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Reflection and Professional Identity Development in Design Education

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Abstract: Design thinking locates the designer as the arbiter of the design space, personally responsible for managing uncertainty, leveraging failures, and gaining insight through reflection to maintain momentum and deliver meaningful design outcomes. As design education becomes more closely aligned with design thinking, the field will need to shift its understanding of the role of the designer and support students in developing professional identities that reflect this understanding. This study investigated the use of reflective writing in an introductory design course to help students explore and interpret their design beliefs, experiences, and self-awareness. The results indicate that authorial presence, analysis, and narrative quality are common qualities in reflective responses, but emotion is notably lacking from student writing. Students were highly reflective in relation to a general experience with uncertainty and least reflective when discussing ideation processes. Implications for design education and research are discussed.

Keywords: design education, designer reflection, professional identity development, designer principles

Introduction

Four designers on a design team huddled together brainstorming ideas on designing an instructional intervention using the social media platform Twitter. The identified problem was teaching adolescent girls at a weeklong residential camp about bullying using social media. Having never used Twitter as an instructional platform, the team was uncertain about the constraints of this design, the participants and the short instructional deliver cycle (only one week). The team embraced their uncertainty and drew on their beliefs and experiences to influence the design. One talked about her experience at a similar one-week camp she attended several years ago while another drew from her experience of being bullied as an adolescent. A third had extensive multi-media experience; although this background did not include Twitter, she realized she could transfer some of the skills she mastered. The team had individually experienced the challenges of short design time cycles before and had diverse previous design experience. All had a fairly clear vision of what the final design product could look like, while each was trying to determine how to achieve the vision. This is an example of a design team immersed in design thinking.

Design thinking positions the designer as an active arbiter of the design space whose actions, judgments, and decisions generate momentum toward an effective solution. Designers are charged with embracing the uncertainty inherent in loosely-structured design problems; leveraging failure as an avenue to better understand the problem-solution relationship; and taking personal responsibility for the outcomes of their designs (Cross, 2011; Nelson & Stolterman, 2003). The problem-solution relationship for the bullying instructional design team was multi-layered where the topic, the delivery method, the short design time, and the realization of the overall product, were a few of the problems. The solutions for the design lie in part in each of the designer's personal beliefs, precedents and self-awareness integrated in their professional identity.

Design education programs must prepare future designers to take on a professional role that is more personal, complex, and dynamic than was previously understood or incorporated in design curriculum (Tracey & Boling, 2013; Tracey, Hutchinson & Quinn Gryzbyk, 2014). In order to stand ready to accept the design challenges they will face in their professional practice, similar to those in the bullying instructional design team, design students need opportunities to explore who they are as designers as well as beliefs and experiences that will influence their actions in the design space. This provides a foundation for the development of their identity as a designer, and a schema that integrates their individual characteristics with the duties, values, and territory of the profession.

While professional identity and its development have not been adequately explored in the design literature,

other fields such as teaching, healthcare, social work, and psychology have traditionally included identity development as an important component of professional training (Luehmann, 2007). From research in these fields, professional identity can be understood as narrative interpretations (and reinterpretations) of experiences, beliefs, values, and personal qualities relevant to the professional space. These narratives are constructed in a social context (particularly within one's community of practice), and are constantly evolving to account for new information, although core principles tend to develop slowly and are resistant to change once established (see Luehmann, 2007, for a review). For the bullying instructional design team, through each individual designer's identify formation in part due to their experiences; they came to recognize themselves (and be recognized by others) as a particular type of designer, representing an integration of the self with professional responsibilities. Their design precedents helped form their professional identity, which in turn improved the designed product.

Design Precedents and Professional Identity Development

As illustrated in the above design team example, design precedents may be key to designer professional identity formation, development and ultimately practice. Design precedents have been characterized as design experiences (and the lessons learned from them) and episodes that fuel designer intelligence, intuition, and decision-making in the design space (Tracey & Hutchinson, 2013). Designers draw on their personal pool of stored design precedents, both experienced and witnessed, as they engage in reflective conversations with the design problem and tentative solutions in order to better understand the relationship between the two. Design precedents are considered the foundation of design intelligence but they also serve as a pillar of professional identity, along with beliefs and self-awareness. Beliefs (such as individual conceptions of what design is or what instruction is) provide a context to locate experiences and self-awareness (such as a sense of your own traits or habits of thought and action) provides a filter for interpreting experiences. Identity is ever evolving, due to the transactional relationships among these pillars, which are influenced by new experiences that challenge or confirm existing identity attributes. Thus, to best serve design students, the construction of preliminary design beliefs, precedents, and self-awareness must be aligned with the realities of professional practice in order to provide a durable and meaningful foundation for professional identity.

Reflection and Professional Identity Development

In addition to its well-documented role in the design space, reflection (and particularly reflective writing) is a common pedagogical technique for identity development in other fields such as teaching and medicine (Luehmann, 2007). The use of reflection is not novel, as it can be traced back to Dewey's work in the early 1900's. He described reflection as an active ongoing process of examination of one's beliefs, experiences and other forms of critical assessment including assessment of their foundations and implications (Blaschke & Brindley, 2011). Schön's (1983) concept of "reflection-on-action" in professional practice is relevant for understanding the role of reflection in identity development, as it characterizes the dynamic narration and interpretation of past experiences. McAlpine and Weston's (2000) description of "reflection-for-action" builds on this by directing the momentum of reflection-on-action toward planning for the future. Reflection-for-action is particularly relevant to design education, as the goal of any design curriculum should be to prepare students for what they will encounter in their future professional practice. Constructing meaning with the goal of acting in the future lends vitality to the reflection process, keeps the insights generated during reflection from stagnating, and provides the emerging designer with a tentative roadmap for their future actions in the design space. This research study positioned itself in the conceptual framework of Dewey and Schön's work.

Research Goals

This current study is part of an ongoing, design-based research program on reflective writing for professional identity development in design education. While our previous work included pilot investigations of the central ideas and methodology presented here (see Tracey, Hutchinson, Gryzbk 2014), the goal of this article is to refine and extend our established research framework to a larger dataset in order to draw more substantive conclusions from our findings, with implications for design education and research. For this study, our research questions include:

1. What qualities of reflection are represented in students' written narratives regarding beliefs, experiences, and self-awareness as they relate to professional identity, and to what degree are they included? This approach moves beyond a binary framework (determining whether a response is reflective or not) to develop a more nuanced profile of reflection by looking at aspects such as

narrative quality, personal voice, meaning making, attention to emotion, etc.

2. Do the qualities of reflection vary based on the topic students are writing about? In other words, does the reflection profile change when students are reflecting on different aspects of identity, such as belief, experiences, or self-awareness? Do specific prompts elicit different reflection profiles, and if so, how do they differ?

Methodology

Participants and Context

Participants included 69 graduate students from four consecutive semesters of an online, introductory design course offered by public research university in a large city in the Midwestern United States. Participants varied in age and race, with many international students included in the participant pool. The course is required for all students in the university's Design and Performance Systems (D&PS) Master's and PhD programs, and is also a mandatory course for an online teaching certification program that is open to all graduate students at the university. Thus, while most participants were enrolled in the D&PS program, there were some from other fields, particularly library science.

The course itself follows a design thinking approach, devoting the first seven weeks of class to learning principles and concepts of design in general. This provides a context for introducing concepts of instruction and learning needed for the design foci beginning in the eighth week. The course emphasizes integrating design principles and concepts within the design space as defined in design thinking. The instructional activities are constructivist in nature, including reflective writing, peer group activities, readings, case studies, and a final design project.

Data Sources and Collection

Data was drawn from personal reflection journals kept by students as Google docs shared with the instructor for feedback. The journals were maintained throughout the semester, with writing prompts assigned during eight out of 14 weeks for a total of 27 prompts. Weeks 1-6 all included prompts, as did the eighth and fourteenth weeks; prompt topics included professional identity elements such as beliefs, experiences, and self-awareness, along with questions regarding course readings and case studies. Nine prompts were identified as being relevant to this study, including two related to beliefs, three related to experiences, and four related to self-awareness. Table 1 details the text of the prompt and associated identity domain; each prompt is labeled by the week it was included and its prompt number for that week (so Prompt 1.3 was the third prompt during the first week, while Prompt 5.5 was the fifth prompt during the fifth week). The text of two prompts (3.3 and 5.1) were modified slightly across semesters; see Table 2 for details.

Table 1.4: Reflection prompt text

#	Prompt Text	Domain
1.1	What are your thoughts today about design based on watching the two videos? [*Note: students were assigned to watch two short videos about well-known design firms, IDEO and Van Cleef & Arpels.*]	Beliefs
1.2	According to Cross - "Everyone can and does design. We all design when we plan for something new to happen." Describe in detail a time when you designed something. How (if appropriate) was it - effective, efficient, creative, imaginative and/or stimulating? [*Note: this prompt references the course text, Design Thinking by Cross (2011)*]	Precedents
1.3	Describe a time when you felt totally uncertain. Try to remember how that felt and the greatest challenges you faced because of the uncertainty. What did you do to handle it? Knowing that part of being a designer is always dealing with uncertainty, how do you feel about being a designer?	Precedents
3.2	Are you a Gordon Murray or a Kenneth Grange designer? Why? Which would you like to be as you ultimately develop as a designer? Why? [*Note: this prompt references the course text, Design Thinking by Cross (2011)*]	Self-awareness

3.3[1]	Describe a time when you had a 'sudden inspiration'. How do you let your mind relax (refer to slides 5 and 6 for this week) to help you guide this question.	Precedents
5.1[1]	Cross states that: "Design intelligence involves an intense, reflective interaction with representations of problems and solutions." Now that we are in week 5 of this course, how are you preparing to have constant, intense reflection in your daily design activities? What will work for you to make sure this happens? He also states that design intelligence is NOT simply a given 'talent' or 'gift' but can be trained and developed. How do you plan to train and develop your design intelligence? [*Note: this prompt references the course text, Design Thinking by Cross (2011)*]	Self-awareness
5.5	What are your thoughts about the last slide in the PPT presentation this week? Please share where you are today. (coping w/uncertainty)	Self-awareness
6.6	As you completed the previous five tasks, what design ideas emerged for you? How did this happen? Reflect on and document your design ideas and how you came up with them. [*Note: this prompt referred to a case study project also assigned during week six.*]	Self-awareness
14.4	You have now walked through 15 weeks of learning about design in general and designing instruction specifically. Reflect on this journey, what you have learned, your thoughts on designing in general, instructional design specifically, and you as a designer. Describe your future goals in design.	Beliefs

[1] These two prompts were changed during later semesters; see Table 3 for more detail.

Table 2.4: Changes to prompt text by semester

Semester	Prompt 3.3: Inspiration	Prompt 5.1: Reflection & design intelligence
S1	Describe a time when you had a 'sudden inspiration'. How do you let your mind relax (refer to slides 5 and 6[1] for this week) to help you guide this question.	Cross states that: "Design intelligence involves an intense, reflective interaction with representations of problems and solutions." Now that we are in week 5 of this course, how are you preparing to have constant, intense reflection in your daily design activities? What will work for you to make sure this happens? He also states that design intelligence is NOT simply a given 'talent' or 'gift' but can be trained and developed. How do you plan to train and develop your design intelligence?
S2	Same as S1	Same as S1
S3	Referring to slides 5 and 6[1] from this week's PPT lesson:

a) How do you let your mind relax? Why do you think this works for you?

b) Describe a time when you had a sudden inspiration. What were you doing when you had this inspiration? Why do you think the inspiration came to you at that moment? | (1) Cross states that: "Design intelligence involves an intense, reflective interaction with representations of problems and solutions." Now that we are in week 5 of this course, how are you preparing to have constant, intense reflection in your daily design activities? What will work for you to make sure this happens?

(2) He [Cross] also states that design intelligence is NOT simply a given 'talent' or 'gift' but can be trained and developed. How do |

		you plan to train and develop your design intelligence?
S4	Describe a time when you had a sudden inspiration. What were you doing when you had this inspiration? Why do you think the inspiration came to you at that moment?	Same as S3

[1] The slides referenced in the prompt text described designer characteristics related to sudden inspiration, relaxation, and idea generation.

At the end of each semester, the course instructor downloaded the journals of students who agreed to participate in the study and removed any personal identifiers before forwarding to the research team. Separate files were created that listed each response to each prompt by semester, and coding forms were created for distribution to the coding team along with their assigned response sets.

Data Analysis

Developed by Wald, Borkan, Taylor, Anthony, and Reis (2012), the Reflection Evaluation For Learners' Enhanced Competencies Tool (REFLECT) was used to assess journal responses. Originally developed for medical education, his rubric was validated by its creators and was also used in a previous study by the authors (Tracey et. al, 2014), demonstrating its utility for assessing reflection in a design context. The value of REFLECT is (1) the ability to code for six different dimensions of reflection; and (2) the ability to code for four different levels of reflection. The six dimensions include:
- Writing spectrum: the global quality of the reflective narrative.
- Presence: the sense of the author in the response.
- Conflict description: the detail and insight included in the description of the triggering event or situation.
- Emotion: recognition of and attention to affective aspects of the response.
- Analysis: the quality and nature of analysis and meaning construction.
- Attention to assignment: the alignment of the response to the prompt.

For each reflection quality, the rubric provides specific criteria for determining the level of reflection for that dimension. The four levels include habitual action (short, generic, unengaged fact reporting); thoughtful action (elaborated description and engagement but no meaning-making), reflection (inclusion of efforts to make meaning), and critical reflection (comprehensive exploration and critique). See Table 3 for the revised rubric used in this study, including criteria for each reflection level and quality.

Each journal response was assessed by two data coders using REFLECT, which meant that each response required six coding decisions. If the two initial coders agreed, the decision was considered final. If not, it was sent to a third coder; if this coder agreed with one of the two initial reviewers, then that was designated as the final decision. In cases where all three coders disagreed, the decision was sent to the PIs for final adjudication. Our data coding team included eight graduate students in D&PS and one in educational psychology, and all worked independently to make coding decisions.

Table 3.4: Revised REFLECT (Reflection Evaluation For Learners' Enhanced Competencies Tool) Rubric originally developed by Wald, et al (2012)

	Levels[1]			
Criterion	**Habitual action**	**Thoughtful action**	**Reflection**	**Critical reflection**
Writing spectrum	Superficial descriptive writing approach (fact reporting, vague impressions) without reflection or introspection	Elaborated descriptive writing approach and impressions without reflection	Movement beyond reporting or descriptive writing to reflecting (i.e., attempting to understand, question, or analyze the event)	Exploration and critique of assumptions, values, beliefs, and/or biases, and the consequences of action (present and future)
Presence	No sense of writer being present[2]	Sense of writer being partially present[2]	Sense of writer being largely or fully present[3]	Sense of writer being fully present[3]
Description of conflict or disorienting dilemma	No description of the disorienting dilemma, conflict, challenge, or issue of concern	Absent or weak description of the disorienting dilemma, conflict, challenge, or issue of concern	Description of the disorienting dilemma, conflict, challenge, or issue of concern	Full description of the disorienting dilemma, conflict, challenge, or issue of concern that includes multiple perspectives, exploring alternative explanations, and challenging assumptions
Attending to emotions	Little or no recognition or attention to emotions	Recognition but no exploration or attention to emotions	Recognition, exploration, and attention to emotions	Recognition, exploration, attention to emotions, and gain of emotional insight
Analysis and meaning making	No analysis or meaning making	Little or unclear analysis or meaning making	Some analysis and meaning making	Comprehensive analysis and meaning making
Attention to assignment	Poorly addresses the assignment question and does not provide a compelling rationale for choosing an alternative	Partial or unclear addressing of assignment question; does not provide a compelling rationale for choosing an alternative	Clearly answers the assignment question or, if relevant, provides a compelling rationale for choosing an alternative[4]	Clearly answers the assignment question or, if relevant provides a compelling rationale for choosing an alternative[4]

Notes:

[1]The full REFLECT rubric also includes an optional Axis 2, which allows for further assessment of responses that are deemed as critical reflection for the writing spectrum criterion. The Axis 2 levels include transformational learning or confirmatory learning. Because of the low number of responses that were coded as critical reflection for the writing spectrum criterion in this study, we did not include Axis 2 in our results or analysis.

[2]The original descriptions for habitual action and thoughtful action for the presence criterion were identical, so we revised the habitual action to read "No sense of the writer being present" for the purposes of this study. However, Semester 1 responses were coded using the original rubric, and thus only thoughtful action or reflection were coding options for this semester.

[3]The descriptions for reflection and critical reflection for the presence criterion are not mutually exclusive, so we collapsed these categories as reflection for the purposes of this study.

[4]The descriptions for reflection and critical reflection for the attention to assignment criterion are identical, so we collapsed these categories as reflection for the purposes of this study.

Results

Aggregated Reflection Levels

Coding decisions are listed by prompt and reflection dimension, as well as the number of responses per prompt. It is important to note that this number varies for two reasons: first, not all students submitted a response for each prompt; (2) two prompts (3.3 and 5.1) were altered slightly from semester to semester, including breaking the prompt into two distinct questions (see Table 2). In these instances, the responses were coded separately but all were included in the data sets for these two prompts, leading them to have a larger N than our overall participant population of 69. With an N=626 responses, each of which coded for six dimensions of reflection, our data set included 3,756 coding decisions in total. Table 4 illustrates this large data set.

Table 4: Reflective assessments by dimension and prompt

Dimension	Code	N=	Beliefs		Precedents			Self-awareness				ALL
			1.1	14.4	1.2	1.3	3.3	3.2	5.1	5.5	6.6	
			67	62	68	68	79	69	100	67	46	**626**
Writing	HA		7	5	1	5	7	3	5	4	11	**48**
Spectrum	TA		27	24	34	16	32	17	54	23	13	**240**
	R		31	30	30	43	37	46	40	32	19	**308**
	CR		2	3	3	4	3	3	1	8	3	**30**
Presence	HA		11	0	0	0	3	1	4	1	5	**25**
	TA		28	10	1	7	16	8	13	7	17	**107**
	R		28	52	67	61	60	60	83	59	24	**494**
	CR^2		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**n/a**
Conflict	HA		3	6	0	2	2	2	2	2	5	**24**
	TA		36	28	20	18	34	29	56	34	24	**279**
	R		25	27	45	47	42	35	40	28	16	**305**
	CR		3	1	3	1	1	3	2	3	1	**18**
Emotion	HA		41	22	32	9	32	23	67	16	35	**277**
	TA		21	27	28	25	35	40	29	40	7	**252**
	R		5	10	7	33	8	6	4	11	4	**88**
	CR		0	3	1	1	4	0	0	0	0	**9**
Analysis	HA		4	4	0	1	4	2	3	1	6	**25**
	TA		27	14	30	15	34	18	52	33	16	**239**
	R		32	41	35	47	39	47	43	29	22	**335**
	CR		4	3	3	5	2	2	2	4	2	**27**
Assignment	HA		6	5	0	5	6	1	4	1	9	**37**
	TA		25	33	23	15	38	27	50	38	22	**271**
	R		36	24	45	48	35	41	46	28	15	**318**
	CR^2		n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**n/a**
REFLECT	HA		**72**	**42**	**33**	**22**	**54**	**32**	**85**	**26**	**71**	**437**
TOTALS	TA		**164**	**136**	**136**	**96**	**187**	**139**	**254**	**174**	**99**	**1385**
	R		**157**	**184**	**229**	**279**	**222**	**235**	**256**	**187**	**100**	**1849**
	CR		**9**	**10**	**10**	**11**	**11**	**8**	**5**	**15**	**6**	**85**
	TOTAL		**402**	**372**	**408**	**408**	**474**	**414**	**600**	**402**	**276**	**3756**

<u>Code Legend</u>

HA: habitual action (simple fact reporting and/or omission of major response elements)

TA: thoughtful action (elaborated narrative but remaining at the descriptive level)

R: reflection (effort to engage in meaning-making, analysis or some other aspect of reflection)

CR: critical reflection (comprehensive response that considers multiple interpretations or viewpoints)

BOLD text = totals

1=REFLECT criteria used during F13 did not differentiate between HA and TA, so TA only was coded; criteria modified for later semesters.
2=REFLECT criteria did not differentiate between R and CR, so only R was coded for all semesters.
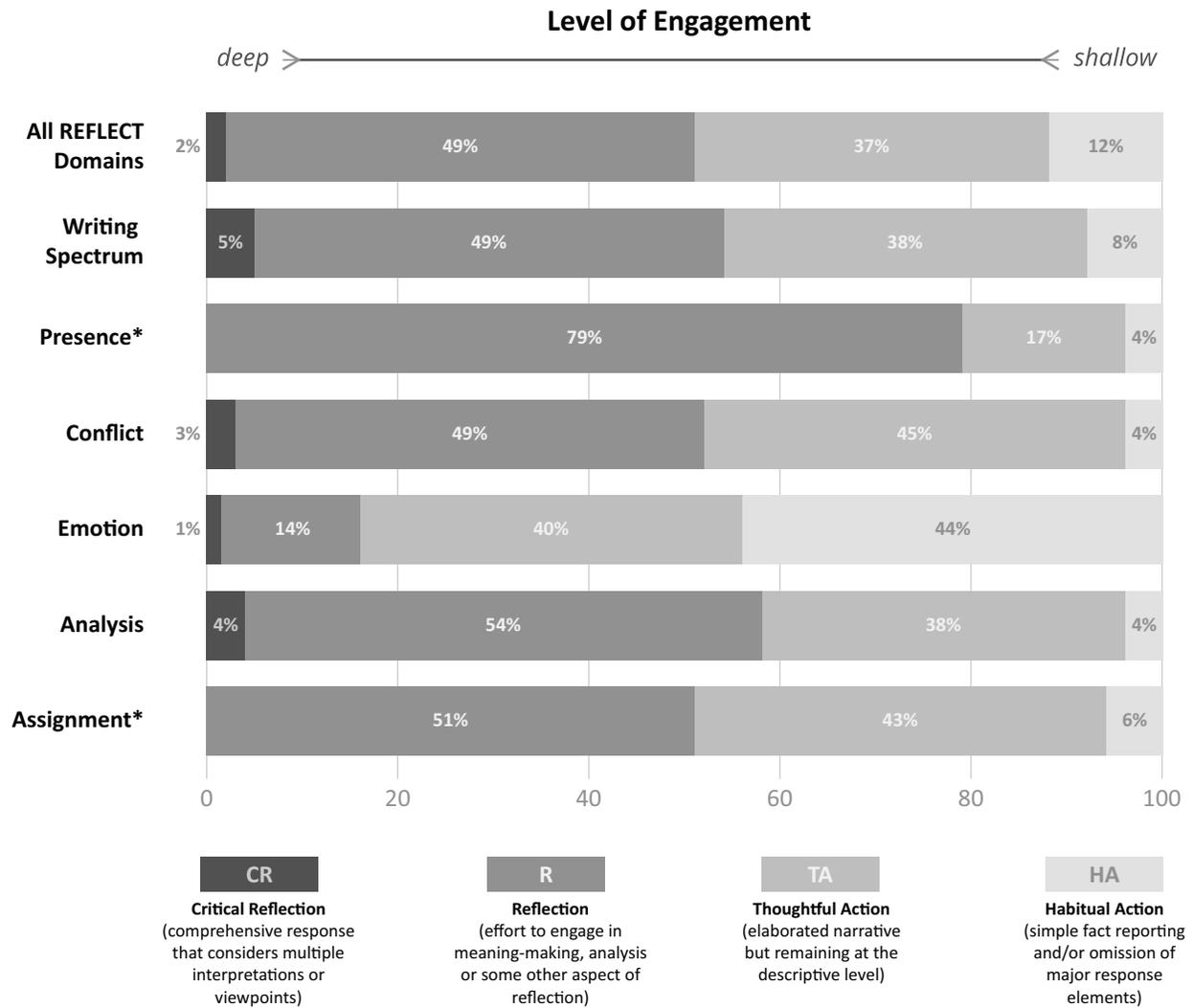
Aggregated Reflection Levels for all Prompts

When looking at participant level of engagement (deep vs. shallow) we found that as a whole, 49% of the prompts were coded as reflection (effort to engage), 37% were coded as thoughtful action (remaining at a descriptive level), 12% were coded as habitual action (fact reporting), and 2% were coded as critical reflection (considers multiple interpretations or viewpoints), as shown in Figure 1. An example of a reflective response is student 7 (W13), written in the first week of class in response to the third prompt (1.3) describing a time when she felt totally uncertain, how she dealt with uncertainty and how she maintains these beliefs and actions will impact her as a designer (Prompt 1.3):

> I am known by my family and friends to be a very indecisive and uncertain person in every aspect of my life and I never would have expected that this is a question I would be asked but I must say it really does hit home with me. I am constantly questioning myself as to what the right decision about something is, whether it's something as simple as picking out an outfit or as pivotal as choosing a major… In order to choose a final major for my Bachelor's degree, I went through a yearlong internal and external debate… I was very confused about the kind of person I wanted to be. So many factors go into making a decision of that magnitude: satisfying my parents, pursuing areas of interest, pursuing areas of talent, obtaining a degree that will give me the opportunity to get a good job, etc. I ended up changing my major three times (Political Science, Education, History) until I finally got to the one I would complete: English Literature. To make my decision I tried to find the one major that would combine the majority of the factors that I mentioned above. I took the advice of people who were older and more experienced than myself and I bowed down to reality. I can say now that I am very relieved that I did. That is why choosing a major for my Masters degree was not as difficult for me, although I did deliberate about it and took some time off to make my decision. That is why I believe that this uncertainty will not affect me negatively as a designer… So although I would have my doubts, I am confident that I could get around them and attain my goal (S7, Prompt 1.3, W13).

This is an example of deep reflection. Note that in this response she clearly articulates an uncertain situation, reflects on how it felt, what actions she took and how she perceives this experience may impact dealing with uncertainty in design. This is also a fitting example of Presence, the individual domain that had the highest overall rate of reflection (79%). Moreover, unlike most of the other students who had difficulty addressing emotion which had the lowest overall reflection rate (14%), reading this response to Prompt 1.3, we can sense this student struggling with the question, expressing her vulnerability when describing her battle in selecting a bachelor's degree focus and illustrating confidence while at the same time identifying doubts. Four of the other domains, Analysis, Attention to Assignment, Conflict and Writing Spectrum are also present in this response, which overall were closely aligned with a combined average of 51% rate of reflection. See Figure one for a complete breakdown of each dimension and level of engagement.

Figure 1.3: Aggregated reflection levels for all prompts (displayed as percentages)

Level of Engagement

deep ⟩———————————————————⟨ *shallow*

	CR	R	TA	HA
All REFLECT Domains	2%	49%	37%	12%
Writing Spectrum	5%	49%	38%	8%
Presence*		79%	17%	4%
Conflict	3%	49%	45%	4%
Emotion	1%	14%	40%	44%
Analysis	4%	54%	38%	4%
Assignment*		51%	43%	6%

CR	**R**	**TA**	**HA**
Critical Reflection (comprehensive response that considers multiple interpretations or viewpoints)	**Reflection** (effort to engage in meaning-making, analysis or some other aspect of reflection)	**Thoughtful Action** (elaborated narrative but remaining at the descriptive level)	**Habitual Action** (simple fact reporting and/or omission of major response elements)

General note: As a result of rounding, some percentages may not appear to add up to 100%.
* The Presence and Assignment dimensions did not include critical reflection as a coding option.

Aggregated Reflection Levels by Prompt Domains and Individual Prompt

As Figure 2 details, reflection levels varied quite a bit within the three prompt domains (beliefs, precedents, and self-awareness), with no distinct, domain-based pattern emerging. When looking at individual prompts, rates of critical reflection were low and similar across prompts, ranging from a high of 4% (Prompt 5.5) to a low of 1% (Prompt 5.1). Prompt 1.3 (the prompt the above student example addressed), specifically asking students to describe a time when they felt uncertain, generated the highest rate of reflection (68%), while the lowest levels were seen in Prompt 6.6, specifically asking students about design ideas that emerged and how it happened, (36%).

An example of a lower level of reflection for Prompt 6.6 is student 17 (W13), describing his design ideas and how they emerged (Prompt 6.6):

> I would not say that many "design" ideas came to me through this exercise. I've identified the key factors and problems that could arise which has led me to the conclusion that time needs to be spent communicating with students and on providing some kind of professional development workshops. I think much of the solution to the problem lies in identifying how educational technologies are currently being used by new teachers and experienced teachers, and seeing where the teacher preparation program is falling short (Student 17, Prompt 6.6, W13).

This student is responding to a case study problem addressing the need to design an online course for undergraduate students in a teacher preparation program. He not only fails to reflect on his precedents (he was currently taking an online course), he also did not articulate his beliefs regarding online courses, the overarching problem or the predicament the designers and end users described in the case may be experiencing. His response indicates a shallow level of engagement and a lack of emotional involvement in the design. Most students were somewhat similar to this example, remaining at a descriptive level illustrating thoughtful action to the prompts. See figure 2 for the complete breakdown of each dimension by prompt and the level of engagement.

Figure 2.3: Reflection levels by domain and prompt (displayed as percentages)
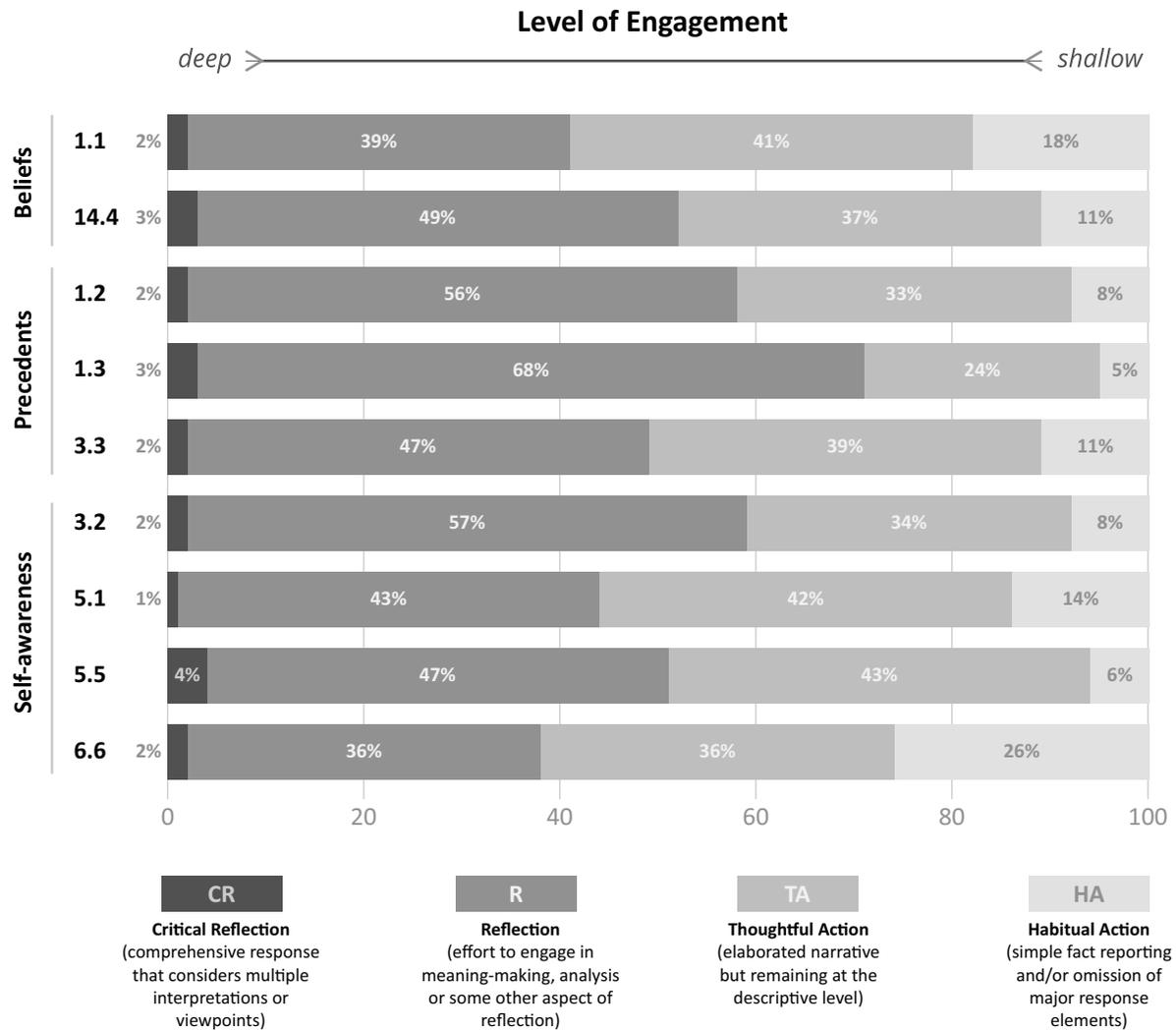
General note: As a result of rounding, some percentages may not appear to add up to 100%.

Reflection Levels by Reflection Quality and Prompt

Writing Spectrum

The highest level of critical reflection for writing spectrum were seen in Prompt 5.5 (12%), while Prompt 5.1 had the lowest level (1%), with the remainder between 3-7%. An example of a critical reflection response in writing spectrum is student 5(S13), describing his reflections on coping with uncertainty, asked in week 5 of the course (Prompt 5.5):

> I plan to use uncertainty to my advantage. In other words, I am going to use uncertainty to work for me rather than against me, as it will ultimately make me a better designer. As a designer, exploring uncertain new problems and solutions will help me work creatively and innovatively. It will help me define and redefine the problem and solution cycle. If there was absolute certainty in the field, we would not be able to explore our creative minds and manipulate our designs. This is especially true when creating designs that are unprecedented. How can something be designed with certainty if it has never done before? Naturally, the designs will change along the way. As we have learned, every designer creates his or her own problem and solution, and comes up with unique results. Hence, there are no right or wrong answers, but by exploring new uncertain ideas, we will gain a better understanding of the field of design as a whole and use this experience to become better designers. My hope is that by taking advantage of uncertainty, I will be able to exceed my client's expectations.
> I have an idea of where I see myself as a designer in the future and how I will approach designing. I am not there yet, as it will take many years for me to master the skill. However, each week I am striving to get closer to my goal. The way I think about design today is completely different than how I thought about it before starting this class. Previously, I did not realize that uncertainty was standard – I thought that in the design field, an idea would need to be created and executed. I am relieved to know that change is a normal part of the design process. I am confident that design is the right field for me, and I welcome to opportunity to live in uncertainty (Student 5, Prompt 5.5, S13).

In the short timespan of five weeks, this student articulates the exploration of his assumptions and beliefs regarding uncertainty, the biases he held and the current value he places in uncertainty and design, an excellent example of critical reflection illustrated in his writing.

Reflection in the writing spectrum dimension had the highest rate for Prompt 3.2 (67%) and the lowest rates for Prompt 5.1 (40%) and Prompt 6.6 (41%), with the rest falling between 44-63%. Thoughtful action was highest for Prompt 5.1 (54%), and lowest for Prompts 1.3 (24%) and 3.2 (25%); the range for the rest of the prompts was 28-50%. Finally, Prompt 6.6 had the highest level of habitual action at 24%, while Prompt 1.2 had the lowest at 1%, with the remainder between 4-10%.

Presence

Prompt 1.2 had the highest reflection level for presence at 99%, while Prompt 1.1 had the lowest at 42%; the remainder ranged from 90% to 52%. For thoughtful action, Prompt 1.1 had the highest rates at 42% and Prompt 1.2 the lowest at 1%, with the range for the rest at 10-37%. Prompt 1.1 generated the highest rate of habitual action at 16%, with Prompts 1.2, 1.3, and 14.4 all at 0%; the remainder ranged between 1-11%. An example of a habitual action response, the lowest level of reflection is student 5(F12), describing her reflections on what design is, asked in week 1 of the course (Prompt 1.1):
> My thoughts on design based on watching the two videos has shown me that design can be based on a need, whether it is for solving everyday problems or a need to create beautiful jewelry. In the Oxo video, design is based on making everyday life tasks easier for anyone, whether you have a medical need or not. For the Van Cleef video, design is not only to create beautiful jewelry, but the jewelry has also been designed to become other, different parts of jewelry. These designs make the jewelry innovative in the design process. It also created a whole design movement, art deco (Student 5, Prompt 1.1, F12).

The student's response is a minimal account of the content in the design video examples. Student presence in this response is not indicated, as she does not articulate any of her thoughts or impressions although they are specifically asked for in the prompt, about design based on viewing the videos. This is an example of a lack of

presence, reflection and emotion in a reflective response.

Conflict Description

Four prompts achieved 4% for critical reflection in conflict description (1.1, 1.2, 3.2, and 5.5), which was the highest level, while the lowest levels were seen in Prompts 1.3 and 3.3, both at 1%; the remaining three prompts were at 2%. For reflection, the highest level was 69% for Prompt 1.3, while the lowest was 35% for Prompt 6.6; the rest ranged between 37-66%. Prompt 5.1 had the highest level of thoughtful action at 56% and Prompt 1.3 had the lowest at 26%, with the range for the remainder between 29-54%. An example of thoughtful action, the second lowest level of reflection is student 7(F13), describing how he is going to prepare for daily intense reflection in his daily design activities. The prompt also asked how the student would plan to train and develop his design intelligence. Students addressed this prompt in week 5 of the course (Prompt 5.1):

> Attempt making quick transitions from problem framing to solving the problem. Creating an early preliminary design phase instead of not developing existing sketches. Develop the abstract ideas of the design that I've had on lateral landscapes. Work out details of design as part of a system that looks at every station of the design daily (Student 7, Prompt 5.1, F13).

The student fails to describe the conflict (time for constant intense reflection and developing design intelligence) in developing his designer professional identity. He mentions a few examples of how he will address design intelligence development therefore the coding decision was thoughtful action. This student does not address the need for reflection as a designer and the conflict he may be experiencing as he moves toward designer professional identity development. He writes as though he believes that design is somewhat of a systems process he can control with specific activities. The lack of conflict description in this example is multi-layered and although his reflection lacks engagement, many students responded to the prompts with habitual action, the lowest level of engagement. The habitual action dimension was highest for Prompt 6.6 (11%) and 14.4 (10%), while Prompt 1.2 was at 0%, with the rest falling between 2-4%.

Emotion

Critical reflection for emotion was highest for Prompts 14.4 and 3.3 at 5% each, followed by Prompts 1.2 and 1.3 at 1% each; the remainder had 0%. An example of critical reflection, the highest level of reflection for emotion is student 7 (F12), describing her thoughts on the journey of learning about design in general and designing instruction specifically. The prompt asked students to reflect on what they had learned, their thoughts on design and how they view themselves as a designer. It finally asked students to articulate their future goals in design. This prompt was asked in week 14 of the course (Prompt 14.4):

> Foremost, the project in this course has been an extremely humbling experience. I realized that you do really have to drop your ego out of the design process. You can be extremely proud of an outcome, but during the actual process of design, establishing a rapport with your client, developing a solid understanding of the design problem and space, and moving slowly at first with plenty of communication, are all pretty crucial to the ultimate success of the project. I have learned I need to improve my listening skills, and how important these skills are to a successful designer. I have also been thinking a lot about providing peer evaluation, and how you offer that assistance in a supportive manner. I know the environment I will graduate into as a designer will be more group oriented and may work more asynchronously, so understanding how to state things succinctly and supportively to my team members will be an important skill.
> I enjoy learning the theoretical background of instruction, learning, human development and communication. I am extremely interested in how people learn, and how we measure success, and how to design instruction to support those "a-ha" moments in our learners. I am still confused by the much of the terminology and definitions surrounding educational technology and instructional technology I'm still not sure how to reconcile all of the different design processes we have learned about in this course, such as the layers of necessity, systems approach, design space, Merrill's Principles of Instruction, Gagne's Instructional Events, etc. I have learned a lot, but feel I am at the lower end of Vygotsky's ZPD—I have a long way to go.
> I have also consciously forced myself to view the content in the class as all new. Even though I have been

exposed to and am familiar with much of the basic instructional theory and design content in this course, I have tried very hard to keep an open mind. I am cognizant of my own mental models regarding the content of this course, and have worked to try to engage with the content as a new learner. The Design Thinking content really opened new doors for me, and actually helped me a lot in my desire to learn openly. For me, as a designer, this course has made me want to incorporate more drawing activities into my design strategies I will be reading the Cross book again. I want to learn more about visual literacy. I feel our world is moving to a more visual (as opposed to textual) mode of communication. I want to answer the question "How do we engage learners with content visually without sacrificing depth of knowledge?" I want to open my mind to possibilities in teaching, learning and instruction I had never considered before (Student 7, Prompt 14.4, F12).

Student 7 recognized and articulated her emotions through this vulnerable response. She states that she is humbled, must keep an open mind, drop her ego out of design, communicate and improve her listening skills. She is describing the emotions of humility, fear, confusion and anxiety as she evolves her designer professional identity. Concluding her thoughtful response she describes her courage and determination to develop her professional identity. This critical reflection response was unique in that as previously indicated, the emotion dimension overall scored the lowest levels of reflection across all students, all semesters in all prompts. Reflection, the second highest domain, was highest for Prompt 1.3 at 49% and lowest for Prompt 5.1 at 4%; the rest of the prompts ranged between 7-16%. For thoughtful action, the highest level was seen for Prompt 5.5 (60%) and the lowest for Prompt 6.6 (15%), with the range for the remainder at 29-58%. Prompt 6.6 had the highest level of habitual action at 76% and Prompt 1.3 the lowest at 13%, with the remainder between 24-67%. These percentages indicate that most of the student responses coded in the emotion dimension were in the habitual action domain, the lowest level of engagement.

Analysis

Critical reflection, for the analysis dimension was highest for Prompt 1.3 at 7% and lowest for Prompt 5.1 at 2%, with the remainder between 3-6%. An example of critical reflection, for analysis is student 16 (F12), addressing the uncertainty Prompt (Prompt 1.3), the third question in week one of the course:

During my first week as a hired developer, I was assigned to a design task for a very big client. The objective was to design an interface for an eLearning course about social media. I researched various designs and took inspiration from modern layouts…, as well as edgier designs…. However, every time I began to create something new, I would begin to doubt my work. My mind was so clouded with fear that the design was becoming *too* modern, *too* edgy, *too* this, or *too* that. The ending result was a rough interface that had a little bit of everything. The messy design was lacking consistency, and was certainly not up to par with the work I had showcased in my portfolio. I was on the verge of total failure when a co-worker gave me some advice that has since become my own mantra for design. He explained that design was a process, and that designers rarely have a "slam dunk." The *process* is the fun part about being a designer, and learning how to effectively manipulate the design process is what makes a designer "good." It was during this experience that I realized "good" design goes much deeper than what we see on the surface. Given this advice, I was able to step back from the project and start from scratch. I let the process take over, and adjusted my design along the way. It was one of my strongest learning experiences that I imagine every designer must experience in order to improve. Overall, I love being a designer. Learning how to balance client needs with your own design principles is the toughest part of the gig. However, it's a skill that becomes easier with each unique experience. Though the process can be grueling, there is nothing quite as rewarding as creating a successful end product (Student 16, Prompt 1.3, F12).

Analysis in reflective writing is the ability to explain a comprehensive examination of a situation and to ultimately make meaning of it. This reflection response illustrates the student's analysis of the uncertainty he felt, why he felt it, how he analyzed his situation, was able to articulate his uncertainty to a colleague, make meaning of the colleagues advice and incorporate it into his own practice. Overall, students reflections were high in the analysis dimension as indicated in the reflection dimension, where Prompt 1.3 had the highest rate at 69% followed closely by Prompt 3.2 at 68%; the lowest rate was 43% for Prompts 5.1 and 5.5 with the rest ranging from 48-66%. Students appeared to have a little more difficulty with Prompt 5.1 as it had the highest rate of thoughtful action at 52%, while the lowest rates of thoughtful action were generated by Prompts 14.4 (23%) and 1.3 (22%); the range for the remaining prompts was 26-49%. Finally, habitual action in the analysis dimension was the highest for Prompt 6.6 at 13%, and lowest for Prompt 1.2 at 0%, with the remainder between 1-6%.
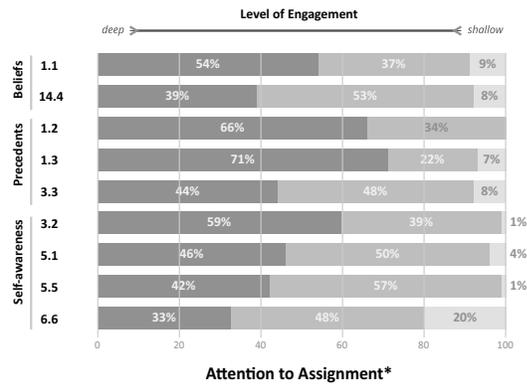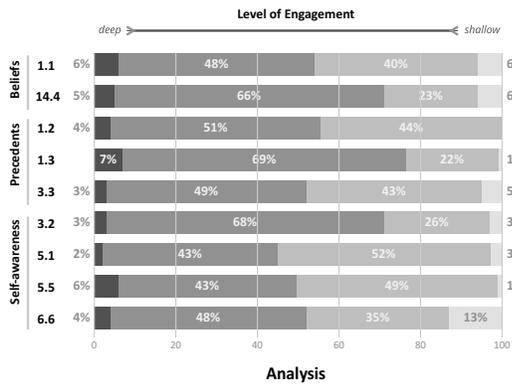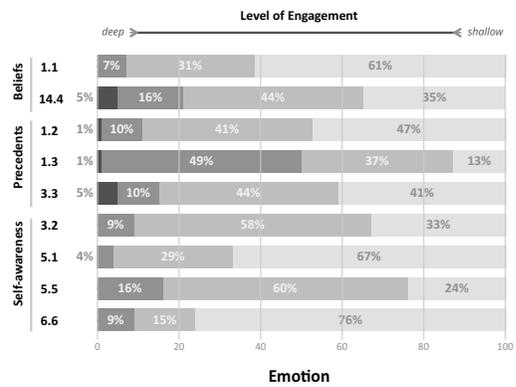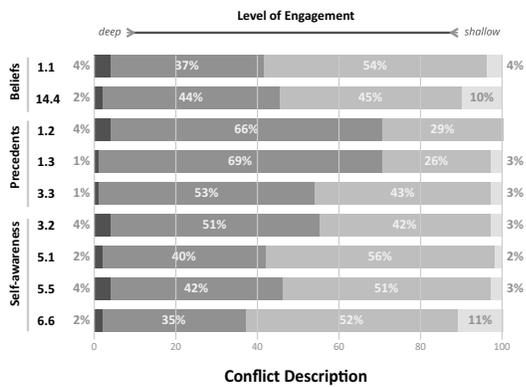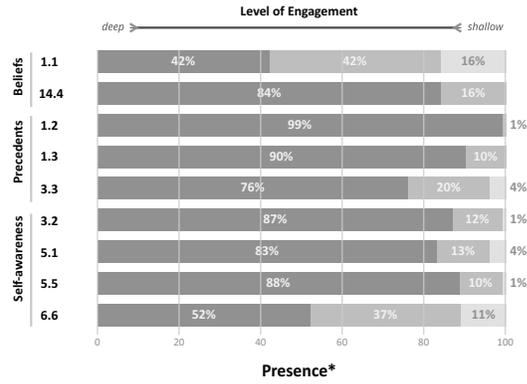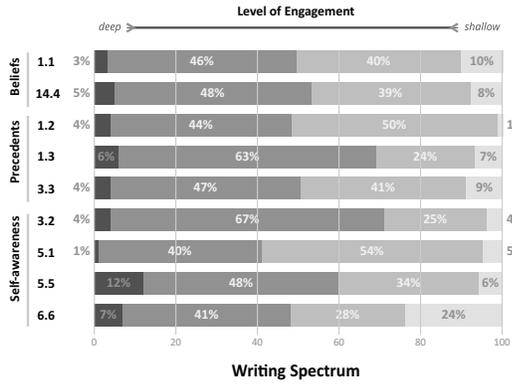
Attention to Assignment

Regarding the final dimension measured, the attention to assignment dimension, the highest reflection rate was generated by Prompt 1.3 at 71% and the lowest by Prompt 6.6 at 33%, with a range of 39-66% for the rest. For thoughtful action, Prompt 5.5 had the highest rate at 57% and Prompt 1.3 the lowest at 22%; the remainder fell between 34-53%. Prompt 6.6 had the highest rate of habitual action at 20% and Prompt 1.2 the lowest at 0%, with the rest of the prompts falling between 1-9%. Although most student reflection responses scored in the reflection level some had difficulty with the attention to the assignment specifically in prompt 6.6 when asked about articulating design ideas. Here is an example of habitual action, the lowest level of reflection for attention to assignment, student 12(W13), describing her design ideas that emerged after reading a case study project assigned in week 6. The prompt asked students to describe what design ideas emerged for them as a result of reading the case, in other words, how would they design a solution to the design problem. The prompt also asked students to reflect on and articulate how these ideas emerged. This prompt was the sixth prompt assigned in week 6 of the course (Prompt 6.6):

> Looking at what should be considered in evaluating and developing a teacher preparation programs I keep coming up with different approaches to focus on. Staying focused on state I've have talked about federal standards or federal best practices. I believe all stakeholders should be aware on how teacher preparation program have direct effect on things like standardize scores, and use of technology in teaching (Student 12, Prompt 6.6, W13).

The answer this student provides fails to address the assignment. She does not provide any design ideas, and is therefore unable to articulate how she came up with the design ideas. Although this is a possible indication of a lack of design understanding, the student does not reflect on any aspect of the questions given in the prompt. While the overwhelming reflection response to the assignment domain is in the reflection level, this student completely fails to address the attention to assignment in any reflective manner.

Figure 3 provides a detailed visual of the reflection levels for each dimension and prompt in percentages. Finally it is important to note that across all 3,756 coding decisions, 96% achieved agreement of two-out-of-three reviewers, with 4% sent to the PIs for final adjudication.

Figure 3.3: Reflection levels by reflection dimension and prompt (as percentages)

Writing Spectrum

Level of Engagement
deep → ← shallow

Beliefs
- 1.1: 3% | 46% | 40% | 10%
- 14.4: 5% | 48% | 39% | 8%

Precedents
- 1.2: 4% | 44% | 50% | 1%
- 1.3: 6% | 63% | 24% | 7%
- 3.3: 4% | 47% | 41% | 9%

Self-awareness
- 3.2: 4% | 67% | 25% | 4%
- 5.1: 1% | 40% | 54% | 5%
- 5.5: 12% | 48% | 34% | 6%
- 6.6: 7% | 41% | 28% | 24%

(axis 0 20 40 60 80 100)

Presence*

Level of Engagement
deep → ← shallow

Beliefs
- 1.1: 42% | 42% | 16%
- 14.4: 84% | 16%

Precedents
- 1.2: 99% | 1%
- 1.3: 90% | 10%
- 3.3: 76% | 20% | 4%

Self-awareness
- 3.2: 87% | 12% | 1%
- 5.1: 83% | 13% | 4%
- 5.5: 88% | 10% | 1%
- 6.6: 52% | 37% | 11%

(axis 0 20 40 60 80 100)

Conflict Description

Level of Engagement
deep → ← shallow

Beliefs
- 1.1: 4% | 37% | 54% | 4%
- 14.4: 2% | 44% | 45% | 10%

Precedents
- 1.2: 4% | 66% | 29%
- 1.3: 1% | 69% | 26% | 3%
- 3.3: 1% | 53% | 43% | 3%

Self-awareness
- 3.2: 4% | 51% | 42% | 3%
- 5.1: 2% | 40% | 56% | 2%
- 5.5: 4% | 42% | 51% | 3%
- 6.6: 2% | 35% | 52% | 11%

(axis 0 20 40 60 80 100)

Emotion

Level of Engagement
deep → ← shallow

Beliefs
- 1.1: 7% | 31% | 61%
- 14.4: 5% | 16% | 44% | 35%

Precedents
- 1.2: 1% | 10% | 41% | 47%
- 1.3: 1% | 49% | 37% | 13%
- 3.3: 5% | 10% | 44% | 41%

Self-awareness
- 3.2: 9% | 58% | 33%
- 5.1: 4% | 29% | 67%
- 5.5: 16% | 60% | 24%
- 6.6: 9% | 15% | 76%

(axis 0 20 40 60 80 100)

Analysis

Level of Engagement
deep → ← shallow

Beliefs
- 1.1: 6% | 48% | 40% | 6%
- 14.4: 5% | 66% | 23% | 6%

Precedents
- 1.2: 4% | 51% | 44%
- 1.3: 7% | 69% | 22% | 1%
- 3.3: 3% | 49% | 43% | 5%

Self-awareness
- 3.2: 3% | 68% | 26% | 3%
- 5.1: 2% | 43% | 52% | 3%
- 5.5: 6% | 43% | 49% | 1%
- 6.6: 4% | 48% | 35% | 13%

(axis 0 20 40 60 80 100)

Attention to Assignment*

Level of Engagement
deep → ← shallow

Beliefs
- 1.1: 54% | 37% | 9%
- 14.4: 39% | 53% | 8%

Precedents
- 1.2: 66% | 34%
- 1.3: 71% | 22% | 7%
- 3.3: 44% | 48% | 8%

Self-awareness
- 3.2: 59% | 39% | 1%
- 5.1: 46% | 50% | 4%
- 5.5: 42% | 57% | 1%
- 6.6: 33% | 48% | 20%

(axis 0 20 40 60 80 100)

CR — Critical Reflection (comprehensive response that considers multiple interpretations or viewpoints)

R — Reflection (effort to engage in meaning-making, analysis or some other aspect of reflection)

TA — Thoughtful Action (elaborated narrative but remaining at the descriptive level)

HA — Habitual Action (simple fact reporting and/or omission of major response elements)

General note: As a result of rounding, some percentages may not appear to add up to 100%.
* The Presence and Assignment dimensions did not include critical reflection as a coding option.

Discussion

Reflection Levels by Reflection Quality

Our first research question sought to understand the qualities of reflection that participants included in their responses, or the reflection profile. Presence had the highest level of reflection at 79%, with analysis the next closest at 58% (reflection and critical reflection). This implies that participants felt comfortable including their own voice in their writing, although roughly one-fifth of the responses did not clearly incorporate authorial presence. Considering all the prompts had a personal aspect, the level of reflection for presence could have reasonably been expected to be higher.

On the other hand, emotion was by far the least reflective, with 40% thoughtful action and 44% habitual action, suggesting that over 80% of responses did not explore emotional aspects of their beliefs, experiences, or self-awareness. Attention to assignment only generated 51% reflection, which implies that almost half of the responders struggled to adequately address all aspects of their prompt. Writing spectrum and conflict description generated reflection just over half of the time; along with analysis at 58%, these qualities were present more often than not but show room for improvement.

Reflection Levels by Prompt Domain and Individual Prompt

When considering identity domains (beliefs, experiences, and self-awareness), no clear pattern emerged, which suggests that the participants did not seem to struggle with or excel in reflecting on a particular domain. Individual prompts do contain some interesting results, however. Prompt 1.3, which asked participants to describe an experience with uncertainty from any part of their life, had the highest reflection level (71% reflection and critical reflection combined). In addition, Prompt 1.3 had the highest or second highest reflection levels for all six reflection qualities. This tells us that participants were comfortable engaging with this topic and found it comparatively easy to incorporate a range of reflection qualities and make meaning from a general experience with uncertainty.

At the other end of the spectrum, Prompt 6.6 had the lowest level of reflection; this prompt asked students to document their design ideas from a case study and discuss where their ideas came from. With only 38% of responses achieving reflection or critical reflection, and 26% coded as habitual action, participants seemed to find it challenging to narrate and make meaning from their ideation process. Prompt 1.1 provides an interesting contrast, in that reflection levels were similar (41% reflection and critical reflection), but habitual action rates were lower at 18%. This prompt asked students to discuss their thoughts about design, and based on the lower level of habitual action, participants did appear more engaged in this topic but still found it relatively difficult to reflect on overall.

Reflection Levels by Quality and Prompt

While results at this level tend to mirror results at the level of reflection quality or prompt, a few interesting trends emerge. Among writing spectrum decisions, Prompt 5.5 had the highest level of critical reflection (of any prompt or quality). This question asked students to assess where they were in relation to uncertainty after five weeks in the class; remember that students had been asked to write about uncertainty for Prompt 1.3, which was the most reflective prompt. While students were less reflective for Prompt 5.5 than Prompt 1.3, those who did reflect were much more likely to achieve critical reflection. Lower overall reflection rates were not unexpected for this prompt, as it is more challenging to reflect on current emotional and cognitive states than experiences that are removed by time and thus likely less threatening. But it does suggest that for some students, the opportunity to reconsider uncertainty, while moving from experience to self-awareness in the process, was highly engaging and enriching.

While presence was the overall most reflective of the six dimensions, 58% of responses for Prompt 1.1 and 48% for Prompt 6.6 did not achieve reflection. This is not completely unreasonable for Prompt 1.1, which asked students to discuss their ideas about design. Some may not have seen this as an opportunity to inject their voice but rather as a situation that called for more formal and impersonal writing. However, Prompt 6.6 asked students to discuss their own ideation process, which is highly personal and individual, and could be expected to include a sense of the writer

in the response. Prompt 6.6 was among the least reflective for all six reflection qualities, which suggests that some students may have experienced a more global shut-down in face of a challenging topic. In fact, the lowest reflection level of all emerged from emotion in this prompt (only 9% reflection). This type of regression is not an uncommon response when faced with a developmental challenge, but rather speaks to the complexity of the topic and the need for further scaffolding.

Implications for Design Education

Revisiting the bullying instructional design team example described earlier in this paper, we are reminded of the complex problems designers face and how their professional designer development (including beliefs, experiences and self-awareness) integrated in their design thinking impact the design process and the final outcome. One measure of professional identity development is in reflective writing. Therefore, in developing designer professional identity, perhaps the most important implication of this research may be in the need to support students in incorporating emotional aspects into their reflective writing. The affective component of design has not received much attention in the literature, yet as illustrated in the bullying instructional design example, emotions are integral to the design space. Empathy is a crucial skill for connecting with end users and taking on other perspectives (Kouprie & Visser, 2009), and affective factors have been shown to have an impact on design outcomes (Dong, Kleinsmann, & Valkenburg, 2009; Solovyova, 2003). Thus, emotional self-awareness can be considered part of our professional role as designers and should be encouraged as a part of professional identity development.

Students also appear to need more support to explore and gain insight into their own ideation processes, as this was the topic that generated the least reflective responses by a large margin. This is something that even experienced designers can struggle with (Cross, 2011) but the ability to articulate these internalized processes allows the designer the power to understand them and manage them with intention.

Finally, design educators will also need to be sensitive to the dynamic nature of identity development. Regression in the face of a developmental challenge is neither unexpected nor unwelcome, but rather represents the struggle to adjust to information that requires a schematic alteration. Instructors should view this as a signal to provide additional support rather than interpret it as a failure on the part of the student.

Implications for Design Research

In order to best understand how to better support students as they develop the pillars of their professional identity, more research is needed on how feedback and scaffolding can be crafted and delivered to improve reflection abilities. REFLECT was originally designed as a tool for providing feedback, but more research is needed on the types of feedback that are most useful. For example, feedback to move a student from habitual action to thoughtful action might be different that feedback to move a student from reflection to critical reflection. Scaffolding (including but not limited to prompts) is also likely to be an important support to students for improving the quality of their reflective writing, and design educators would benefit from understanding how to better provide scaffolding for reflection.

More research needs to be done on how professional identity is developed and maintained in designers. It will be important not only to build on this study regarding identity development, but research on how established designers understand, articulate, and maintain professional identity is also needed.

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