"I thought it would be a lot less thinking": Variations in Students' Preconceptions of Architecture from a Beginning Architectural Design Course

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The first-year architecture design studio course is, for many students, an introduction to both the discipline of architecture and the studio learning environment. It is perhaps in introductory studio courses that we see the beginning of "the development of an identity as a member of a community and becoming knowledgeable and skillful" as part of the same process, with "the former motivating, shaping, and giving meaning to the latter" (Lave, 1991, p.65). Its significance to the overall architecture curriculum and to student learning, therefore, cannot be understated.

Adding to the importance of introductory courses, we know that students bring a range of prior experiences that influence how they recognize, organize, and interpret new information. Consequently, this prior knowledge affects how students remember, reason, and apply new knowledge (Bransford, Brown, & Cocking, 2000). Constructionist views position learning as an active process, where students construct meaning through engaging with the world and each other based on what they already know and believe (Bransford, et al.; Sawyer, 2014; Vygotsky, 1978). Since new knowledge is built upon existing knowledge, instructors must unearth the preconceptions, incomplete understandings, and beginning assumptions of what students already know and believe (Bransford et al.).

Previous views of student learning focused on knowledge accumulation, i.e. the tabula rasa, or "blank slate" acquisition (diSessa, 2014). A constructivist reorientation of learning has implications for design education. Lawson and Dorst (2009) argue the assumption that students enter first year design courses with little to no knowledge of value is detrimental to their learning. Nor does a "blank slate" perspective correspond with what we know about how designers learn. Research has shown that design knowledge is highly episodic or conditionalized, meaning designers "chunk" knowledge in memory patterns around specific times, places, experiences and contexts in which it is useful (Visser, 1995). Research on the thinking processes of professional designers has also shown that experts are able to recognize common patterns of problems and solutions, and depend on the ability to recognize parallels with well-known situations and transfer them to new design situations (Lawson, 2004; 2006). Novice designers also attempt to transfer their knowledge gained from previous experiences to new design situations, and although they have yet to learn how to discern the patters of problems and solutions in the same way an expert designer does, novice designers are still attempting to make sense or "fit" their new design understanding to what they already know and believe. Taking into consideration the effects stemming from preconceptions, it is important to take these preconceptions into consideration in order for transformative learning to happen (diSessa, 2014).

Research Purpose and Rationale

The purpose of this study was to describe the qualitatively different ways students conceptualize design and architecture by examining the relationship of these conceptions and students' backgrounds and pre-course experiences. These understandings provide context for developing curricula and teaching practices that leverage students' preconceptions as foundations for new architectural design knowledge.

I situated my inquiry around three questions.

1. What are students' preconceptions of design, architecture practice, and the profession at the start of an introductory architecture design course?
2. How do these preconceptions vary based on students' backgrounds and pre-course experiences?
3. In what ways do these preconceptions inform how students made meaning of their learning in the course?

The data for this study came from a larger ethnographic case study of social learning I conducted over the course of a semester in a beginning architecture course I called "AD 1". The rationale for this focused study on preconceptions was to gain a deeper understanding of how these beginning architecture students integrated new knowledge into their existing knowledge structures to inform their new learning.

Description of AD 1 and Study Participants

The setting for the study was a section, or "studio", of one course, Architecture Design 1 (or "AD 1"), in the first year of an architecture program situated in a design college at a large, public university. AD 1 provided an ideal context for this study for two reasons: (1) it is a studio-based learning environment that is typical of bachelors-level study in an architecture program; and (2) it is an introductory course, setting the stage for an elementary understanding of the foundations of architecture knowledge and practice. Fifteen students were enrolled in the section of AD 1 under investigation, and nine students agreed to participate in the study.

Table 1: Student participants

Name	Race/ethnicity and gender identity	Other demographic and/or pre-course characteristics
Allison	White, female	Non-traditional student (25); community college graduate
Brady	White, male	Member of a fraternity; studying Political Science
Chris	White, male	Father and grandfather were architects; interned in father's firm
John	Multiracial, male	International student; youngest participant (18)
Jon	White, male	Double major Architecture and Engineering; honors student

Kendra	Asian, female	International student; International Baccalaureate/advanced standing
Peter	White, male	Likes drafting; considered CE major
Raven	White/Hispanic, female	Architect in extended family; interested in health care
Tim	Asian, male	Mother is an architect; advanced standing; honors student

AD 1 was scheduled for three days per week, 4 hours per day, from August 24 through December 18, 2015. Students in AD 1 worked on three architecture design projects over the course of the semester. AD 1 is the first course students take in the professional program in architecture at the university, leading to a Bachelor of Architecture (B. Arch) degree. Students apply to the professional program in architecture after a foundational design year in the same college. Therefore, the students in AD 1 are in their second year of university, but in their first year in the professional program of architecture.

The nine student participants were: Allison, Brady, Chris, John, Jon, Kendra, Peter, Raven, and Tim [pseudonyms]. Table 1 lists the students, how they identified by race/ethnicity and gender, and their other demographic and pre-course characteristics.

Research Method

To conduct this study, I used a qualitative research approach called phenomenography, aimed at studying the variation in ways people experience, conceptualize, perceive and understand phenomena (Entwistle, 1997; Marton, 2000). My selection of phenomenography as the research approach in this study aligned with my purpose to explore the variations in students' preconceptions of architectural design and practice based on lived experience.

Data were obtained through ethnographic methods, including observations of daily studio activities, participant interviews, researcher reflections on studio visits, and course artifacts such as the course syllabus and assignment handouts. This focused study on student's preconceptions foregrounded the student interviews over other methods of data collection.

Each student participant was interviewed four times over the course of the semester resulting in 36 interviews ranging from .5 to 1.5 hours in length. The first interview focused on students' perceptions of design, architectural practice, and what a being a professional architect meant to them; subsequent interviews also addressed these and other topics. All interviews were recorded and transcribed for analysis. In addition, field notes from 110 hours observations of students' behavior in the studio, 2.5 hours of recorded personal reflections on the interviews and observations, and 46 student-generated artifacts triangulated data collection and provided supportive contextual information in this study. The study had prior approval of the institutional review board (IRB).

Using multistage analysis, I identified categories of conceptions in the students' first interviews by aggregating the transcripts and dividing the data into sections based on the interview protocol. In the first stage, I tested and retested categories of conception against the data corpus in a cycle of analysis

called 'reiteration' (Åkerlind, 2005; Walsh, 2000), until the categories were determined. In the second stage, I compared the data from subsequent interviews for each student and coded the data based on the predetermined categories; the data from the observations and other sources further refined and illustrated the categories. As I compared and categorized the data, I returned to my participant log to map commonalities in how students spoke about their pre-course experiences and backgrounds; these commonalities and their thematic descriptions of conceptions are presented as findings.

Findings

The findings of this study on preconceptions are presented by research question.

Research question 1: What are students' preconceptions of architectural design, practice, and the profession at the start of a beginning architecture design course?

Conceptions of Design Process

The students' conceptions of the design process varied in focus; some students' descriptions were focused on the beginning stages (i.e. formulating initial ideas) while others were focused on the end product (i.e. final designs, evaluation, and judgement). The outcome of the conceptions of the design process is represented in Table 2.

Table 2: Students' conception of the design process

Conceptions	Sub-conceptions	Description
Formulating	Identifying	Students' recognition of the problem situation, and its component parts; "naming" the design situation.
	Framing	Students' recognition of the need to see the design situation in a specific way, unique to their own through processes; "seeing as".
Representing	Drawing, modeling, and craft	The importance of drawing for formulating ideas and iterations, as well as a high level of craft so the design is accurately portrayed.
Moving	Documenting moves	Documenting changes to show thought process.
	Keep moving, "getting through"	Devote time, withhold fears to keep moving.
Evaluating	Subjectivity	Students' recognition that the evaluation of design moves is subjective to the principles and values of the critic (self and others).

Students conceptualized the design process as "formulating ideas", such as "identifying" and "framing" design problems. "Identifying" included students' recognition of design problems as situations and identifying the components or parts that make up the design situations. "Framing" included conceptions related to seeing the design situation in a way that is unique to their own processes and experiences.

There was also equal emphasis on representation, particularly the importance of drawing, modeling, and craft. Drawing and modeling were seen as an important way to represent design ideas, with the opinion that the higher the craft and technical skill of the representation, the more "accurately" the representation will portray the design.

"Moving", or making changes to the design through an iterative process, was conceptualized as both documenting changes and the rapid pace of changes. Students also felt it was important to the design process to keep documentation of changes as the design progressed. Students also said "keeping moving" was an important part of the design, "pushing worry to the back of your mind" was an important part of the design process, including devoting the time and effort to the design and withholding fear of making mistakes.

Students conceptualized evaluation as part of the design process, but spoke about evaluation with less frequency than the other categories of conception. All of students' conceptualizations of evaluating designs focused on subjective evaluation, emphasizing that judgement of the quality of the design is mainly based on the principles and values of the critic. For most, the opinion of the instructor had the final say on quality. Students also felt it was important not to take criticism too personally. For some, the apparent subjective nature of evaluating "good" design was confusing and frustrating.

Conceptions of Architecture Practice

Students' conceptions of architectural practice were less varied than conceptions of the design process. However, I noticed students mainly articulated their conceptions of architecture practice by describing the value of architecture and in turn, their motivation to become architects. Students' conceptions of architecture practice were characterized by internal or external orientations, and within those categories, various habits of mind and descriptions of "good" architectural practice. The outcome of conceptions of architectural practice is illustrated in Table 3.

Table 3: Students' conceptions of architecture practice

Conceptions	Sub-conceptions	Description
"Internal" orientations	Pressure	Being deadline-driven; having a product by a certain deadline.
	Interdisciplinary	Having an interdisciplinary mindset; combination of science, math, engineering and art.
"External" orientations	Collaboration	Working with others on a team; open to others' contributions.
	Human-centered	Making social change happen; designing for and with people; connecting with other people.

Students who conceptualized architecture practice with an internal orientation described the type of "mindset" young architects need to have to be successful. For many, being an interdisciplinary thinker, or having the ability to solve problems both rationally and creatively, were important mindsets for

architecture practice. Students also stated that it is important for architects to be deadline-driven, and be able to respond well under pressure.

However, most students cited external orientations, such as working with others and being "human-centered" as important skills for architecture practice. Students said that being able to work well with others, whether on team projects during architecture school or later as a professional working with engineers, project managers, and clients, was an important skill of architecture practice. Others pushed this conceptualization further, and said that architecture practice is "human-centered", implying that architecture practice means working with and for people, and "making connections" with others. A few students felt that architecture practice should be a catalyst for social change, and felt it was important architects care about social issues and think "beyond just designing a space."

Conceptions of the Architectural Profession

Students' conceptions of the architecture profession were limited and showed less variation than conceptualizations of design and architecture practice, as illustrated in Table 4.

When asked about their conceptions of a "professional" architect, a few confessed they didn't really know what a professional architect does in their day to day practice. For those that attempted to describe the job of a professional architect, I found little variation in their descriptions. Most felt that going into architecture would result in a "good" job, and results in able to make a living being creative, unlike other disciplines. Others described the actions and products of professional architecture practice, such as measuring spaces and producing drawings. I noticed, however, students also felt that architecture school did not mimic architecture practice in the "real world". Finally, students felt that an important aspect of architecture practice is using "architectural language and jargon…so that employers know what you're talking about." Sounding like an architect was an important goal for students in AD 1.

Table 4: Students' conceptions of the architectural profession

Conceptions	Sub-conceptions	Description
A "good" job		Focused on the employment outcomes; ability to earn a living being creative.
Versus architecture school		Conceptualized as different from what and how students learn in architecture school.
Professional actions and language	Language	Knowing the language is seen important to being "taken seriously" as an architect.
	Actions, or the "doing" of architecture	Focused on the actions of professional architecture practice.

Research question 2: How do the preconceptions vary based on students' backgrounds and pre-collegiate experiences?

Variation in Conceptions of Process

Although student's conceptions of the design process were the most varied, I was unable to attribute this variation to great differences in students' backgrounds or pre-collegiate experiences. I did discover, however, that the students who were designated as high-achieving, due to their participation in the university's honors program, placed emphasis on representation and evaluation in their conceptions of the design process, more so than their peers. Others focused on the "thinking" aspects of designing, and these students had an interest or experience in the study of humanities and social sciences.

Variations in Conceptions Practice

Although there was less variation in conception of architecture practice, the variation that did exist was be attributed to differences in students' social identities. I noticed that the students that identified as "non-traditional" or older students, students of color, and female students demonstrated predominantly external orientations, such as architecture as human-centered practice, design for social justice, and an emphasis on social skills and collaboration. The students who identified as international students spoke frequently about the need to "give back" to their home countries. I also noticed that all the students that identified as female, and none that identified as male, conceptualized architecture as an interdisciplinary field.

Variations in Conceptions of Profession

Students' conceptions of the architectural profession were limited, even for those who had an architect in their family background. I discovered that students who had little to no coursework in art and design before entering design school were the students who felt the day-to-day work of an architect was at odds with what they were learning in architecture school, frequently commenting on how and what they were learning is not, according to their conceptions, what "real architects" do.

Research question 3: In what ways do these preconceptions inform how students made meaning of their learning in the course?

Variations in conception had a relationship with how students made meaning of their learning later in the course. For example, students who emphasized representation and evaluation in the design process were also the high-achieving students coming into the course. I noticed that over time these same students frequently equated the "investment" of their time and effort with the high quality of their work, frequently compared themselves to their peers, and often sought the recognition and approval from faculty and other "high achieving" peers as motivation to learn.

I also found that students who focused on the ideation and reasoning processes in designing were also those who had studied or were studying humanities or social sciences as well as architecture. For these students, they continued to focus on their idea generation and their reasoning processes as the "strengths" they bring to architecture. For example, Brady, who often described parallels between his

interest in political science with what he was learning in architecture, felt his perceived strength was idea generation and seeing a problem from multiple perspectives. Interestingly, he also felt tensions with the use of precedent, struggling with how he was trying to 'fit' his new understanding of the role of precedent with his previous understandings of where design ideas "came from". In another example, Allison, who studied the humanities, described her method of "using three words" as a heuristic for idea generation. Later in the course, Allison learned to rely on this method to give justification to her design decisions in her iterative process.

Students of color and women, who had predominantly external orientations in conceptions of architectural practice, also frequently cited their peers as sources of influence and learning. For example, Raven spoke of discussions with her peers in studio as "chances for inspiration" and frequently listening in on others critiques afforded vicarious learning experiences. However, some students with diverse social identities and external orientations of architecture practice also felt tensions between their values, what they were learning in the course, and perceptions on how their work was evaluated. For example, John cited an example of when he felt that he didn't get the same level of review as his peers on a project, and wondered if he was just too "different" from his peers. "Maybe people just didn't like my project….what was wrong with it, why didn't [faculty] want to review me? I'm not going to say I was insulted or anything like that. But I was hurt. I was bummed... I just kind of gave up."

Discussion and Recommendations

The findings of this study illustrate students' preconceptions of design, architecture practice, and the architectural profession in a beginning architecture course. The findings also demonstrate how the preconceptions vary based on students' backgrounds and pre-collegiate experiences, and the ways preconceptions inform how students made meaning of their learning in the course. The discussion of the findings of this study, and the implications and recommendations offered herein, are intended to enhance course design and current teaching methods in architecture rather than replace them.

Conceptions of the design process were the most descriptive and varied. This is perhaps testament to the effectiveness of the foundational design year as an introduction to design and getting students on the 'same page'. What is interesting to note, however, is the variation in students' foci of the design process, which could be evidence of conceptual change, e.g. the aspects of the process that were new or most profound to them (diSessa, 2014). Asking students to conceptualize the design process, in their own words, at the end of foundation/beginning of introductory course gives insight into students' conceptual change and provides a foundation for instructors to build new learning.

Although students had slightly more limited conceptions of architecture practice, those that did spoke about architecture practice in terms of values and habits of mind. Their bigger picture conceptions of architecture practice provide insight into students' values that can be tapped into to leverage engagement. This is particularly salient for students who have been traditionally underrepresented in architecture education. It is not the goal of this research to identify if these conceptions of architecture practice are in fact misconceptions or superficial ones. What is evident, however, is that students' motivations for entering the architecture profession, at this early stage, are very value-driven.

Likewise, focusing on metacognitive skills as well as knowledge and procedural skills engages students in architecture learning. Even early in the course, students recognized that architecture learning and practice means using interdisciplinary thinking and habits of mind. Also, the interdisciplinary nature of architecture study is what attracted students to architecture, particularly for the women in this study. To leverage this, instructors should focus the interdisciplinary skills used in architecture practice as a way to engage students in their learning. Also, asking students to regularly reflect on how what they are learning in architecture is integrated with their everyday life (and vice versa) also keeps their learning as relevant and helps to eliminate "the confusion and isolation of design knowledge from everyday knowledge" (Lawson & Dorst, 2009, p. 264).

There are limitations to this research that must also be acknowledged, the largest of which is the recognition of the role of studio culture and the hidden curriculum in architecture that has been written about extensively elsewhere (see, for example, Anthony, 2012; Dutton, 1991). Although I did not approach this study through a critical lens, I noticed issues of power and positionality in this study that warrant mention, especially evident in the gendered way students spoke about the qualities of a "good" or successful architect. The lack of a critical lens of studio culture in this study may be considered a limitation of this research.

Conclusion

The call for papers for the 2018 Beginning Design Conference asked, "Should beginning design education serve as a formalized and unified restart for all students, regardless of their point of entry?" I assert that such a 'restart' is not possible, nor is it productive to assume students can and should unlearn their previous understandings to be successful design learners. This study has demonstrated the ways students' previous knowledge informs their new learning. An instructor in AD 1 said, "…we build layers of experience that make us know who we are and what we know." It was my goal that, through sharing the students' experiences of learning in AD 1, we might have a better understanding of how students' preconceptions of design and architecture inform who they are and what they know as they join the community of architecture practice.

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