changes.

A8WJ6(95) JB (12/29/13) This is very interesting. Is this the problem-solution coexisting? In other words, A8 leaves holes and makes assumptions. All the solutions are not figured out yet because all the problems/opportunities have not been looked at. A8 will fill in the “missing pieces” at the end. This is all done to keep the design development moving forward.

A8IM3(111) JB: Asked A8 to elaborate on, “Sometimes that means leaving holes in my design and other times I’m making assumptions based on experiences.”

A8IM3(112) A8: “I am hoping not to have to make assumptions as they lead to holes in the specification.”

A8IM3(114) A8 explained that some assumptions are because he is still waiting for information. But, it is important to move forward with the design.

GD1IM1(92-94) GD1: “Yes, I suggested this. I don’t mind conceptual work, but as a designer you need to know how it works. You need to know the constraints you are working with.”

GD1: “The more information I have, the more we know how it will work, the easier to build and the easier for mobile.”

GD1 explained that the issue she is running into is that much of the work has been conceptual ideas, try this, or try that. These conceptual ideas are running into, “...what can we deliver and what are the core things.”

GD1IM2(185) GD1: “I am plugging along with the information I have and this make me feel good.”

GD1IM2(186) GD1 explained that that there are odds and ends that need to get done. She still needs to design mobile but it follows the designs that have been made. So, there is a little pressure off in regards to the mobile.

GD1IM2(187) JB (10/28/13) Having set milestones is not easy for GD1. It is the actual design project and that it has been a unique design journey. There is one milestone – January 2, 2014. Now, there are key milestones along the way. But, they are a bit fluid. They move along as more information is gathered.

GD1IM3(278) GD1: “It was a situation where it kept falling back on to design. It was hard for project managers to keep it moving as everything fell back to design.”

GD1IM3(279) JB (11/23/13) It is interesting that design and the GD1 drove the project. This can be traced back to the fact that GD1 started with no direction and no information. It was just – design. Design drove the project. Oftentimes, it is the site mapping and wire framing that provide the framework for the design. Here, design provided the framework for the traditional framework things.

GD1IM3(307) GD1: “Being aware of the timeline constraint benefitted in getting things figured out. It affected everyone else in getting things pumped out.”

GD1IM3(308) JB (11/23/13) The time constraint helped keep the project moving. It helped in, “getting things pumped out.”

GD1IM3(327) Another issue was that the navigation for the specialties section was never finished while I was designing it. I knew the real site would have many levels, but since they weren't available, I made some up and developed a style and plan for how the different levels in the navigation would look and function. That extra forethought combined with making a style guide for the developers to follow has come in handy for build, because the developers weren't stopped by another thing needing to be done. I was thanked by one of the developers for this, which made me feel good. Especially knowing that I had done all I could to try to make things easier for them.

GD1IM3(328) JB (11/23/13) It is interesting to see how GD1 kept things moving forward. Over two months into the design, the navigation is just decided on. This is an important part of a webpage design, but GD1 kept designing by, “I made some up,” and then developing a style and plan for how the different levels in the navigation would look and function.

ID6WJ3(29) This week as I have been going through the bullying content provided by the Girl Scouts I noticed many holes. In most cases, the information just touches upon bullying and does not really offer solutions or ways for girls to get out of bullying situations. Or even how to move past a situation when you have been bullied. So in this case I have started looking at how other non-profits or schools addressed the major issue of bullying for young girls ages 14-18.

ID6WJ3(30) JB (10/31/13) Interesting...ID6 realizes that she has no solutions to work with. So, she goes and draws on other non-profit and schools to find solutions. So, she advances the design by realizing that she has nothing to work with and that she has to go elsewhere.

ID7WJ1(10) The NHR workgroup lead for the Customer Service area has been attending the meetings from the different work tracks. She provided me with a “design document” that listed about 15 different topics that would require between half an hour and 2 hours of training each. Some of these topics had absolutely no information listed under them. Unfortunately, I only am familiar with one topic (changes to the Underwriting Policy).

ID7WJ1(11) JB (10/19/13) ID7 is receiving topics that she is not familiar with. She continues to design knowing that she has deadlines quickly approaching. The project moves forward as she reflects-in-action as she receives information. Is this supported by the above elaboration?

ID7WJ3(61) Partial solutions are all I usually have. I constantly just have to move forward with the information that I have available at the time. As more information becomes available, I revise my design based on the new information.

ID7IM1(75) JB: Asked for confirmation that crossing off topics and starting to design for a phase 3 was reflection-in-action in the sense that a lack of understanding (not getting the content) results in changes (cross out topics in phase 2).

ID7IM1(76) ID7: “Very true.” “One of the things that defined phase 2 was the person running it could not get a handle on it. She made a list of subtopics; a couple hundred.”

ID7IM1(77) ID7 explains as they started going through what they had and didn't have, they started to see that they didn't have anything on something specific so they can't train on what they don't have.

ID7IM1(78) ID7 concludes, "Once I got an understanding of what the work groups didn't have, we scratched it off."

ID7IM1(88) JB: Asked ID7 to elaborate on this sentence from a reflection journal, "As more information becomes available, I revise my design based on new information."

ID7IM1(89) ID7: "What is giving me an edge is I know why I cannot use certain information because it is not related to the job function. I cannot relate the piece of information to what a CSR has to do."

Here, a lack of information helped keep it moving along

ID7IM2(122) ID7 noted it was a scramble to get everything printed with the changes from the subject matter experts.

ID7IM2(123) ID7: "There were some things that I did not quite understand so I got clarification."

ID7IM2(124) ID7: "I made a list of all the revisions and what changed. I put in all the changes and worked through material to get ~~them (SMEs) back the changes~~ the SMEs changes to the trainers. I sent the revised trainer and trainee guides to the trainers. They would have struggled to read through the 150+ pages and find the revisions. So I attached a list of the revisions to the email that I sent out with the revised trainer and trainee guides.

ID7IM2(125) JB (11/29/13) There is reflection-in-action here. ID7 had a unique situation (evolving information). ID7 understood the evolving information and made changes. This went to the SMEs. SMEs made changes to the information. ID7 then made changes based on the new information. ID7 was always moving the project forward. ID7 really did not have a choice.

GD1IM2(241) GD1: "I don't like designing without constraints because it is not real. I felt better when I have clear direction regarding what is needed, what it will be built in, and when it is needed by (time constraints). Knowing it was in Drupal and learning its constraints along with the current site's constraints helped me in making solutions for real issues."

GD1IM2(242) JB (10/28/13) This is very interesting. GD1 is not designing for design sake. The constraints are part of reflection-in-action. Think about the discussions between GD1 and the developer. The problem-solution relationship is driven by real issues and real solutions. Reflection-in-action has always been real.

GD1IM1(104) GD1: "I look at user expectations; constraints like budget, timelines, client expectations; and how it affects developers building it." "How can I come up with something great for the client and what platform will it be on?"

GD1IM1(105) GD1 explained that even the browser can throw a wrench in what she can do.

GD1IM1(106) GD1: "I am constantly evaluating through the process."

GD1IM1(107) GD1: "As you evaluate, the circle becomes smaller where you consider smaller things like better colors and different ways to play with things."

GD1IM1(108) JB (10/8/13) This is GD1 reflecting-in-action.

ID7WJ4(104) However, I think I can come up with an example of me driving the change. I was originally given a “design document” that was developed by one of the work group members. This design document listed about 15 general topics that would be developed into units of information for our NHR course. As I continued to go to meetings, we ended up going through lists of hundreds of items that different workgroups wanted trained. Some of these items would be listed several times with slightly different wording because they were submitted by different workgroups. In order to gain some kind of understanding of what actually needed to be included in training, I went through the lists highlighting items related to various topics with different colors. For example, all topics related to Enrollment were highlighted in yellow, topics related to Underwriting in orange, topics related to Contract Maintenance in blue, etc.

ID7WJ4(105) By putting this kind of structure around my problem, I changed the design. I now had a design that included 11 different units of information. Some of these units were not identified in the initial design document that I started with; other units were deleted because the workgroups could not provide the necessary information by the date that we needed.

ID7WJ4(106) JB (11/12/13) This is a great example of reflection-in-action. This is how it all works. So, reflection-in-action did work beyond just getting information and making changes. Here ID6 really reflected on the unique situation and made changes. The changes then helped ID6 to better understand and develop units that could work.

GD1IM3(300) GD1: “Something can seem so small but it can throw off so much like the messaging.”

GD1IM3(301) JB (11/23/13) GD1 would design and she would reflect-in-action. She would reflect on the unique and uncertain situation and make changes as best she could with the information that she had. She would then get feedback from the client which would make her reflect-in-action more. These seemingly small changes had a huge impact on the unique and uncertain situations. GD1 has to move to another design space and reflect some more. GD1 not only reflected on how it affected the design, but also how it would affect development. Multiple spaces here to reflect in.

E3IM2(110) E3 explains, “I try to be in control as much as possible.” “I make it happen.” E3 uses a visual of turning a knob or pushing a button. When this is done, E3 states, “I get a better understanding of the response.”

E3IM2(111) JB (11/11/13) This is reflection-in-action. By “turning a knob” or “pushing a button”, E3 better understands the response. When E3 better understands the response, he can turn another knob or push another button.

E3IM2(112) E3 explains this further. When he is driving a car, he may see or feel a change, but he does not know what is happening. He continues, “I try to do things, so I have a better understanding of what is going on.”

GD1IM2(204) GD1 explained that she is now the, “consistency and branding police.” Now, the designs are more templates.

GD1IM2(205) JB (10/28/13) GD1 did a lot of upfront design work. Early approvals have spearheaded later designs. The heavy lifting is over as now she is the “consistency and branding police”. This is crucial to moving the design project forward. Early reflection-in-action helped

get designs approved and now it is using what was designed and approved as templates for the other sections.

GD2IM3(161) GD2: “My drive for the project is dead.”

GD2IM3(162) GD2 commented that he had a little drive at the end, but his hours were gone to keep designing.

GD2IM3(163) JB (12/29/13) This is interesting. GD2 had to wait around for the client to give the okay to move to the design comps. Once GD2 was designing the comps, he had the constraint of getting done quickly and the hours he could spend on it. This is ironic as he waited around to then hurry up. It is also interesting that GD2’s drive went away. In interview #2, GD2 had commented that he kept thinking about the college homepage as he designed other things. But, in the end GD2 lost the drive.

E3WJ3(82) I spoke previously about adjusting knock thresholds in select speed-load zones where false knock was occurring. I did not revisit the whole calibration table in that case, I simply went with a partial solution of select portions of the table. This again was to mitigate risk. Also, the problem of false-knock occurs during a specific 0-60mph maneuver. Most customers would not experience this problem, thus a partial solution was developed to satisfy a problem that occurs during a portion of a driving experience.

E3WJ3(83) JB (10/22/13) So, again, the partial solution mitigates risk which keeps the design moving forward. So for clarification, are we back to our “ugly” table and he is finding a partial solution for one of his “jagged edges?” Need clarification here.

ID7WJ1(12) On Oct 14 the NHR workgroup lead finally started including me in NHR meetings. This is the first time that I’ve heard anything about most of these topics and yet they expect training to be designed, developed by Nov 1. I should have been assigned to this project sooner, so that I would have a better understanding of the information.

ID7WJ1(13) JB (10/19/13) ID7 is dealing with major constraints, but she keeps moving forward.

Through reflection-in-action, participants moved the design projects to implementation. Moving the project forward often resulted in less than perfect designs.

E4IM3(170) JB: Asked E3 if chasing opportunities results in a design spiral.

E4IM3(171) E3: “Design spirals can happen. There comes a time where you decide to stop tweaking.”

E4IM3(172) E3: “You can get in and endless spiral. You have to make a decision.”

E4IM3(173) E3: “You are looking for a perfect solution and this can be endless tinkering.”

E4IM3(174) E3: “I have to look at priorities. You have to take one priority over the other where I find something that fits a priority with the information that I have right now.”

E4IM3(175) JB (11/27/13) This is a theme that comes up over and over. The design is never perfect. It appears that constraints make it almost impossible to have the perfect design. Some participants (GD1) have called it designing for reality. E3 has information right now and uses

that information to design the best he can. Decisions have to be made, constraints have to be accounted for, the design project has to have an end. E3 and many other participants focus on keeping the design moving forward. They use reflection-in-action to do this. But, in order to keep the design moving forward, perfection may not (never) occur.

GD1IM3(330) Looking back, I think that the project's designed turned out pretty good. There are things I would have done differently, and things that I wouldn't have, but based on time constraints, weird communications/differing goals, the client, my lack of complete control ;) ... I would say it turned out pretty good.

GD1IM3(331) JB (11/23/13) It is never perfect. It is "pretty good." The constraints hang in there until the end and just make it pretty good. But, it gets done. It keeps moving forward. And with all the uncertain and unique situations, GD1 understood what was needed and made changes. She kept reflecting-in-action and kept the project moving forward. The problem and solution co-existed to the end. The specialties section did not come together until the end. The problem (what the specialties should look like) was defined by a year old design. The solution came from a design that was designed a year ago under different circumstances. Reflection-in-action was so fluid for GD1. She was always doing it.

GD2IM3(194) GD2: "I am not happy with what I have designed. All the rushing and no decision making, sometimes it is not a homerun."

GD2IM3(195) JB (12/29/13) In the end, GD2 moved the design along. GD2 produced a design comp within the time frame and within the budgeted hours. But, GD2 is not pleased with it for the reasons described above.

GD5IM1(60) JB: Wanted clarification on why the edits were problematic as noted in a reflection journal.

GD5IM1(61) GD5 explained that the font she used was very heavy and the font that the client wanted was not heavy.

GD5IM1(62) GD5: "It was not as strong so I made the font larger."

GD5IM1(63) GD5 stated that if she had not done this she would have had to go back and change other things.

GD5IM1(64) GD5: "It was the best solution I came up for the revision. I like it better the other way but it is the best solution."

GD5IM1(65) JB (11/27/13) GD5 is moving the design along. She makes edits to the first design comp quickly so it can go back to the client for approval. GD5 is satisfied that she came up with the best solution even though GD5 prefers the other version better. Design in not perfect. GD5 designs within the constraints (get a homepage design comp approved) and moves on. It is good considering the circumstances.

E3WJ2(28) If it is, then I calibrate as I intended. If not (which happens often), then I simply make a sort of compromise between what I imagined and what is capable. This proves to be a bit of a struggle at times. I want my calibration to be perfectly optimized. And with infinite time and resources, I could "perfectly optimize" it. But calibrations have exact release dates. For better or for worse a calibration will be released on such-and-such date. The cal might be good, it might be terrible, but it will get released.

E4WJ2(29) JB (10/14/13) Interesting, reflection-in-action must keep the project moving forward.

E3IM1(46) JB (10/22/13) E3 talks about how there are always opportunities to improve. It is his stance that he has to get something out. So, in that thinking, the milestone is hit because he had the “bulk” of what he wanted done for the trip. For him, it is not a cup of calibration that he can look at. For this milestone he had the bulk of what he wanted in regards to calibration. It will never be perfect for E3, but he is always moving forward.

E3IM1(57) JB: Wanted clarification on E3’s journal reflection: “...I will go back and forth until I reach some happy...or unhappy medium.”

E3IM1(58) E3 explains that sometimes you are trying to satisfy two different means that are opposing one another. For example, more performance versus getting from a to b (pleasant drive). These are two different calibrations, but there is one calibration for one engine. Can’t have both...an “unhappy medium.”

E3IM1(59) JB (10/22/13) E3 accepts that it is never perfect. But, he is always moving his design forward. He has constraints – the new model year. His reflection-in-action puts him in a position to move the calibration to production even if he is dealing with an “unhappy medium.”

E3WJ2(30) Design is not perfect. It has to be good. So you can only polish the rock so far before you have move on to other things. And I always have to keep the customer in mind. I don’t get paid to perfect my calibration development skills, I get paid to release a calibration that will please and add value to the customer. So it is not necessary to have a perfect calibration, it just needs to be perfect for the customer.

ID6WJ10(174) After the project.... I often find myself continuing to design and thinking of ideas when I am supposed to be done. I am at the point though where I have to say enough is enough and I cannot make any additional changes to the design. Instead, what I do is write notes down for future projects as lessons learned that can be included into similar projects.

ID6WJ10(175) JB (12/29/13) The design has an end. It is not a design spiral where ID6 keep designing for the sake of design. The instructional design needs to be launched. The design has to be moved forward to an end – “...enough is enough...”

ID6IM3(187) JB: Asked ID6 to validate if this is the best possible design or is just good enough.

ID6IM3(188) ID6: “It is really. I think that it is a great design.”

ID6IM3(189) ID6: “I have affirmation, not that other stuff could come about.”

ID6IM3(190) ID6: “I made decisions with what I have right now.”

ID6IM3(191) ID6: “I will write things down for future. It could be beyond Twitter or the subject of bullying.”

ID6IM3(192) ID6: “I am very confident in what comes out. I feel good.”

ID6IM3(193) ID6: “This is what I had in front of me at the time.”

ID6IM3(194) JB (12/29/13) Of the participants who have completed their designs (all but A8), only ID6 and ID4 appear to like their designs. For the rest of the participants, the feeling is more that the design is good enough.

ID7WJ1(17) The workgroup lead has given the Business Readiness team from the servicing areas and the documentation team a deadline of 10/22 to determine what the CSRs need to know and document it. If decisions and documentation are not complete by 10/22, the topics will have to wait until Phase 3. By Wednesday morning, I will start crossing topics of the “design document”.

ID7WJ1(18) JB (10/19/13) So, this is interesting. There is an understanding here that not everything can be done on January 1, 2014, so phase 3 will develop. Topics are being crossed off the design document. Need to confirm that these decisions were a result of the reflection-in-action. It is a bit different as the lack of understanding (not getting the content) results in changes (cross out topics in phase 2) and now there is a better understanding of phase 2. So, the inability of coming up with all solutions in phase 2 has defined what is phase 2.

ID7IM1(84) JB: With the looming deadline, ID7 drew on previous templates and previous accelerated/active learning activities. Elaborate on if this is just being efficient or is it “cheating” a bit?

ID7IM1(85) ID7 explains, “It is what is happening. But, on the other hand, I design this way. This is always how I have to design. This is the only way I know how to do it.”

ID7IM1(86) ID7 continues, “Can I come up with a great experience? No, I have to get it done quickly. It is always just a race.”

GD2IM3(212) JB (12/29/13) GD2 summarized the design as “utilitarian.” The design just existed instead of working together.

GD5WJ2(12) During the last round of revisions, it was asked of me to increase the height of the logo above the navigation bar. Since the logo overlaps the links area, I fought visually trying to balance the header contents so it would all look professional and still function properly while not appearing to be cluttered. Through trial and error, I opted for only increasing the center portion circle of the logo that contains the ampersand. I let it overlap the navigation in a more dramatic way but kept the text of the logo at its original size. By doing this, I believe this created a solution that the client AND myself could both live with.

GD5WJ2(13) JB (11/12/13) Interestingly, GD5 noted in an earlier reflection that she was pleased to know that she could play with the logo. This was a unique situation. Usually, logos are off limits in a design. But, as she “trial and errors” the logo ampersand (partial solution), GD5 better understands how she can make it work and makes changes that results in a solution that the client and she can live with. Need validation on this. Also, why is it important that GD5 can live with it?

E3WJ3(84) So as a calibrator I am responsible for a certain portion of the calibration. Out of say 20,000 variables, I am responsible for about 1,000 of them. Many times when a problem is experienced, I will make a mini-calibration (some subset of those 1,000 variables) and send it to whoever is experiencing the problem. I might later include this mini-cal into a later release of my whole cal, but many times this mini-cal might just be used by the intended party so they can do their testing or bypass whatever issue they saw. This is another example of a partial solution. The mini-cal is just a way to bypass an immediate problem while trying to solve a bigger problem or

develop something bigger. The mini-cal can be considered a “fix for now”, until I can develop something better in the future.

E3WJ3(85) JB (10/22/13) “The mini-cal can be considered a ‘fix for now’, until I can develop something better in the future.” This seems to support E3’s approach that his calibrations for this model year create opportunities for next year’s improvements. The focus is always moving the calibration forward toward implementation. Without partial solutions, would he ever release a calibration? In other words, does a whole cal solution really exist? If not, then reflection-in-action on min-cal is the only way to move it forward.

ID6WJ9(164) As a person that likes to see the ‘finish line’ this is somewhat of a constraint to me as a designer. I have to keep working to be okay in not knowing how the projects will fair.

Because of this I am constantly trying to predetermine a Plan A, Plan B, Plan C etc. And in most cases, I can’t prepare for everything and I just need to accept that there is no “predetermined solution”.

GD2WJ9(144) The large background image was added to satisfy the clients desire to have the site reflect the style of the Notre Dame site, which had big imagery. There were no provided assets, so I took an image offline of their campus as a placeholder, I felt using a campus image, especially one of the tower would be a safe bet, Preferably the image would be fixed and selected purposefully, but with no real room for that kind of thought or execution the placeholder had to do.

Through reflection-in-action, participants moved the design forward toward implementation by turning “what ifs” to design decisions and exploration to design commitment.

ID6WJ7(98) The first major theme of having the tweets, was great with everyone. My ‘what if’s’ consisted of what each of the tweets was made of. So for example I had been exploring the idea of sending the initial tweet, if that tweet didn’t get any response from campers, I would send out the next tweet. After research I knew that I had an idea of what that next tweet would be, but I needed the buy in from the rest of the research team before moving on. My thought on this is to send the first tweet at 8:00am which sounds early for 14-18 year olds, but breakfast is going to be at 7:00am, so I think this will work. But I want them to get the first tweet about 8:00am. this tweet will lead them to the Girl Scout Website that a website designer will create where the students can read more information. The thing is that you can only use 140 characters when tweeting, so if I am going to have campers try to solve something, I will need a space that gives them more information to use in order to solve. So, if the first tweet is “SOS, a fellow camper needs your help! Go to (insert website here) to help her! Then of course the website will have further instructions. I told the research team that I think that it would be helpful to see if there are differences between the online (twitter) response and the face to face response. Such as once campers are directed to the website they will respond online hopefully but then we can also ask them to do something in the mess hall like sign something to take a stand for the camper. I don’t really know that yet, what I do know is that the research team liked this idea. So now, I have to work on what will be tweeted, what will go on the website and what we will ask them to do face to face.

ID6WJ7(99) JB (11/29/13) ID6 went to the research team with her “what ifs” and from the feedback from the research team ID6’s idea on tweets turned to design decisions.

ID6WJ7(100) Other benefits from this meeting includes we would also have to be prepared to teach the campers how to use twitter if some of them have not used twitter before which is something that I didn’t think we would need to do. One of the research team members mentioned that if you are using twitter, not all campers would be ‘trained’ on how to use twitter because they have never used it. To me it was pretty easy to figure out, but I am so glad that this came up as it would have put us in a difficult spot if some campers wanted help. So the ‘what if’ with twitter is that we need a short instruction such as a handout explaining how to sign up and use twitter. In addition as we explored ways to get bullying content to the campers, we determined that we would need a website or a space to house more bullying content then what twitter would offer with only 140 characters.

ID6WJ7(101) JB 11/29/13) What ifs have turned to design decisions. Exploration has turned to moving forward? Are the decisions and commitments late or is the timing good to keep things moving? Need elaboration here.

ID6IM2(144) JB: Asked if ID6’s decision not to do another pilot is due to a time concern?

ID6IM2(145) ID6: “It is a time situation. It is why I am backing off.”

ID6IM2(146) ID6: “I don’t think that it will impede my design too much.”

ID6IM2(147) ID6: “I just want to wrap it up.”

ID6IM2(148) JB: Wanted to confirm that design decisions are timely to keep the design moving forward.

ID6IM2(149) ID6 confirmed that design decisions are moving the design forward.

ID6IM3(204) ID6: “After Arab Springs, I started another design document.”

ID6IM3(205) ID6: “I pitched it to one research team member. She said it was a great idea for another project.” ID6: “I started from scratch, but didn’t spend a lot of time.”

ID6IM3(206) JB (12/29/13) This is very interesting. ID6 designed another approach to the instructional design. This is ID6 seeing other opportunities and reflecting-in-action to see if it could work. It is an exercise in “what if” and exploration. Eventually, ID6 had to commit to a design. This is what moving forward is all about.

ID7WJ7(160) Hmmmm....I’m having trouble with this one. Our biggest “what ifs” relate to changing information. I’ve already discussed how I handled this by adjusting my design based on the information that the workgroups provided or didn’t provide.

ID7WJ7(161) JB (11/29/13) For ID7, the line when what ifs turned to decisions, and exploration turned to design commitment is a bit blurry. There has been constant reflection-in-action. Instructional design was pushed out as quickly as it could be finished. At points, it was here is the information push it out. Need feedback from ID7 on this.

E3WJ7(122) Several times during the calibration process there are “what if” moments. In my experience, someone comes to me with a problem my calibration is causing them. My calibration is already set at this point, so now it becomes, “what if” we change it slightly, what will happen. Well in these instances, I first brainstorm what potential problems can be caused from altering

my calibration. Then I change my calibration and test it and see if those potential problems prove true.

E3WJ7(123) JB (11/27/13) True reflection-in-action happening here.

E3WJ7(124) If they do, then an alternate path has to be explored. If the potential problems don't prove true AND I see a benefit to the change, then I commit to the change and move forward with the new calibration I just made.

E3WJ7(125) JB (11/27/13) Reflection-in-action results in moving the design forward. Great example!

GD1IM1(130) JB: I asked GD1 to discuss the difference between sketching wireframes and mood boards where she stores it in her head.

GD1IM1(131) GD1: "For me, sketching is pen and pencil. It is the lowest technology first. I can throw it away and no one cares. When it is polished, it is hard to throw it away."

GD1IM1(132) GD1 explained that when sketching, GD1 does different variations. She looks at different iterations. Then, she finds one to go with.

GD1IM1(133) GD1 noted that she will find things like a, "piece of a website", certain font, or a "texture". She, "banks these away."

GD1IM1(134) GD1 explained that she calls this information architecture. She needs to separate these out in the beginning. For her, she has to strip the things she banks out so she can focus on the best solution then she brings in the things that she banks away.

GD1IM1(135) JB (10/8/13) Here GD1 is reflecting-in-action and framing as she goes along. The banking is interesting. She takes stock in her sketches and finds one and goes with it and then brings in the things that she has banked.

GD1WJ8(269) Sketching and wire framing is part of mapping out a plan and help determine that plan's execution. Like blueprints on a house. While they can be altered, the core plan should remain in tack if it is going to survive. The more tight the deadline, the more imperative it becomes for the plan to be the most simplistic and easiest to execute, to ensure successful completion. Additional features, etc should be set aside for later to respect the timeframe of development.

GD1WJ8(270) JB (11/23/13) So, interacting with the sketches and wire frames set the framework. They can be altered but the core plan should always remain intact. In this project, the designs deviated far from the early sketches and wire frames. In many instances, depending on the section, the core did not remain intact.

GD2IM3(171) GD2: "I tried to fit in as much as possible. I sketched for 10-15 minutes and then got the design going."

GD2IM3(174) GD2: "When I design I am designing and coming up with fonts, content, and assets."

GD2IM3(175) GD2: "It becomes a mess in your head. You multitask and at times you are just getting it done."

GD2IM3(177) JB (12/29/13) First, sketching is important to GD2 even though it may be for a short time. In the design comp space, this is GD2 drawing from the wireframe that he created. The 10-15 minutes of sketching is a reflection-in-action space so GD2 can then get the design moving. The sketching phase moved GD2 to the design comp space.

A8IM1(55) JB (12/11/13) It is an interesting comment from A8 that “Every decision builds on every other decision.” When designing and reflecting-in-action in spaces, one space informs another space and this is how the design keeps moving forward. A8 confirms, “There are times that you have to make decisions and keep the project moving.”

GD1WJ7(257) "What if" in this stage is my least favorite thing to hear because we should be past the ideation and planning to the execution portion of the design for the desktop version.

GD1WJ7(258) JB (11/12/13) This is very interesting. “What ifs” at this stage are no good. It is now about execution. Ideation and planning are over. Exploration has turned to commitment at least in the mind of GD1. GD1 is now worried that the “what ifs” will hurt the developers.

Although reflection-in-action continued to move the design project forward toward implementation, participants deigned in uncertainty.

ID6IM1(63) ID6 explained that connection to Arab Springs could be people coming together for change by using social media.

ID6IM1(64) ID6 noted that she looked for literature on Arab Springs. With no literature found, she had some self-doubt that it could work. She explained that she wants to make the biggest impact and the Arab Springs model could do this.

ID6IM1(65) ID6: “I am still moving forward in some uncertainty. This is okay as I am forced to grow.”

ID6IM1(66) ID6 explained that it is so big and fascinating to have an uprising in change.

ID6IM1(67) ID6: “I am not sure if it will work but we will go with it.”

ID6IM1(68) JB: What will a design-based research project approach do to advance the design?

ID6IM1(69) ID6: “My first thought is that it gives me leeway with the product when it launches.”

ID6IM1(70) ID6 explained that she will see tweets and this will take pressure off her as she can revise.

ID6IM1(71) ID6 explained that a design-based research approach helps her.

ID6IM1(72) ID6: “I have to walk through uncertainty and design-based research means that I do not have to have the answers right away.”

ID7WJ1(7) The clock is ticking for Phase 2 of NHR training. I’m getting more nervous by the minute. I am not consciously thinking about the design process, I’m just designing as fast as I can and revising my design as more information becomes available.

ID7WJ1(8) JB (10/19/13) So, there is uncertainty here. Interesting, she is not consciously thinking about the design process. She is designing as fast as she can and revising her design as she receives more information. First, she is a designer. So, is it necessary to be conscious about the design process? Need ID7 to elaborate on this. Second, there is reflection-in-action as she revises as she receives more information. The circumstances are providing the context to reflect-in-action. Need ID7 to elaborate. Is this her getting more information which helps her understand more and then she makes changes? Gets more information and makes more changes.

ID7IM1(73) ID7 continues, “It is a very frustrating way to work. I am trying to hit deadlines, but I don’t know all the information. I keep pushing the design forward.”

ID7WJ5(149) I also know that the President’s announcement yesterday is going to have major impacts. We already had closed down all our old health insurance plans and created new Qualified Health Plans (QHPs) that had the required 10 Essential Health Benefits.

ID7WJ5(150) We’re probably going to have to pass out an addendum that we can just add to this phase of training and make major changes in Phase 3. I’m not really sure what’s happening yet, because I don’t know the company’s response to the situation.

ID7WJ5(151) JB (11/29/13) Talk about working in uncertainty.

ID7WJ5(152) Since the project keeps changing, we just keep implementing whatever we have at the time and moving forward the best that we can.

ID7WJ5(153) JB (11/29/13) It is all about reflection-in-action.

E3IM3(148) JB: Asked E3 if it is the uncertainty that keeps him going or is there just enough certainty to keep it going?

E3IM3(149) E3: “There was not ever enough uncertainty that I just threw my hands up.”

E3IM3(150) E3: “There was enough certainty to keep going.”

E3IM3(151) E3: “In the calibration world, there is not an option to throw your hands up.”

E3IM3(152) JB (11/27/13) This is interesting. E3 worked in uncertainty which from journal reflections and previous interviews drove his reflection-in-action. E3 had a lot of reflection-in-action. There is an interesting balance here. There was never too much uncertainty. There was always enough certainty to keep it going.

GD1IM3(329) JB (11/23/13) It is interesting that GD1 faced uncertainty throughout this design. She never really seemed to feel comfortable with it. GD1 understands that it is part of design, but often notes that the uncertainty created caused a lot of inefficiency. But, on the other hand, even though GD1 was always working in uncertainty, GD1 kept the design moving. When there was little to no direction or information, GD1 kept it moving. When specialties were changed late in the game, GD1 kept it moving forward.

GD1WJ1(61) With so many people commenting and no one knowing what was happening, I got stressed fast. Luckily, I had my supervisor to work through/with, because the Lead PM of that section had very conflicting ideas of how things should be from the Owner and other PMs.

GD1WJ1(62) JB (9/29/13) Frustration, stressed, confused... Working in uncertainty. Being uncomfortable. From this journal, these are positives in moving the design forward more than negatives. GD1 has not been stymied. She keeps moving. Need clarification on this.

GD1IM1(127) JB: I asked that even though GD1 noted in her week #1 journal that she gets frustrated she keeps moving forward.

GD1IM1(128) GD1: “I personally cannot just stop. This is where creativity really comes out.”

GD1IM1(129) GD1 continued that when she is at her most frustrated this helps her push over constraints. If people tell her no, she finds a way around.

RQ3 – What impact does the design’s problem-solution relationship have on the reflection-in-action process?

By receiving and gathering information and constraints, participants reflected-in-action on the problem-solution relationship and better understood the problems and solutions.

GD1WJ1(11) How is the design problem or opportunity leading to solutions? I’m not sure I am clear on this question, because all problems or questions lead to solutions/answers. The quality of those solutions is based on the information received/gathered, understanding of the project, its goals and constraints and working within those (will clarify this below).

GD2WJ6(100) My opportunity for solution development on this project was high, as I had the ability to absorb both the PMs notes and the clients words as recorded by the AMA meeting. More often than not I focused on those ‘omg’ moments clients expressed, which I described earlier on.

GD2WJ6(101) My opportunities were rather high as we had initial control over the wireframes.

GD2WJ6(102) JB (11/27/13) GD2 had a very unique opportunity to “absorb” the PM notes and the AMA recordings. This provided GD2 good, validated information to drive his wireframe designs which he says increased his opportunities for solution development as GD2 had initial control over the wireframe. His wireframe reflected the notes and recording.

E3IM1(60) JB: Wanted elaboration on E3’s journal reflection that adjusting thresholds is a discovery of what may be part of the problem. Are the possible solutions (adjusting the thresholds) defining the problem or pinpointing the problem? Is this the same thing? If not, what is the difference?

E3IM1(61) E3 explains that it is defining the problem. “I know the problem from a broad level. I have to get to the details to see what is causing the problem.” E3 explains that there is more than one way for the problem to occur. There are different reasons why something can happen. Thresholds help to filter out other things.

ID6WJ1(10) At a preliminary meeting one of the other team members of the project indicated that the Arab Spring idea might be something that we could look to here. I was able to do a little bit of research on ‘Arab Springs’ and it sounds like something that would be very difficult to replicate as this just emerged naturally and for a cause. So if my cause is bullying, but it is being replicated with 14-18 year old girls, I am not sure if that will work.

ID6WJ1(11) JB (10/14/13) So, here a potential solution will not work. Is the problem/opportunity defining that this solution will not work? Or, is the no-good solution better defining the problem/opportunity?

ID6WJ1(15) I think as I work toward figuring this problem out research has been a comfort to me.

ID6WJ1(16) JB (10/14/13) Interesting, right now the problem is not figured out. When will it be figured out? It is still evolving as ID6 researches solutions.

GD1WJ1(77-80) Looking back, I wish we would have done this in the beginning.

I would have known the constraints of the project.

I would have known the plan for building.

I could have come up with other design styles and ideas based on what we have. Meaning I could be just as inventive/creative, but also have everything sized right for the current site. As it stands now, I basically have to redo all I did... and I'm not even sure I would have styled things as I did with the sizes of the columns and other areas of the website that currently exists which I will be working with in. Wish we could have designed for reality first, and then was asked to make an altered version for phase two of their site. Think we would be further ahead with the project if we had.

GD1WJ1(81) JB (9/29/13) This is interesting. It appears here that the problem-solution have had to develop together. No one knew the problem and no one knew a solution. But, the early solutions have helped define the problem that maybe the homepage should include what it has now and then maybe there is a phase 2. How have each informed one another?

GD2IM3(179) Follow-up regarding the importance of constraints. What if I gave you six images to choose from?

GD2IM3(180) GD2: "So much easier. Now I am designing."

GD2IM3(181) GD2: "You have given me constraints. I have to use these. I can do it."

GD2IM3(182) GD2: "Typographically, when I don't have constraints I have to be more general. It has to fit everything."

GD2IM3(183) JB (12/29/13) This is very interesting. GD2 wants constraints. When he doesn't have constraints, he has to design with a broad brush. He cannot be too specific because the design has to be general enough, in this case, to accommodate all types of images.

GD2IM3(184) JB (12/29/13) But, if GD2 had specific images that would be used, he then would see the problem-solution coexisting. A specific image allows GD2 to possibly get rid of general text boxes and place text right on the image where it would allow. But, when he doesn't have a specific image to work with then he doesn't really know the problem and the solution has to be a catch-all. GD2 wants the problem-solution to co-exist as he moves the design forward. The image wasn't a thought in the wireframe space. But, then in the design comp space, it becomes an opportunity (problem). GD2 looked at the problem from a different perspective and this resulted in a bunch of opportunities as long as GD2 was held to specific images. But, he was not, so his opportunities weren't as many. He had to design not knowing what the images would be.

GD2IM3(185) GD2 explained on the current design, type is in a box. If the client would confirm that the current image is the final image, then the type could be on the blue sky.

GD2IM3(186) GD2 concluded that since he doesn't know the image he has to be more general with design so it fits all possible images.

GD2IM3(187) GD2: Designers work best when they have constraints."

GD2IM3(188) JB (12/29/13) This is reinforcement of what has been shared by other participants.

ID7WJ1(20) On Thursday, the workgroup lead called a meeting and listed all the topics that Business Readiness identified for Phase 2 training. We all went through the hundreds of sub-topics (similar to a learning objective level of information) to determine what information we

had, what we didn't have, when did we think we could get, who was responsible for making these decisions, can we push this to Phase 3, or is it essential to train by Phase 2. At least now we know what we don't know.

ID7WJ1(21) JB (10/19/13) This is what is happening. The solutions based on what information they have, what they don't have, when they can get it, who can make the decisions have better defined phase 2, and phase 3.

ID7WJ9(202) Most of our design problems were caused by constantly changing content. Last night we discussed how we are handling this issue:

ID7WJ9(203) We are keeping SharePoint log for questions that arise from training, that we don't know the answers too. We contact the workgroups to find out additional information. Trainers can check the log to find the answers to their questions. (Note that at this time there is no plan to have extra sessions to clarify this information. If we need clarifications, they will be included in Phase 3 training.)

ID7WJ9(204) We are keeping a log of revisions that need to be made to the training materials. The trainers can check the log to see the revisions. Although we are revising the word files, we are not republishing the training material.

ID7WJ9(209) JB (12/16/13) This is very interesting. ID7 reflected-in-action to take care of incomplete problems and problems that have no predetermined solution. ID7 has to work under the constraints that tracking and compliance are very important. Therefore, updating materials becomes very problematic because of version control. So, reflection-in-action, as a group, determined how to take care of this unique situation.

E3WJ1(16) Why this is occurring, I am not sure yet. It will take more discovery to figure that out. So potential solutions better define the problem because of basic trial and error. You try something to fix the problem, if it does not fix it, or cause some other problem, the original problem becomes better defined.

E3WJ1(17) JB (10/11/13) So, more discovery is needed. Interesting that E3 uses discovery. Why use discovery? E3 uses trial and error to find potential solutions that better define the problem.

ID4WJ1(16) Accordingly, the design methodology needs to be adaptable to the specific group. Each group to whom it's delivered has different dynamics, different needs and desires different outcomes. Thus, the basic integrity of the design must stay intact, but allow the facilitator leverage in how the design is delivered to the specific audience.

ID4WJ1(17) JB (11/12/13) So, the solution (design methodology) must be adaptable because the problem will change from dealer to dealer. There is problem-solution co-evolution here. As the facilitator, ID4 needs to be able to come up with other solutions as he sees different problems at the different dealerships.

ID6IM2(160) One item that comes up in the interview that was not discussed directly is the problem-solution co-evolution. ID6 is preparing the scaffolding tweets. She is coming up with solutions that will help define potential problems. She has a scaffold tweet (solution/partial solution) if the tweets go the wrong way. She has scaffold tweets if no one tweets.

ID7IM1(82) JB: ID7 reflected in a journal that she ignored the work group lead who told her to just use the M & B material. Elaborate on this. Was this an example of the problem and solution developing together?

ID7IM1(83) ID7: “Yes, this is what happened. The problem and the solution were developing together.”

As participants reflected-in-action, opportunities emerged from the problem-solution relationship.

GD1WJ1(82) Because someone may request for something to be done, and knowing why allows me to come up with ideas that can make it even better. For example, say the reason for a change is that a call to action is supposed to stand out more than something else. If I am just told to change text or some other request, without being told that, I miss out on the opportunity to choose a different font, change the color, add a highlight or box, or any other treatment which may achieve the true goal. GD2 made a similar point regarding knowing the constraints, knowing information, and/or knowing what is wanted results in opportunities. This important because: (1) opportunities will be discussed by multiple participants and (2) when you look at the problem from a different perspective opportunities happen.

GD1IM1(98) JB: In reflective journal week #1, GD1 discussed “Discovered complexities.” What did she mean by this?

GD1IM1(99) GD1 talked about the problem as the goals. There are constraints within the goals and when she receives more information, it throws in more complexities. She works to come up with solutions for the goals. The goals are what need to be address.

GD1IM1(100) JB (10/8/13) This is interesting. The problem is really goals. It is more opportunities than problems.

GD1IM1(110) GD1 explained when she is able to get information, “I can think of six different ways to do what you want.”

GD1IM1(111) JB (10/8/13) This is the Kees Dorst approach. New approaches to problems result in multiple opportunities.

GD1WJ4(177) Lastly, when designing the careers section page the PMs and I discovered how much the graphic map and content on the page changed the meaning of the page and the map itself. As a result, different map styles were created, as well as variations in placement and content to show various ways to highlight similar information. At one point in the process I wasn't sure how we would get the right messages represented, but the most fascinating thing to me was that I soon learned through communications with the PMs that there wasn't a 'right 100%' direction. Each solution represented different issues or needs the user may have or different approaches. In the end, it just will boil down to what the client would like to communicate... But I think there are some solid options and thoughts behind what we did. That interaction with the PMs actually helped invigorate and spark my excitement in the project, when I could have easily hit a creative wall otherwise. Especially cause we were able to give each other open feedback as we talked ideas. It was nice.

GD1WJ4(178) JB (10/22/13) This is very interesting. We are back to problem/solution co-evolution. As there was reflection with PMs, opportunities evolved (“...but the most fascinating

thing to me was that I soon learned through communications with the PMs that there wasn't a 'right 100%' direction."). GD1 continues, "Each solution represented different issues or needs the user may have or different approaches." Opportunities ended up bringing solid options. This keeps the design project moving.

GD2WJ1(29) Understanding the problem by asking questions creates more conditions that are in some way related to the problem. This makes the problem have more layers, and each time a new layer emerges, the problem becomes more clear as the consequences of that new layer, brought on by the questions become more apparent. So potential solutions help us define problems simply by trial and error I would wager.

GD2WJ1(30) JB (10/26/13) This is interesting. Need elaboration on a problem's layers. So, solutions can help define the layers and bring the layers out? This is what happened above, correct? Problem – the site is outdated... Ideas start... Problem layer – the message is not there... Idea make it more transparent, geared toward students (how students want to get information)... Problem layer – technically the site is not close to being mobile friendly... Idea make it so it is, now idea opportunities... (1) design is smart for a phone, (2) Immerse students and tell a story, (3) Take a "me-focused" approach. These ideas (is it really trial and error) get to the problem.

E3WJ1(10) The design opportunity is leading to solutions in that it provides opportunity to explore the calibration and truly flex what is possible and what is not possible. The opportunity of building a robust knock detection calibration first forces a plethora of data acquisition to understand the problem. Then of course there are more ways than one to skin a cat.

E3WJ1(11) JB (10/11/13) What is interesting here is that he begins to talk about opportunities and that opportunities result in, "...more than one way to skin a cat." Is E3 taking a different approach to the problem (Kees Dorst)?

E3IM1(53) JB: Wanted clarification on if E3 feels that he is dealing with problems or opportunities.

E3IM1(54) E3: "I guess lots of times it can be opportunities." E3 explains that with an engine in year 1, you do the best you can as you have to put something out there. As time goes on, you can improve the car and make it better.

E3IM1(55) E3: "These are opportunities to make it better."

E3IM1(56) JB (10/22/13) This is becoming more and more interesting. As the problem/solution co-evolve, there is this constant reference to opportunities. Solutions generate opportunities from what is defined as the problem. I wonder if this is due to the fact that E3 has to do his best to get something out there so now for the next year he is looking at opportunities to make it better. It is not that the problem has not been solved. It's that the solutions for year 1 create opportunities for year 2.

E3WJ6(120) Opportunities are a bit of a joke around the office because opportunities are just a politically correct way to say problem. But true opportunities do exist. Sometimes however there is hesitation to seize new opportunities because of the old "it it's not broken don't fix it." For example, the old way to enable cam phaser movement based off of engine RPM worked. But there was an opportunity to calibrate that function differently (and better). But because the

software change was not implemented properly, a problem was actually created! But true opportunities do make themselves available in general when brand new programs are being developed. This current project I'm working on however does not really lend itself to new opportunities. There are certainly calibrations that were developed before I came on the project that have the opportunity to be improved, but because of time and the averse culture to risk, those opportunities cannot be realized.

E3WJ6(121) JB (11/12/13) This is very interesting. Does it make a difference that E3 is a new calibration specialist? In other words, does it change that he is new and may see things differently? So, constraints can knock down opportunities. Is this okay? The design project has to be completed. Would chasing opportunities result in a design spiral? Are the problem-solution co-existing? Are opportunities helping to define the problem this late in the game?

E3IM3(160) JB: Asked if constraints knock down opportunities to improve the calibration.

E3IM3(161) E3: "Constraints can result in opportunities not realized."

E3IM3(162) E3 explained, for example, in a turbo charged engine the calibration is not ideal.

E3IM3(163) E3: "I have thoughts but there is too much risk in the program."

E4IM3(164) E3 noted that he would need drive time which is not possible so it cannot be realized.

E3IM3(165) Follow-up on if these then would be opportunities for 2015.

E3IM3(166) E3: "Sometimes, opportunities could be realized due to timing. So, it could be realized in 2015."

E3IM3(167) E3 explained that opportunities that are realized with more time and are risky could not be realized because of the risk.

E3IM3(168) E3: "Never take the leap for that risk."

E3IM3(169) JB (11/27/13) Risk is interesting here as a constraint. E3 has thoughts on how to improve the calibration for a turbo engine. With time this could be rolled out in 2015. But, the risk constraint supersedes the time constraint. It is an opportunity that cannot be realized.

E3IM4(208) E3: "I adjusted calibration and added spark."

E3IM4(209) E3 continued that this adjustment could add fuel economy in cold weather. For this model year, this was no good as it was too late. But, for the next model year it could help. Under cold temperatures, there may not be enough power so the exercise could help this.

E3IM4(210) E3: "This was a what if that I explored and down the line it could help."

E3IM4(211) JB (12/11/13) The idea that a what if may not come to fruition in a current model year due to the time constraint. However, "...down the line it could help." We have seen this with other participants. It is all about opportunities. E3 looks at the problem (spark and cold temperatures) from a different perspective and E3 sees an opportunity to improve fuel economy in cold temperatures. The time constraint for this model year does not kill the exploration and the opportunity to help down the line (the next model year).

ID4WJ1(18) Solutions are evolving as I learn about each audience prior to a training event. Initially, I have a conversation with the owner of the dealership. Then I have the dealership leadership team members each take a personality profile to determine the makeup of the personality styles of the leaders. I assess the report generated from the collective personality profiles. Based on my preliminary meeting with the dealer and personality profile reports I

determine how the design will need to be altered to allow the greatest training impact on the given dealership based on their specific needs.

ID4WJ1(19) JB (11/12/13) This is very interesting. So, there is a general goal (DISC training) that needs training. Training is designed around this. But, at each dealership, ID4 has to alter the design to fit what he gains from the preliminary meeting and personality profile. So, at each dealership, is ID4 seeing these opportunities and hence altering the design solution to meet these opportunities? Does ID4 sometimes have trouble figuring out the solution because there are so multiple opportunities? Is this a Kees Dorst situation where we could have gone 30 different ways?

ID4WJ6(108) Opportunities for solution development are abundant. Every group has a different complexion, environment, interest level, size, manager make-up, experience with DiSC, and varying needs, so solutions have to be crafted, on-the-spot to best overcome obstacles presented in each setting.

ID4WJ6(109) JB (12/16/13) This is interesting. It is very Kees Dorst. Opportunities allow you to go in different directions. What is key here is the ID4 has a unique situation each time he steps into a dealership. ID4 reflects-in-action. His give me something to react to is his group. ID4 understands his unique group and makes changes. These changes then can help him understand more his group. What is interesting is if Day 2 is unique as compared to Day 1. In other words, are the days totally separate in their uniqueness and uncertainty or are they very close to one another? Need elaboration here.

ID4IM2(151) JB (12/29/13) This is a good example of ID4 reflecting-in-action and drawing from his toolkit to facilitate an exercise that fits the unique situation. ID4 receives immediate feedback as he sees the participation. This is another example of the opportunity-solution developing together. In the Kees Dorst way, ID4 looks at his unique situations as opportunities, and not so much as problems. ID4 has his experience to draw from and he has his strong belief in the material. His experience shows him that if he gets through the workshops, the participants are going to find it valuable. There is an opportunity to go in different directions as long as ID4 holds true to the material.

ID6IM1(58) JB: For ID6 a solution for the instructional design is that it must use social media. The instructional design project does not define which one to use. I wanted follow-up to see if ID6 views that as a problem or opportunity.

ID6IM1(59) ID6 noted that it is really opportunities rather than a problem.

ID6IM1(60) ID6: "Twitter was actually the runner-up. In my research, Instagram was number one and Twitter was second."

ID6IM1(61) ID6: "I thought it would be better to use Twitter since the Girl Scouts already had Twitter."

ID6WJ10(171) I find that very helpful. I like to find someone who knows nothing about the project (usually my mom) and I just talk to her about what I am doing. What's important about this is not what my mom might say afterwards, but what I think of when I say it out loud. I equate it to people that wake up with an idea, that certainly happens to me sometimes, and you feel like you have to write it down quickly...well for me, talking, describing, saying things out

loud allows me to think about what I am doing from another perspective and will often provide a window or space into an idea that I didn't think of before.

ID6WJ10(172) JB (12/29/13) It is very interesting that ID6 uses the term "space". This is what reflection-in-action is all about. ID6 designs in spaces and each space helps the next space.

GD1IM2(218) JB: It appears that even later in the design project there is still the problem and solutions co-evolving. Explain if this is going on.

GD1IM2(219) GD1: "Everything has not been black and white. It has been refreshing to talk to people and have them open to different ways to do things. This is nice."

GD1IM2(220) GD1 explained that sometimes people are too rigid even though different ways would be better.

GD1IM2(234) GD1: "Often times, I can see something won't full solve the problem, but if the other people on my team are not open to listening or considering other options, it can often lead to major problems down the line when those issues then come up. It's very frustrating."

GD1IM2(235) JB (10/28/13) The problem-solution evolves. Remember, GD1 talked about how she can see 10 steps ahead. This co-evolution – other options to solve the problem – keeps the project moving forward.

GD2IM2(60) GD2: "A solution is a solution like a mathematical problem. An idea is just an idea. I think of ideas that will solve the problem."

GD2IM2(61) GD2 provided an example. An idea like a slide show can solve a problem for immediate engagement.

GD2IM2(62) GD2 continued, "Solution has a funny buzz today. It disturbs me. It's not the true meaning of the word. What does a graphic solution mean? I make graphic ideas that could be a solution."

GD2IM2(71) GD2 explained that when there is a problem process he will often inject a new idea into the process. He continued, "Structure disrupts the organic process."

GD2IM2(72) GD2: "Conversely, when structure is in place already, it can help make aware of the structures before the organic process."

GD2IM2(73) JB (11/24/13) GD2 comes up with new ideas for the "process". When there is too much structure, "injecting a new idea" can be disrupted. But, when there is structure in place it can help in awareness for ideas. Here is a very interesting take on the problem-solution (ideas for GD2) co-existing, co-evolving. For GD2, it appears that he doesn't think of it as co-evolution ("It is a stream of consciousness. This one leads to another thing."). Rather, it is just there all the time. The problem comes with structure so you know where the organic process (ideas) will begin. The organic process should not be disrupted by the structure.

GD5IM1(56) JB: Follow-up regarding what would have happened if she could not play with it.

GD5IM1(57) GD5: "I would have had to do a different design because the old logo was stacked."

GD5IM1(58) GD5 explained that an idea to change the logo helped validate that the site was outdated.

GD5IM1(59) JB (11/27/13) Here, the solution (update the logo) better defines the problem – an outdated site. If GD5 could not change the logo, the design would have been different.

E4IM4(205) JB: Asked E3 is the “what if” exercise is another way of discovering solutions and ideas that help define the problem?

E4IM4(206) E3: “What ifs help define the problem.”

E4IM4(207) E3 provided an example where on an earlier trip E3 had to deal with cold temperatures. E3 looked at tables to add or take out spark. The ‘what if’ was to add spark to see if the engine could take it.

As participants reflected-in-action, problems were uncovered from the problem-solution relationship.

GD1IM2(223) GD1 explained that more thinking (reflecting) can uncover more problems and then more solutions can come up.

GD1IM3(312) GD1 explained that things that she was told and then switched back to how it is in the current site caused her extra work.

GD1IM3(313) JB (11/23/13) Here is another example where the problem and solution developed together. GD1 designed for one way only to switch back to how it functions on the current site. There was co-evolution of the problem and solution.

GD1IM3(314) GD1 explained that if the technical constraints were clearer in the beginning she could have designed to these technical constraints. She noted that she then would not have needed to go back.

GD1IM3(315) JB (11/23/13) For GD1, the problem(s) was never defined. As she designed solutions, she came up against technical constraints that came about because of what she was designing. This then pushed her back to design from the current website functionality.

GD2WJ1(23) In this instance the ‘design problem’ is that the college’s homepage has no real hierarchy on its page, further it is not speaking to its target audience, instead it seems more focused on its own achievements rather than its prospects. Furthermore, the site looks dated, but this was only half of the problem. After speaking with the PM I came to understand that the college is a smaller, less overwhelmingly bureaucratic school. But instead of playing on this strength, they seem more focused on fabricating a reality where they are bigger. This begs the question, why, in a time when colleges are seen as big and fairly freedom-starve restrictive machines would a college want to fit in to the normal college scene? The new thing is to be small, focused, independent and passionate. This will get applications from prospects that would fit best at their college.

GD2WJ1(24) In this way the design problem has presented us with what was potentially another problem, a positioning/messaging problem. The intent seemed to be flat out lying, they wanted to lie. And that lead me to try to steer them elsewhere, towards reality and transparency.

GD2WJ1(25) JB (10/26/13) So, through reflection, begin to understand that the problem has another problem. And now, ideas (solutions?) lead to, “steer them elsewhere.”

GD2WJ1(26) On the more web/interface side of the spectrum, the dated nature of the site raised, among many others a question, what if it was not dated? But, what is not dated? Mobile is pretty new, so perhaps shifting the focus away from the traditional site to a more direct, mobile-friendly, quick and possibly smarter site would be better. But, how could we do that? Perhaps we could make it ideal for any teenager's cell phone? Further, perhaps it could be designed in a smart way, that got the teenager to the information they wanted almost immediately, without needing to scroll through lots and lots of detailed text. Even further, what if the content, while being less lengthy was immersive, maybe told a story? Kids are used to a very fast-paced life style, and they love TV and Dramas. Further they love to think about themselves, not with any malice of course, so perhaps a very 'me-focused' approach would work here. This 'me-focused' experience would work right alongside a school that prided itself on being smaller and more focused, in this way their messaging problems have influenced their technical problems.

GD2WJ1(27) JB (10/26/13) So here is the co-evolution of the problem-solution. This is really interesting. The messaging problem (a dated site) influences the technical problem (lack of a mobile site because it is dated). From this, the ideas (solutions?) start to evolve ("perhaps"). Now, GD2 has co-evolution – "This 'me-focused' experience (an idea/solution) would work right alongside a school that prided itself on being smaller and more focused (the school's issue), in this way their messaging problems have influenced their technical problems."

GD2IM2(75) GD2 explained that when he was reflecting on the "me" approach, "Each step was a layer with a problem. The main problem was we are not communicating. Okay, this can mean lots of things."

GD2IM2(76) GD2: "What are the layers of communicating and then have ideas for the layers."

GD2IM2(78) GD2 further explained that he can have a slide show to address an issue but the audience may not know how to operate a slide show. "How do we address this problem?"

GD2IM2(79) JB (11/24/13) Design is about dealing with the problems that come up. A solution may cause another problem to address. Problems can define solutions and solutions can define more problems.

E3WJ1(9) The design problem is to release an 80% spark/knock/dilution calibration for my engine. Within than design problem, there are smaller problems such as adjusting the knock detection calibration such that vehicles don't detect false knock during performance testing (0-60 mph runs, wide-open throttle runs) but at the same time, still detect real knock at an acceptable rate. This tends to be a double-edged sword. What gives you better knock detection tends to lead to more false knock and vice versa. Other little problems involve prepping a vehicle for an altitude development trip. This involves making sure all data acquisition equipment is working properly, which it was not.

E3WJ1(14) But as I adjust the thresholds, I see that some of the false knock events are unaffected because the signal-to-noise levels are too high. So I discover that part of the problem appears to be that the average signal calculation the controller performs seems to be incorrect for some reason.

E3WJ1(15) JB (10/11/13) So adjusting thresholds is looking for solutions. But, here by adjusting thresholds, there is a discovery of what may be part of the problem – "the average signal calculation the controller performs seems to be incorrect for some reason." Possible

solutions (adjusting thresholds) are defining or maybe, more appropriately, pinpointing the problem. E3 already noted that it is a back and forth.

ID6WJ6(92) Here though what other modes of communication are engaging on twitter. So if I send a link to a YouTube video, will the campers open and watch it, can I even track that? If I send out a picture of someone in a bullying situation, will campers respond to that more? As I am thinking these ideas, I have run into a copyright concern. I didn't go into this design thinking that I would be hiring students to act in a short film on bullying or that I would be taking pictures of bullying situations. I figured I would find these supportive materials online for free. Well I am learning that is not so much the case.

ID6WJ6(93) JB (11/29/13) Very interesting unanticipated problem that has come up.

ID6IM2(161) ID6 does not know if girls will learn about bullying via tweets or what are the best tweets to learn from. The problems that arise will define the solutions and the solutions will help define the problems. The problem-solution evolves together.

ID7WJ6(158) We will probably continue with this approach for the rest of our training. In fact, I don't see this training has having a finite end date for quite a while. As things continue to change, we will continually have to add more training events.

ID7WJ6(159) JB (11/29/13) Interesting that this training does not have a definite end date. Interesting that the unanticipated problems drove more solutions. This was late in the game. The problems and the solutions evolved together. The Phase 3 solution is helping to define the problem – this is going to be ongoing for awhile. The fact that the workgroups could not finish developing new processes and procedures defined the solutions and the solutions (the three bullet points) to the solutions.

ID7WJ1(27) We could not have one long workbook. We were going to have to split the workbook into sections that corresponded to each section of the underwriting manual. As we introduced each section of the workbook, we would direct the trainees to a specific section of the underwriting manual, thereby focusing their search. Also, we included a trainer debrief after each section, rather than at the end. This will allow trainees to make sure that all their questions regarding each section of the manual are answered before moving to the next section.

ID7WJ1(28) This approach was just too long and boring!!! I decided to only cover about half the information as a workbook. The rest of the information is covered through a lecture/discussion format.

ID7WJ1(29) JB (10/19/13) Reflection-in-action with the assistant resulted in changes to the design. The assistant asked questions and when ID7 could not determine what the assistant was asking, ID7 searched the manual. ID7 began to understand that the manual did not easily provide the information. She took stock in the situation and changed two things in the design.

RQ4 – What impact does a designer drawing from a repertoire of precedents inside and outside the project have on the reflection-in-action process.

Participants drew from many things and experiences. The literature notes that designers may draw from anything and everything. GD2 provided examples of how true this is. E8 drew on, “...some innate sense of symmetry, pattern, and beauty...”

GD2WJ2(31) I drew inspiration from imagery I found at <http://designspiration.com> and also from current trends as reflected in album covers, like these: <http://www.culturebully.com/wp-content/uploads/2011/01/CUT-COPY-ZONOSCOPE-COVER.jpg>
<http://cdn.pitchfork.com/news/43482/80235a61.jpg>

GD2WJ2(32) Mostly indie music and anything considered hip. I noticed that popular artists are starting to embrace this trend in aesthetics. It was also just a gamble based on this line of reasoning:

GD2WJ2(33) “The definition of cool is often determined or at least influenced by what the prior generation of youth considered hip” So indie music is all the rage with college kids, or at least my generation, so I’m taking a gamble that the design trends that we see on designspiration will reach the youth looking to move into college.

GD2WJ2(34) JB (10/28/13) This is very interesting. GD2 has gone outside of the web world but staying true to his belief that the design should be very focused on the student. He had come up with solutions based on the “me-focused” approach. Now, his ideas are moving into design. He is providing something to react to. Elaborate on “gamble”. Why is this a gamble? GD2 has spent time thinking about the problem-solution. He has reflected on it. Has the problem not evolved enough? Are the solutions not really solutions, but rather just ideas. What is the gamble?

GD2WJ2(37) I also drew inspiration as always from Swiss design and minimalism, because I feel it is one of the best ways to preserve legibility and clarity of the information being presented. So could be a personal bias, I admit.

GD2WJ2(39) I also drew from the ‘individualistic’ approach of the current generation, ‘the me factor’, as illustrated by Facebook and Twitter. Once again a risk.

GD2WJ2(40) JB (10/28/13) GD2 draws from a lot of stuff. Themes, what is cool, minimalism, what is considered hip. GD2 is drawing on specific things outside the design for this design project. These things fit with his early solution ideas. Is it safe to say that depending on the design project, he would draw on different things outside of the project?

E4WJ2(30) In addition, I draw on some innate sense of symmetry, pattern, and beauty when creating a calibration.

E4WJ2(31) JB (10/14/13) This is interesting. It is like a visual that really isn’t a visual. This is pulling from outside of the design and then bringing it into the design and pulling from it.

Drawing on things outside of the design project validated design direction, guided the design, and provided “what ifs” during reflection-in-action.

GD1WJ1(42) Research - Used the information from the research I did earlier to determine the best strategy for users to find what they need fast and also learn more as they wanted to.

GD1WJ1(43) JB (9/29/13) Repertoire of precedents. Something to draw from right from the get go, even though this was a little constraints directive, go and do it. Still had to draw from something.

GD1IM1(117) JB: I asked GD1 to explain what she draws from outside of the design.

GD1IM1(118) GD1: “I look to other sites to understand what is being done; not to copy what they are doing; what are people using, and what is happening in other markets.”

GD1IM1(119) GD1 continued that she gets an understanding of what is happening inside and outside of the industry. She finds experiences on how things are done. She looks at what is happening outside of the design.

GD1IM1(120) GD1: “This is another way to evaluate in that circle.”

GD1WJ2(148) The outside influences I draw on are from the benchmarking I did on medical websites, colleges and university websites, and commercial websites that contain many brands (like Comcast, GM, P&G, etc..) While reviewing the sites, I evaluated the amount of content they have, the number of brands or subgroups they have, how they direct users to information, the functionality offered, and their mobile strategy/approach (if applicable) and its similarities and differences to the desktop version. The reason for selecting the sites to review, I did is that they are all award winners or leaders in their industries. The medical websites were primarily to determine how other hospitals and medical organizations handle their content, what users experience when visiting them, and how up to date they are with current web trends. The schools/universities were selected because they also have many groups and sections that they oversee (such as different departments and schools within the college/university).

GD1WJ2(149) JB (10/11/13) The sites that GD1 drew from were chosen for a reason. Medical sites to see if they are doing anything different. University sites because they have a similarity in that they are organizing a lot of information and there are colleges within the universities like specialties within a hospital. Commercial sites tend to be forward thinking, customer focused and driven to market themselves.

GD1WJ2(151) In researching about these industries and comparing various sites on various screens and devices, I was able to see how people took short cuts, or didn't, what strategies people had and decisions they made about the content and functionality of the websites. This helped me to think outside of the medical bubble and think bigger, but also realistically. I noticed things that users would like and even expect when visiting other websites (not just medical ones).

GD1WJ2(152) JB (10/11/13) Interesting...GD1 appears to feel that she has gone outside of the, “medical bubble and think bigger, but also realistically.” But, she has stayed within the web. As a follow-up, does she go out and beyond the web. This is outside of the design (university and commercial), but still in this broader category of web.

GD1IM2(190) GD1: “A lot of the design style is more flat similar to Google, Microsoft, and Comcast sites.” GD1 explained that she has pulled from corporate sites where simplicity is important. An example is the icons – very simple.

GD1IM2(191) GD1 explained that even without looking at sites outside of the “medical bubble”.

GD1IM2(192) GD1: “I may have gone this way without these.”

GD1IM2(193) GD1 explained that she has designed a simple approach from the very beginning.

GD1IM2(194) JB (10/28/13) So, GD1 did go outside the “medical bubble”, but what she started with when she was told to “just design” has remained throughout the design. A simple approach.

GD5WJ1(5) As with most of the website design comps I've done for the past few months, I've kept with the full width image slider appearance. I personally enjoy websites that utilize full width imagery because it gives the appearance of richness and professionalism whether it is true or not of the actual company. I chose to remove the color from that main slider image to solidify an overall duotone kind of look for the entire site. With a single rich darker green and gentle muted neutral creams, I think the contrast help the viewer's direction on where to go once they start scrolling below the fold.

GD5WJ1(6) JB (11/10/13) So, GD5 draws from design comps that she has designed in the past few months. Interesting that she states, “I personally enjoy websites...” How much does your personal “enjoyment” come into play in the design?

GD5IM1(42) JB: Wanted GD5 to elaborate on drawing from outside and inside the design project.

GD5IM1(43) GD5: “I did 15 minutes of my own benchmarking. There have been lawyer websites with a younger, fresher approach.”

GD5IM1(44) GD5: “I have done this a couple of times for lawyer sites.”

ID4WJ2(24) I've also used powerful statistics in past initiatives to make strong points. I'm incorporating some of those statistics into the design. For instance, if a customer leaves your dealership and has service done elsewhere, 90 percent of them won't return to your dealership. I've also developed scenarios, in past initiatives, to illustrate the value of one lifetime customer to a dealership. I intend to map out an “on-the-fly” visual reference, perhaps on a flipchart, of the value of one customer to the particular dealership.

ID4WJ2(25) JB (11/27/13) This is interesting. ID4 pulls from statistics and lifetime customer scenarios. He pulls from things that he knows. He is pulling from things that he is confident in and has seen succeed. Validate this.

ID6WJ4(35) The first thing that came to mind when I read this was that design with social media is new to me. So I am working on figuring out how many tweets to prepare to send out to the campers. On the one hand, I want the study to be successful of course, but on the other hand I do not want to overload them. In this situation I am thinking back to literature and to my own experience. I think what I am going to do to solve this situation is to have 5 tweets be the ‘normal’ amount of tweets that will go out during the day... then I will prepare additional tweets to be used as scaffolding tweets. Or I guess you could say, as needed tweets. I think the best way to accomplish this would be to schedule a daily meeting with the design team to determine what tweets have been retweeted or sent out by campers and then decide if the campers are in the right direction so that the decision could be made to ‘tweet’ the supportive or scaffolding tweets.

ID6WJ4(36) JB (11/10/13) So, the uncertain situation is that social media is new to ID6. She draws on the literature and her own experience to understand and then make changes to “normal” amount of tweets and the “scaffolding” tweets. So, ID6 has to design with some flexibility as the number of scaffolding tweets will be determined on the fly. Interesting. Get validation on this.

ID7WJ2(46) Since I always have to design quickly and without having all the information available, I use a variation of the ADDIE process and continually visit and revisit any step of the model in any sequence that I find necessary. As state by Cennamo & Kalk in Real World Instructional Design (2005), “Where traditional instructional design models include discrete stages for Analysis, Design, Development, and Evaluation activities, we find that most projects do not unfold in a linear fashion. Instead, instructional designers refine their understanding of learners, outcomes, assessment, activities, and evaluation throughout the design process. This process of development aligns with the rapid prototyping models “where you move in iterative cycles from a vaguely defined vision to a concrete product...” (p.7).

ID7WJ2(47) Thank goodness for this process. I originally started with about 15 different topics that I needed to include in the design. I have since dropped several topics due to lack of content and have added a few others as more information became available.

ID7WJ2(48) JB (10/28/13) This is very interesting. ID7 draws on a variation of the ADDIE process. She has taken the ADDIE process and combined it with a rapid prototype variation presented by Cennamo and Kalk. She is thankful for this process as it is helping her design.

GD2IM2(112) GD2: “You can learn things from another project. Technology changes.”

GD2IM2(113) GD2: “It has not ended. My direct design ended, but indirectly my knowledge is still going.”

GD2IM2(114) JB (11/27/13) This is very interesting. Even though GD2 is not directly working on the college homepage design comp, GD2 is still reflecting-in-action on the college homepage as he designs other projects. GD2 reflects-in-action as he reflects on other projects. The actual work has stalled.

GD2IM2(115) JB (11/27/13) The actual work has stalled to no fault of GD2. But, he is still designing. He is still moving the design forward because he is keeping it fresh in his mind. It is on his design radar.

GD2IM2(123) GD2: “During the wait period, an idea could be presented.”

GD2IM2(124) GD2 mentioned that he is currently working on a design that, “...could tie into the college site.”

GD2IM2(125) JB (11/27/13) Again, GD2 reflects-in-action about the college site design as he designs another project. If something comes up, he will document it. To directly move forward, GD2 needs the client to approve GD2’s direction.

ID6WJ6(90) *To me and in the instruction field words are not all that attractive I would say engaging, but the concept of twitter (which is mainly 140 character tweets all words) is in itself ‘engaging’ to participants, so the instructional design rules that I know of with motivation, message design, engagement etc. are not so applicable here.

ID6WJ6(91) JB (11/29/13) This is interesting. So, what ID6 would draw on, instructional design rules, do not apply. As a designer, what ID6 would naturally draw from will not work. Confirm this.

ID6WJ8(102) One way that I used any kind of drawing would be to try to image what any or every tweet that might sent to students would look on their side when they receive it. This is important as Message Design literature suggests that if it's too much to read, too wordy, etc., the participants are less likely to read it all.

ID6WJ8(103) JB (11/29/13) Earlier ID6 mentioned that it was difficult to draw on instructional design principles. Here, she is able to draw on message design. Need elaboration here.

Drawing on things inside of the design project informed what could and couldn't be done, supported the design purpose, and guided the design during reflection-in-action.

GD1WJ2(154) Inside design influences I draw on now are my original web comps and goals. I compare the much more simplified goals we have now to the larger ones I have. So while designing the newer stuff, I ask how I can incorporate the most of what I learned, planned and hoped for in the original, into this new way. Already there have been some issues, but I am rolling with any changes which occur to try to make things work for everyone. The interesting thing to me is that, I would have probably had the same style and ideas in my head from the research I did before hand, even if I had not done the design comps.

GD1WJ2(155) JB (10/11/13) So, early comps are not in vain. They visualize the, "...more simplified goals." Now, with larger goals, what was, "...planned and hoped for in the original..." was used in the newer comps. What is interesting is that she believes that she would have ended up in the same place if she had not done the earlier comps. She would have used what she drew on from the "outside" comps.

GD1WJ2(156) I have also been pulling a lot from work with a developer on the project (Paul). He and I have met several times to discuss how things are built on the website and to run ideas past him. This has proven invaluable because it has allowed me to see where I can push lines and where I can't.

GD1WJ2(157) JB (10/11/13) This is interesting. Inside the project, GD1 drew on conversations with the developer who provided insight in what could and could not be done. So, there is reflection-in-action with the developer. Here is what I am thinking, can I push the line or not. It is the developer's know-how on what it can do that she draws on. But, she is taking stock in what she is doing. Drawing from what the developer gives her is reflection-in-action. GD1 reflects on what she has done at this point. She draws on what the developer tells her as it relates can her design at that time function in the way she has designed.

GD1WJ2(158) Also, he has been able to say that we can't do something one way because of a technical constraint, to which I can then ask about if it would work still if I changed it in some other way.

GD1WJ2(159) JB (10/11/13) So, here is the reflection-in-action. The designer begins to change from what the developers says about what she has designed.

GD1WJ2(161) I would also add the wireframes I made as a reference and the videos that are a part of their new branding. The print branding that has been created doesn't fully fit the needs of what we are doing. But the videos and write ups on messaging shows what they are aiming for at least, so that is continually being kept in mind.

GD1WJ2(162) JB (10/11/13) Again, drawing on things inside the design – early wireframes and videos explaining the new branding.

GD1IM2(198) GD1 explained that initial thoughts in early comps were scrapped because of Drupal, how things are set up in Drupal, and the deadlines.

GD1IM2(200) JB: What has impacted the design more drawing from inside or outside?

GD1IM2(202) GD1: “I got feedback and designs got approved. What got approved spearheads what we are now designing.”

GD1IM2(203) GD1: “You approved this so this one look looks like this. I am drawing on what I have done.”

GD2WJ3(52) Further, I created mock content based around their feedback in the AMA, as to enforce their ideas and to try to get them excited about implementing certain concepts that were in the current scope. A copywriter could have done this part, but with the companies limited time and resources I decided to try to develop something myself, in an ideal world I would have worked with a copywriter on this.

GD2WJ3(53) JB (11/5/13) Interesting. GD2 draws from the AMA which is part of the design process. GD2 drawing from inside the design project.

GD2IM1(90) GD2 explained that in the AMA, one woman wanted to down play athletes and athletics, but the dean did not want to. GD2 continued, “The back and forth helped me. The dynamic conflict showed me that there was give and pull so they could meet in the middle.”

GD2IM1(91) GD2 further explained from the AMA he could pick up on people’s excitement. For example, the AMA participants were open to a different way to have students pick their major on the site. GD2 continued, “You cannot pick this up in written words. The voices emphasized ideas.”

GD2IM1(92) JB (11/24/13) GD2 draws on a recorded AMA session. This is inside the design. It was how people interacted with one another which gave him insight into what he could and could not do. He was able to pick up on the subtlety of “give and pull” so there could be a meeting in the middle.

GD5IM1(45) JB: Follow-up on drawing from early sketches.

GD5IM1(46) GD5 explained that she does not sketch.

GD5IM1(47) GD5: “I can already see where it is going in my head so I start.”

GD5IM1(48) GD5 stated that for this design she wanted to keep it current information and highlight a few things.

E3WJ2(34) When I look at a surface, I want it to be smooth, and when it’s not, I delve into the calibration to see if I did something wrong, or if I can change something. I guess you can consider this as drawing on an image from within the design project...

E3WJ2(35) JB (10/14/13) There is definitely a transition happening here. Pulling from the outside moves the inside and then pulling from the inside.

E3WJ2(36) Inside the design experience I draw from previous calibrations. So any calibration at this point starts from a previous calibration and essentially gets updated as things change on the engine or new learnings occur.

E3WJ2(37) JB (10/14/13) Would E3 consider this working within frames where each frame affects the next frame? Reflection-in-action occurs – more learning and then updates as things change. Would like confirmation that changes help understanding and understanding results in more updates and changes?

E3WJ2(40) We also have procedures and examples of what the cal should look like, give or take. So obviously I look at procedures when I am developing a calibration, because they tell me what to do and give me guidance.

A8WJ1(11) Every design decision has pros and cons to it. I review the pros and cons and make design decisions with the input of the client, code criteria, industry standards, personal experience. These decisions are ultimately done to achieve the overall objective which is to protect the inside of a facility from the weather. Each decision affects the next design problem. They are woven together or stacked like building blocks. An example of this might be the wind calculation for Tuscaloosa indicated wind speeds of 100 mph . This affects the uplift pressures and indicates the number of insulation fasteners required.

A8WJ1(12) JB (11/29/13) A8 notes, “Each decision (solution) affect the next design problem.” A8 sees these as, “woven together.” The problem (wind speeds of 100 mph in Tuscaloosa) affects the solution (number of insulation fasteners required).

A8WJ1(13) JB (11/29/13) A8 draws on a lot to make decisions. Is this because every design decision has pros and cons? Need elaboration here.

A8WJ2(16) Reflecting on my inside experience I think an example might be at the same site Tuscaloosa we have existing light weight insulating concrete over the existing metal deck. Typically we would remove everything down to the existing decking, and start our new roof assembly. On this location the light weight concrete is not practical to remove. We will leave the lightweight insulating material in place and fasten through it into the existing metal deck.

A8WJ2(17) JB (11/29/13) A8 draws from the existing structure. Although it is not typical, A8 will fasten through the lightweight insulating material. A8 draws on the fact that it is not practical to remove the lightweight concrete. Is this A8 drawing on his experience or is this input from others?

ID4WJ2(26) As for inside design experiences and images, I will use the following:

- a completed sample management DiSC profile
- actual completed DiSC reports for each participant (they will each have completed the DiSC assessment prior to the training event)
- a cumulative DiSC report which combines the results from all leadership team members’ Disc profiles, to be used to discuss the overall DiSC profile characteristics of the particular dealership’s leadership team. (i.e. maybe there are six members of the leadership team, two have “D” behavioral styles, 2 have “i” styles, and 1 has an “S” style and one has a “C” style.) We will use the report to discuss the team’s strengths and areas of opportunity

ID4WJ2(27) --videos to illustrate the various characteristics of DiSC

ID4WJ2(28) --Hand outs which describe the strengths and areas for improvement for each behavioral style

ID4WJ2(29) JB (11/27/13) ID4 has a rather unique situation. As he designs his facilitation he has all this information that impact the design. This is another example of how information is so vital to the participants. Like GD5 summed up the more information the better. For ID4 the results of the DiSC profile dictate the facilitation design. So, in essence, no two facilitations would ever be the same.

ID4IM2(163) JB: Asked ID4 to validate that if he doesn't have experience he always has something to draw from (DiSC, environment, class size, etc.).

ID4IM2(164) ID4: "Yes, that it true."

ID4IM2(165) ID4: "For the dealership in New Jersey, if I didn't find materials this would have been bad."

ID4IM2(166) ID4: "Videos are key. If I didn't have these it would be really bad."

ID6WJ2(27) So one of the ideas that came to mind really quickly with this project is the idea of trying to replicate the 'Arab Spring' situation overseas. I have been able to do some research on the subject and found that Twitter and Facebook were the most used social media to get organized and to get the word out about major meetings and events for the cause. I need to research Twitter, Facebook & Instagram or even Vine to find out what our learners are using.

My guess is Instagram, but even if that's the case I will still need to meet with the research team to make a final decision on what social media to use. We have a meeting coming up so once that happens, I will know what media I am moving forward with and can really begin to design. At first glance I am thinking of tweeting out a problem to the campers and having them work together over a social media to solve it or discuss it. Not sure though. This is somewhat difficult as I am not currently using any social media except Facebook and even then my participation is limited. I am going to explore all these media on a personal level this week as well.

ID6WJ2(28) JB (10/26/13) So early on, ID6 is drawing on the fact that social media is part of this design. She just doesn't know what type of social media it will be. A constraint is coming up again...ID6 is not wired to all the different social media. She is going to explore these social media. This will probably develop a bit more as she moves forward. Once she has a good feel of all the social media platforms, she may draw from these to validate that she is designing with the right social media platform. This will be interesting to see.

ID7WJ2(55) My prior knowledge of learner characteristics is driving my design. Since this is an implementation, trainees are expected to have a level of prerequisite knowledge. I have to identify what they already know, what is changing due to NHR, how this affects their job functions, and what they now need to know to do their job. Gap analysis is crucial to my design. In fact, as I uncover more detail, I am constantly questioning the workgroups, revising my understanding of the problems, and revising my design.

ID7WJ2(56) JB (10/28/13) ID7 draws on gap analysis and learner characteristics which in a traditional instructional design process happen early in the design process. Drawing on gap analysis has ID7 constantly asking questions to the work groups as she is designing.

ID7WJ2(57) I am also leveraging everything that I possibly can to complete this project by the deadline:

ID7WJ2(58) I am using pre-formatted templates for developing materials.

Participants drew on their own experiences. Drawing on experience provided design context and made uncertainty a bit more certain during reflection-in-action.

E4WJ2(23) I generally draw on my past engineering roles as a Product Line Combustion Engineer. In that role, I gained considerable knowledge in terms of fundamental engine combustion. That includes the effect of spark timing on engine performance and the mechanisms with which knock occur. Two-thirds of my current role as a calibration specialist involve spark calibration and knock calibration. So I have a firm understanding of spark and knock and just need to become well versed in calibration itself and not the fundamentals of spark and knock. So when I am developing a calibration, I first imagine what I want the engine to do and how I want it to respond under certain conditions.

E4WJ2(24) JB (10/14/13) This is interesting. Love the term imagine.

A8WJ2(14) Reflecting on my outside experience I think example might be which roof membrane we select at a particular site. For Tuscaloosa we are in zone four mandating a reflective membrane. My past experience tells me that giving the amount of mechanical equipment and foot traffic that this roof might see we will need a multi ply membrane rather than a single ply membrane. Thicker being stronger and more puncture resistant. This roof is perfect for a two ply modified asphalt membrane with a reflective coating.

A8WJ2(15) JB (11/29/13) A8 draws from past experiences. Follow-up for A8: Would a single ply membrane satisfy the requirements but A8's experience leads him to the multi ply membrane?

ID4WJ2(22) Outside experience/images I draw from for the dealership training process include previous knowledge I've gained from working with other clients on previous "customer experience" initiatives. For instance, in a previous training I asked participants to imagine what it would be like to be their customers and how those customers might feel being served by the participant. I want to incorporate that imaging process in the dealership design.

ID4WJ2(23) JB (11/27/13) ID4 pulls from his experiences.

ID4IM1(78) JB: Asked ID4 since he pulls from things that he knows, will he pull from this experience in the future?

ID4IM1(79) ID4: "Absolutely, I will pull from this experience."

ID4IM2(167) ID4: "Experience is important too."

ID4IM2(168) ID4 explained that people realize that the training is valuable.

ID4IM2(169) JB (12/29/13) This is interesting. If it is a unique situation (ID4 has never experienced it), then ID4 draws from the materials and the DiSC framework. ID4 moves forward because he has experience and/or the DiSC materials. ID4's reliance on experience is a bit like A8's reliance on experience. In both cases, ID4 and A8 know where the holes are. They know what can happen. By reflecting-in-action and understanding the unique situation, ID4 and A8 can

go to their designer toolkit and make changes. Oftentimes, the solutions here are based on opportunities rather than problems. ID4 is very good at seeing the opportunities – sitting around the kitchen table, two people chatting, real conversations with customers, etc.

ID6WJ2(23) I have been thinking about the general concept of Girl Scouts over the past week. I used to be a Girl Scout and I have fond memories of the meetings I used to go to and the projects we worked on. I remember most specifically having fun and enjoying myself. I also think about going to Girl Scout camp which was not as much fun. I just remember being really hot and bugs everywhere. I don't remember any fun parts just the 'bad' parts of it. In addition to this, I have another member of our team who has vividly horrible memories of being in Girl Scout camp, I certainly was thinking about this as I was working on the project.

ID6WJ2(24) JB (10/26/13) This is interesting. ID6 has had both good and not so good experiences as a GS. It provides context for her. She is drawing on memories of being a GS. Remember Starck drew on his love of science fiction and retro rocket ships as a child.

ID6WJ2(25) Another image that came to me right away was thinking about a time in middle school where I had a bullying experience. At the time I did not define the moment as bullying, and just thought it was “girls being girls”. In comparison to what girls/kids have experienced today I think my experience was minimal, but it’s still important because it reminded me how sensitive and important the issue of bullying is. Remembering my own sensitive feelings at that same age with the same topic constantly encouraged me to be very thoughtful about moving forward with this issue.

ID6WJ2(26) JB (10/26/13) Very interesting. “...but it’s still important because it reminded me how sensitive and important the issue of bullying is.” Drawing on this bully situation, she remembers her own sensitive feelings at that same age and this is encouraging her to be very thoughtful about moving forward with this topic.

ID7WJ2(59) I am revising previously used accelerated/active learning activities so that I don’t have to spend time trying to come up with new and creative ways to present/review the information. Since we just completed Phase 1 of NHR training, I asked one of the trainers for feedback regarding which activities worked well and which didn’t.

ID7WJ2(60) JB (10/28/13) This is very interesting. With a looming deadline, ID7 draws on previous templates and previous accelerated/active learning activities. This is almost drawing both from outside and inside the design experience. I would be interested to see if ID7 still sees this as part of the design or is it “cheating” a bit. Is this being efficient and effective or is it taking the easy way out? Is this her design tool box to draw from? Need follow-up here.

ID7IM1(69) JB: Elaborate on your design process. Are you consciously thinking about the design process?

ID7IM1(70) ID7 states, “I don’t know. On the one hand, no. I am throwing things so fast I am not following any process. It is not important. On the other hand, I am following the basic rules that I have internalized.”

ID7IM1(72) ID7 continues “At some point, I had to follow some process. What do I really need to know? I have to internalize enough about instructional design so I can pull pieces together that I need.”

E3WJ9(193) This problem is concerning because SPI is not a regularly occurring phenomenon and needs to be induced on the engine, which is not simple. So I am at the mercy of a “chance” occurrence, occurring 29 more times. Honestly, looking at data for 30 events is just a feel good number on past experience. But really this is a level of confidence situation. The more events I have recorded data for, the more confidence I have in the algo I develop from that data.

E3WJ9(194) JB (12/2/13) To the bitter end, E3 is still reflecting-in-action. Inducing SPI, which we saw in earlier journal and interview meetings, is reflection-in-action. A unique and uncertain situation that once understood changes are made to better understand and then make more changes to try to induce the SPI.

GD2IM1(81) GD2: “The gamble is what is cool and hip changes all the time.” “By the time is comes out, it may not resonate. But this may be okay. There may be a residual audience like older people who like it and the younger audience follows what the older audience likes.”

GD2IM1(82) GD2 explained that he moved forward with the gamble because the PM expressed that the client was open and didn’t want to be conservative. Also, there was no time to get data. GD2 had to make a decision. He based it on life experience that it would resonate.

GD2IM1(83) GD2: “It was a guess. It is intuitive like someone gambling. I am just going to pull the handle on the slot and just do it.”

GD2IM1(84) GD2: “You have to be comfortable to take risks.” The payoff can be huge and it takes risks to get great results.”

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ABSTRACT**EFFECTS OF INTERDISCIPLINARY DESIGNERS REFLECTING-IN-ACTION
DURING DESIGN**

by

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As a specific type of reflective practice, reflection-in-action emphasizes that unique and uncertain situations are understood through attempts to change them, and changed through the attempts to understand the situations (Schön, 1983). The purpose of this interdisciplinary research was to study reflection-in-action regarding three aspects of design activity (content, context, and process). The study addressed four research questions: (a) what is the impact of reflection-in-action on evaluation processes while a design is developing and not yet complete, (b) what effect does reflection-in-action have on keeping a design project moving forward toward implementation, (c) what impact does the design's problem-solution relationship have on the reflection-in-action process, and (d) what impact does a designer drawing from a repertoire of precedents inside and outside the project have on the reflection-in-action process?

The phenomenological research design studied reflection-in-action using a qualitative approach and used a purposive convenience sample of eight participants designing real projects in their design environments. Using five data collection methods: (a) interviews (b) participant reflective journals, (c) design project timeline, (d) project artifact analysis, and (e) a field journal,

data were collected and trustworthiness was established through credibility, transferability, dependability, and confirmability. A constant comparison method was used to compare information units applicable to categories and to integrate properties of categories.

For each research question, three to five themes emerged. Interesting and compelling themes that have implications for instructional design included when participants reflected-in-action, they took stock in and reacted to external representations, which were rich in context, information, and constraints. Participants interacted with information and a lack of information, which kept the design project moving forward. Participants moved the design forward toward implementation by turning “what ifs” to design decisions. Through receiving and gathering information and working with constraints, participants better understood the problem-solution relationship. Drawing from outside of the design validated design direction, guided the design, and provided “what ifs”. Drawing from inside the design informed what could and could not be done, supported the design purpose, and guided the design. Drawing on participants’ experience provided design context and made uncertainty more certain.

AUTOBIOGRAPHICAL STATEMENT

As a senior account manager with a metro-Detroit web development company that focuses on e-learning among other digital solutions and as an instructional design lecturer at Wayne State University (Detroit, MI) and Oakland University (Rochester, MI), John Baaki has interests in both instructional design and human performance improvement. Specifically, he is interested in how reflecting-in-action affects instructional and human performance improvement design. He is also interested in persona discovery and how it impacts the development of instructional design and performance improvement interventions. John is a big fan of Benjamin Bloom's Taxonomy of Educational Objectives and is interested in the impact of higher levels of thinking in decision making. He enjoys exploring instructional design as design thinking. Questions that intrigue John include, "What can we learn from designers in architecture, engineering, and graphic design?" and "How do we become better designers?"