Chapter 5 Teaching a Broad Discipline: The Critical Role of Text Based Learning to Building Disciplinary Literacy in Architectural Education

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Architecture, in words

Architecture is the art which so disposes and adorns the edifices raised by man, for whatsoever uses, that the sight of them may contribute to his mental health, power, and pleasure. (Ruskin, 1989, p. 8)

The Architect, by his arrangement of forms, realizes an order which is pure creation of his spirit; by forms and shapes he affects our senses to an acute degree and provokes plastic emotions; by the relationships which he creates he wakes profound echoes in us, he gives us the measure of an order which we feel to be in accordance with that of our own world, he determines the various movements of our heart and of our understanding; it is then that we experience the senses of beauty. (Le Corbusier, 1986, p. 1)

The Classical Orders, by means of tectonic order, celebrate the laws of both physical and human nature. In this sense Classical architecture - and by extension, traditional architecture in general - is neither an arbitrary adornment of building nor the inevitable causal outcome of building technique. Rather it is the symbolic form that man gives to his building craft when he imitates such craft by means of tectonics. That is why architecture makes us see the building craft from which it is born, from which it detaches itself as art, and to which it always alludes. (Porphyrios, 1991, p. 52.)

This collection of quotes comes from a modest collection of books in a personal library of an architect and professor. As each spine is cracked for the first time in a while, the reader senses an entry point, a return to something cherished from the past, a refresher of something lost to memory, or the exhilaration of starting a new journey. The writing of architects, historians, theorists, critics, building scientists, engineers, scholars is an inextricable piece of the great ageless discipline of architecture, linking the reader to an ancient past or thrusting her into the promise of a better future.

Access through this threshold stands open to all who seek the richness and cultivation encapsulated in the literature. Indeed, across the globe architecture students for generations have delved into this literature, seeking a sense of belonging within the intellectual culture of this venerable discipline. This literature provides is a central component of the critical path to disciplinary literacy in architecture, with the commensurate ability to fully participate as a practitioner, theorist, or scholar. But not all students cross this threshold easily, as it is text-based, with active, careful reading required for successful entry. Contemporary students of architecture, like many students in other disciplines, face myriad reading and text-based learning challenges or competing interests blocking passage: frustration from poor comprehension, unsuccessful application of learning strategies, conflicting priorities between academic work and personal time, work-avoidance goals, sense of the lack of intrinsic value of reading (Hoeft, 2012).

Like other disciplines, many architecture courses rely on student reading as an important component of learning. Less common are the courses where faculty explicitly help students with the reading challenges they face. Architecture faculty may believe reading skills are the students' responsibility and should have been already acquired and developed (Wambach, 1998; Hoeft,

2012). Where reading is resisted and/or rare in a student's education, deep learning and awareness of the meaning and significance of architecture that these quotes articulate is hampered, thereby impeding the growth of student's disciplinary literacy (Fang, 2012). While other forms of communication and media may provide alternative sources for learning and developing disciplinary literacy, texts remain the primary repository par excellence of the rich and diverse body of knowledge and ideas available to the 21st century architecture student (Ockman, 2012).

This chapter seeks to provide a guide to engaging students with architectural texts to facilitate building their disciplinary literacy. It focuses on helping architecture faculty work explicitly and implicitly to increase their students' dedication to reading and reading effectiveness to support this goal. The importance of expanding reading integration and support is discussed and exemplified in case studies as central to the facilitation of developing disciplinary literacy, both through course work as well as self-directed learning. Much of this chapter applies to undergraduate students, but it may be useful for consideration of graduate teaching as well. Ultimately, this purposeful emphasis on reading in architectural education can help faculty build a teaching culture that enables students to grow confidently in their engagement with the rich literature that widens and deepens their appreciation, understanding, intellectual growth, but, most importantly, full immersion in the noble discipline of architecture.

Breadth of Architectural Education and the Role of Text-based Learning

Architectural education has inherent challenges stemming from the breadth of this discipline that seeks balance between science and art. The wide range of required skills for successful practice outlined by Vitruvius is carried into the 21st century by reflection on

contemporary architectural education and practice and codified in registration and accreditation boards. Vitruvius emphasized that the architect should be a person "of letters, a skillful draughtsman, a mathematician, familiar with scientific inquires, a diligent student of philosophy, acquainted with music; not ignorant of medicine, learned in the responses of jurisconsults, familiar with astronomy and astronomical calculations" (Granger, 1995, p. 9). Joan Ockman outlines the complexity of architectural education as combining "technics and aesthetics, sciences and humanities." She goes on to describe the "highly disparate types of knowledge" schools must impart, "negotiating the architect's multiple identities as craftsman, technician, and creative artist; professional and intellectual; public servant and businessman" (Ockman, 2012). The National Architectural Accreditation Board requires accredited degree programs to provide evidence of student learning in the categories of Critical Thinking and Representation, Building Practices, Technical Skills and Knowledge, Integrated Architectural Solutions, and Professional Practice (NAAB, 2014). From the list of skills and knowledge from the ancient world to Joan Ockman's recent summary, the individual seeking the professional title of architect needs to be well-rounded and capable of analysis of complex and multifaceted issues and synthesizing broad knowledge through a focused creative process.

In this breadth of concerns and complex identities, the discipline demands more of the student than mere content knowledge. The student must come to an awareness of the role of architecture in society, in the history of diverse civilizations, its meaning and significance to each culture, the way it communicates ideas and mirrors or enhances culture, the iconographic potential of architecture, the tectonic language that ties architecture to history, material, methods of making and crafting. Without this literacy, architecture loses value and meaning in culture. Indeed, critiques of the consumerist/formalist crisis in architectural practice in the 21st century

may be linked to a lack of deep disciplinary literacy that starts with the education of architecture students (Salingaros & Masden II, 2008).

Professional architecture degree programs are required to expose their students to the broad scope of the discipline. Non-professional degree programs are typically more focused on particular aspects of practice, but still contend with a broad scope of skills and knowledge. In either case, reading, especially reading outside the classroom, persists as a critical activity expected by the faculty for the acquisition of knowledge and understanding of discipline content. Reading also is likely implicitly relied on to provide the foundation for disciplinary literacy in most degree programs, where the deep learning of the meaning and language of architecture, the development of cognitive processing at increasingly higher levels of sophistication is expected to originate and be nurtured. Students who are challenged by learning through text, however, are placed at a significant disadvantage in their development of disciplinary literacy in these conditions.

Challenges to Reading in Architectural Education

In the highly competitive employment marketplace, disciplinary literacy offers students an opportunity to distinguish themselves, with the ability to participate in broad or deep discussions of architecture, analyzing and synthesizing ideas simultaneously with their demonstration of technical proficiency. This literacy can be acquired to a large degree through active, guided engagement with the rich literature on architecture. Although reading skills are foundational to development of disciplinary literacy, they are likely to have effectively diminished in the last few decades, following trends across disciplines in higher education (Ryan, 2006; Hoeft, 2012). Indeed, a broad examination of architectural education reveals

students struggling to communicate in professional settings, a symptom of challenges with skills and knowledge linked to disciplinary literacy and reading (Boyer & Mitgang, 1996). This trend will undoubtedly continue without a change of approach to curriculum development and teaching. Curiously, however, reading in architectural education is a rare topic in the disciplinary literature. The lack of attention to student reading in the literature or the classroom is not necessarily resulting from any conscious change of pedagogy, but from a number of factors prevalent in the contemporary architecture classroom.

Factors that Undermine Reading in Architectural Education

There are many factors that undermine reading in architectural education, thereby impacting the depth of students' disciplinary literacy. These include the overarching emphasis on the design studio, the prioritizing of hard skills, the tactic acceptance of students' lack of engagement with texts, the nature of architectural texts, and deficient cultural literacy demanded by texts.

Impact of the domination of the design studio. The design studio remains the heart of architectural education (Anthony, 1991; Boyer & Mitgang, 1996; Salama & Wilkinson, 2007, Ockman, 2012). The creative process of design captivates students and demands significant time and effort on their part. Faculty apply their own experience of design studio to their courses, with expectations centered on long hours of creative exploration, development of ideas, and sophisticated presentations. Reading in this mode of architectural education is not commonly integrated, leaving text-based learning relegated to other parts of the curriculum. Students recognize the importance of design studio to their education and give it priority, leaving little time and energy for reading in their other courses.

Impact of emphasis on hard skills. There is a persistent historic culture of architectural education that centers on hard skills as the key to employment and a career (Boyer & Mitgang, 1996; Johnston, 2005). In the past these skills centered on mechanical drafting; today they focus on digital tools for drafting and modeling, building information modeling (BIM), rendering, and fabrication. The dichotomy between practical and theoretical knowledge that emerges where hard skills dominate in architectural education can diminish the emphasis on historical, theoretical, and general education learning and contribute to the reduction of the exploration of ideas and concepts through architectural texts.

Implicit acceptance of avoidance of reading. Diminished dedication to reading in architectural education can result from the combination of student and faculty inattention and/or implicit acceptance of performance goals that allow reading to become effectively optional (Lei et al., 2010; Wambach, 1998). The development of the course syllabus and the tools for grading and assessment may have the intention of requiring student reading, but may actually allow students to bypass this requirement (Hoeft, 2012). Students seeking the most efficient path to a passing grade will focus their reading efforts in a such a way as to be able to perform on a quiz or exam or in a class discussion, thus determining their reading persistence and depth of engagement (Roberts & Roberts, 2008; Ambrose et al., 2010). Tensions impacting student motivation may also effect their dedication to reading (Ambrose et al., 2010).

Diverse types of texts in architectural education. Active reading is foundational to entry level access and higher levels of learning in a wide range of subtopics that pertain to the discipline, including the history of the art of building; the evolution of aesthetic, compositional, and conceptual ideas that drive architectural design, refinement, and innovation; the broad questions relating to human habitat and urban/rural settlement; the science of materials and

assemblies; the ethical urgency and strategies to reduce global warming and responsibly practice in response to climate change; the social implications of planning and development; and the legal regulations that ensure health and safety. The use of language and vocabulary as well as the functions and purposes of these texts vary considerably, thereby requiring students to use different cognitive strategies in the reading process. For example, reading and interpreting the legal language of the building code is a very different activity from reading historical analysis of architectural design. Where faculty do not explicitly assist students in navigating this diverse and challenging disciplinary literature, students may struggle to meaningfully engage with these texts.

Continued prominence of architectural texts in print. Reading in architectural education is also impacted by the nature of and access to architectural texts. While access to free online journals is increasing, a significant portion of important architectural literature online is still found behind paywalls while print books still occupy a central place in disciplinary publication (Alger, 2010). The expense of accessing books or online journals is a first level impediment to student reading, but it is not the only one. Library collections supporting architecture programs are most likely well stocked with the seminal works, but even free access does not ensure use (Alger, 2010). Efficient internet searches for information erode the students' interaction with print texts while students' lack of information literacy results in the loss of quality control on the reading that students *actually* do. Students need motivation and explicit encouragement to engage with the curated texts found in college libraries. The library should serve as a critical space for architecture students' learning, but it likely does not happen organically in the 21st century.

Cultural literacy demanded by architectural texts. Architectural texts also commonly assume a "cultural literacy" that the reader brings to the text. When familiarity with the common knowledge, background knowledge, cultural codes in architecture is lacking, it creates a disconnect between the text and the reader that is difficult to counteract (Bean, 2011). Similarly, vocabulary and syntax present significant barriers to reading effectiveness (Bean, 2011). When vocabulary needs to be understood both in terms of definition but also disciplinary context that is not yet presented as part of the curriculum, students struggle, impacting their motivation and persistence to learn through texts (Bean, 2011). If reading is to be a vibrant, persistent, meaningful activity that is central to student development of disciplinary literacy, faculty must consciously reflect on these issues and apply strategies to address them.

Key Learning Principles Impacting Text-Based Learning in Architectural Education

The revitalization of text-based learning to support disciplinary literacy in architectural education should pay special attention to entry level students. These students have the highest potential for significant variation in college preparedness and established skills. Entry level students also have the highest potential for benefiting from the positive impacts of specific strategies to engage them and help them become better learners (Kuh, 2007). This obliges faculty to pay attention to the factors that impact the effectiveness of student learning in general, and learning through text specifically. Outlined below are four principles that are particularly important to developing strategies that support text-based learning in architectural education: prior knowledge, knowledge organization, student motivation, and meaningful learning.

Prior knowledge of architecture and its role in society. Faculty need to be cognizant of the students' prior knowledge of the discipline at the beginning of each semester. (Ambrose et al., 2010). Entry level architecture students' prior knowledge of the discipline may be insufficient, inaccurate, or inactive (Ambrose et al, 2010). These students may not see architecture as a rich discipline where science and art are synthesized but more like a trade involved in building construction. Their first-hand experience of great buildings may be limited and/or cursory. To improve the reception of new knowledge and the students' ability to learn, faculty must be aware of the sufficiency and accuracy of student prior knowledge and to ensure that it is activated and developed when the new material is presented in the course (Ambrose et al, 2010).

Knowledge organization of the myriad concepts in the discipline. Students need to learn how to structure the new knowledge they are obtaining in their courses. They need to visualize the relationships, associations, and connections between this new material and what they already know and develop an "organized representation" of the larger body of material (Ambrose et al., 2010, p. 42). This learning principle is particularly important to architectural education where the diversity of the subtopics results in an exceptionally large body of material to synthesize and fit together into an organized understanding of the discipline. As the practice of architecture demands synthesis of complex requirements and concerns, seeing the connectiveness of the many issues at play, and organizing them into a cohesive whole, the development of knowledge organization is critical to architecture students' growth in the discipline.

Student motivation in the discipline. With the emphasis on the design studio, it is important to consider the motivations that impact study habits of architecture students. Student

motivation impacts the "direction, intensity, persistence, and quality of the learning behaviors in which students engage" (Ambrose et al., 2010, p. 68-69). When students are not in the classroom, many competing interests will impact how they study and how they see the connections between out-of-class work and their overall learning. Where students are motivated to perform well in design studio, much of their time out of the classroom will be dedicated to this work and may lead to the sacrifice of other modes of studying and learning required for their other classes. If most of their text-based learning takes place in classes other than studio and this reading work requires significant time that competes with design studio work, this component of learning hinges significantly on each students' motivation and the specific goals that direct her behavior.

Meaningful learning as a path to disciplinary literacy. Dedicated and motivated engagement with the text is an important step, but it does not ensure meaningful learning on its own. Architecture faculty need to reflect on the nature of learning through the diverse texts of the discipline and how to cultivate deep learning through them. Richard Mayer (2002) offers three possible outcomes as a result of student reading: no learning, rote learning, or meaningful learning. The outcome of student reading is dependent on the cognitive processes students are applying when they read. Students are conditioned to see memorizing as the core goal of reading, but recalling information alone does not lead to meaningful learning, especially in a discipline with a broad range of knowledge that needs to be synthesized. Meaningful learning requires students to move beyond the basic activity of memorizing to the higher order cognitive processes of understanding, applying, analyzing, evaluating, and creating (Mayer, 2002). This in turn requires faculty to reflect on the way they organize their course and the activities they plan for

students, with special attention dedicated to fostering active reading and developing students' disciplinary literacy.

Strategies to Enhance Disciplinary Literacy in Architectural Education

As text-based learning is a central activity for developing disciplinary literacy in architectural education, below there are a number of strategies for the integration and enhancement of text-based learning in courses with potential to facilitate students' increasing engagement with architectural texts and compliment and deepen their learning. Two case studies are provided as examples of the application of these strategies in two of the critical courses in architecture curricula: the design studio and building science courses.

Strategies Especially Applicable to Early Years in the Curriculum

New students in undergraduate architecture programs may have varying skills and knowledge of the discipline as they start their studies. The strategies below seek to provide early students with foundational develop of disciplinary literacy to help them succeed as they progress into higher levels of the curriculum.

Formative assessment and course adjustment. In first-year courses in architectural education, it is importance to consider some sort of assessment that can help the faculty member gain perspective on the students' preparedness for deep learning in the discipline. The findings of assessments can guide faculty adjustments to the curriculum, course content, and teaching methods to the needs of the cohort, which may vary year to year, in particular bridging any gaps in prior knowledge and base skills. For example, a common challenge for new students is their

proficiency in understanding architectural concepts and ideas presented in texts and architectural drawings. Texts may be challenging if they require prior knowledge and vocabulary new to the students. Architectural drawings may be more challenging for the students to "read" and understand than faculty appreciate, especially two-dimensional drawings, due to their abstract nature. These challenges often coincide with a lack of vocabulary and terminology related to architectural concepts, conventions, and drawing techniques. These challenges can have a profound impact on student understanding of readings, assignments, and discussions if they are not explicitly addressed.

To understand the preparedness of the students in the course, an initial short reading assessment can be designed to measure the incoming students' reading skills and general knowledge of the discipline as well as specific vocabulary and terminology, usually consisting of 2-3 pages of text and 6-10 short answer questions designed to address reading comprehension, analysis, context, and evaluation. This can be combined with an assessment designed to measure students' experience with reading architectural drawings. The drawing assessment can ask groups of students to sort scrambled drawings of a group of buildings, identifying each unique building and grouping the drawing sets accordingly (Figure 5.1). Together these assessments offer insight into students' disciplinary knowledge and their preparedness for building a foundation of disciplinary literacy.

Figure 5.1 Students sort drawings into organized sets to assess their experience of reading architectural drawings. Photo by Jason Montgomery.

The results of these assessments can guide the faculty in the development of discussions focused at the right level for the cohort on how architect's communicate ideas through text and drawings. Where the assessments reveal students struggling with both text and drawings, the professor can scaffold cognitive skills while addressing prior knowledge gaps. One strategy is to integrate a seminar in class where a foundational reading that provides critical base knowledge is read out loud and discussed, with the faculty member guiding students through the reading while actively modeling engaged interaction with the text through diagramming and annotating. This can be followed by group activities that build familiarity with two-dimensional and three-dimensional architectural drawing with an annotation component that can help students build their vocabulary of architectural elements and understanding of terms related to drawings and drawing conventions. The faculty member can prime the students with a Socratic discussion that probes why text-based learning and reading architectural drawings is so challenging for first-year students, helping them reflect metacognitively on their learning needs.

Scaffolding knowledge organization. Student disciplinary literacy is critically linked to their skill of organizing the broad knowledge of architecture, linking new knowledge to existing knowledge in a structured way. There are explicit strategies that support the development of architecture students' skill to organize knowledge. One strategy is to map the course content directly in the syllabus, illustrating the concepts presented and how they relate to each other. This map can help students build a mental picture of the concepts they are going to learn and allows them to anticipate each transition from one concept to another (figure 5.2). This map serves as an armature for the course readings, giving the students a critical overview before they move into the readings (Maguire, 2015). It also models techniques the students can apply to their study techniques.

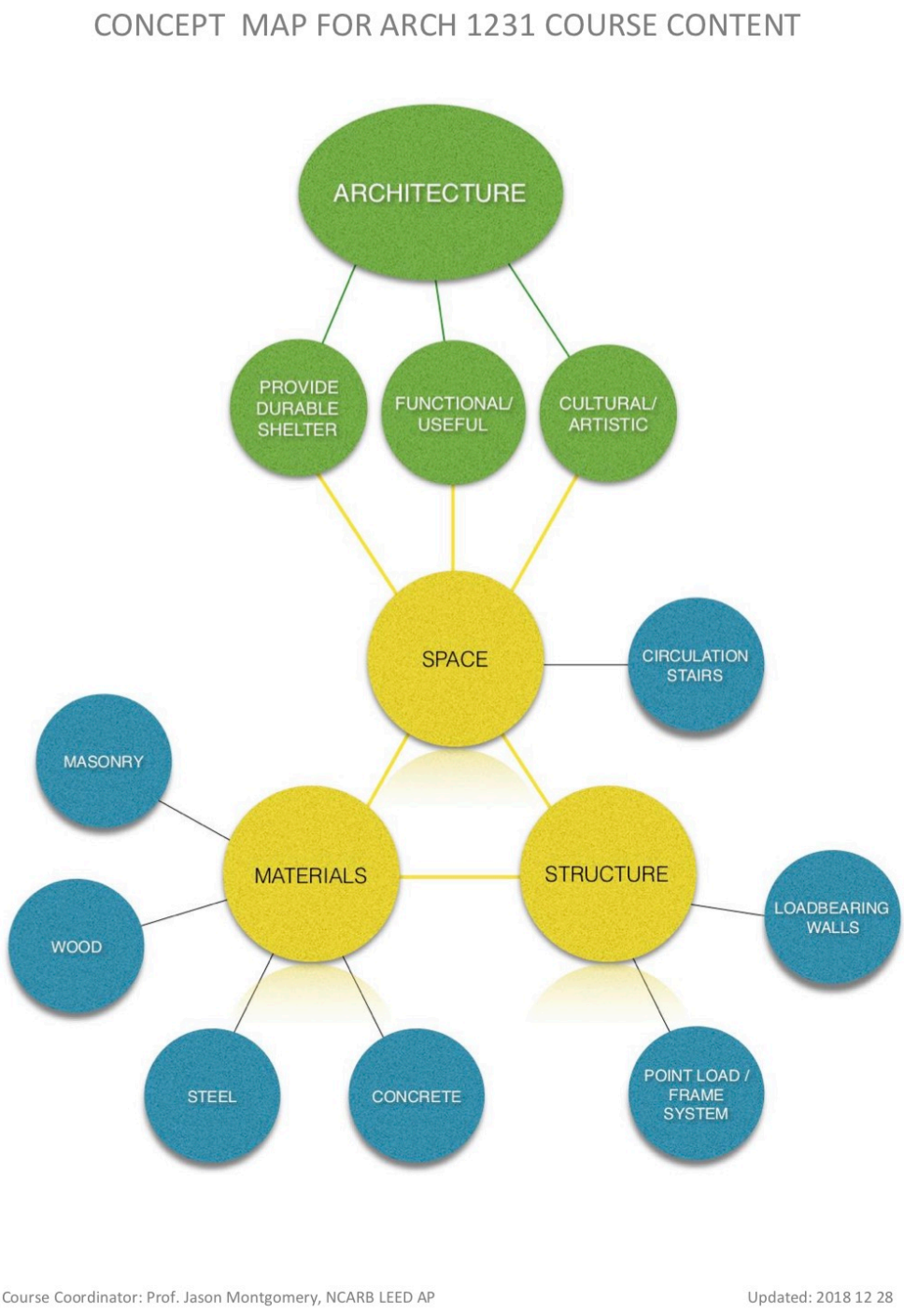
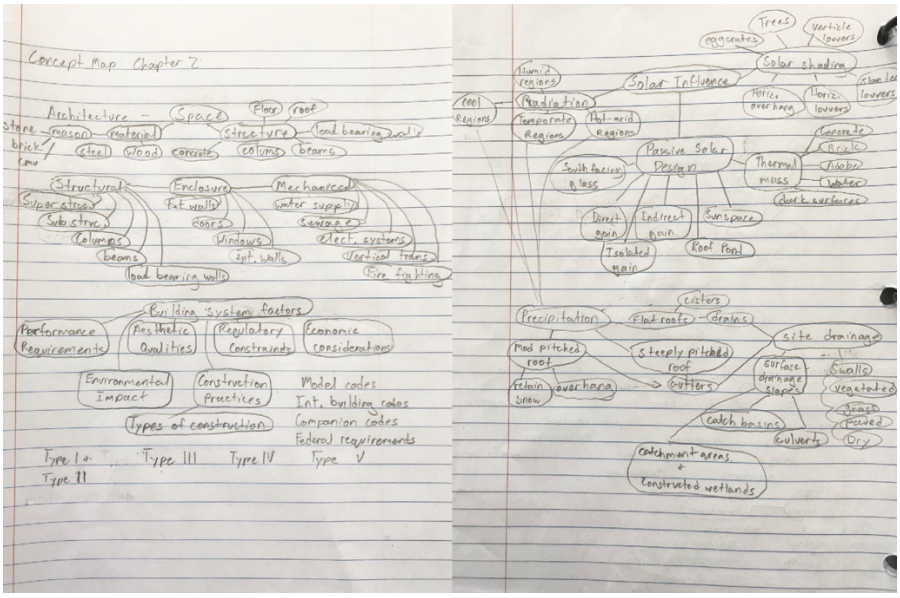


Figure 5.2 Concept map for an introductory building science class course content. Jason Montgomery

Concept mapping, diagraming, and graphic organizers are particularly useful as study tools in architectural education where visual learners can use them in a structured way to build a more sophisticated knowledge organization. These tools can help facilitate students' navigation of the broad complexity of architecture as a discipline and place their learning in one course in the broader context of the discipline, or to organize the detailed concepts presented in an assigned reading. Concept maps, diagrams, and graphic organizers can help students focus on the bigger picture understanding of the *relationships* between the concepts discussed in class and in the readings, counteracting the students' tendency to focus merely on rote memorization of information. Faculty can require this approach to note-taking (figure 5.3), emphasizing that concept maps can be applied at any scale of information, zooming out to see the whole and zooming in to see the detail, much as they do in the development of architectural drawings. Faculty can model mapping for the students as an integral part of class lectures and discussions and explicitly stress knowledge organization as a critical activity for growth in disciplinary literacy.



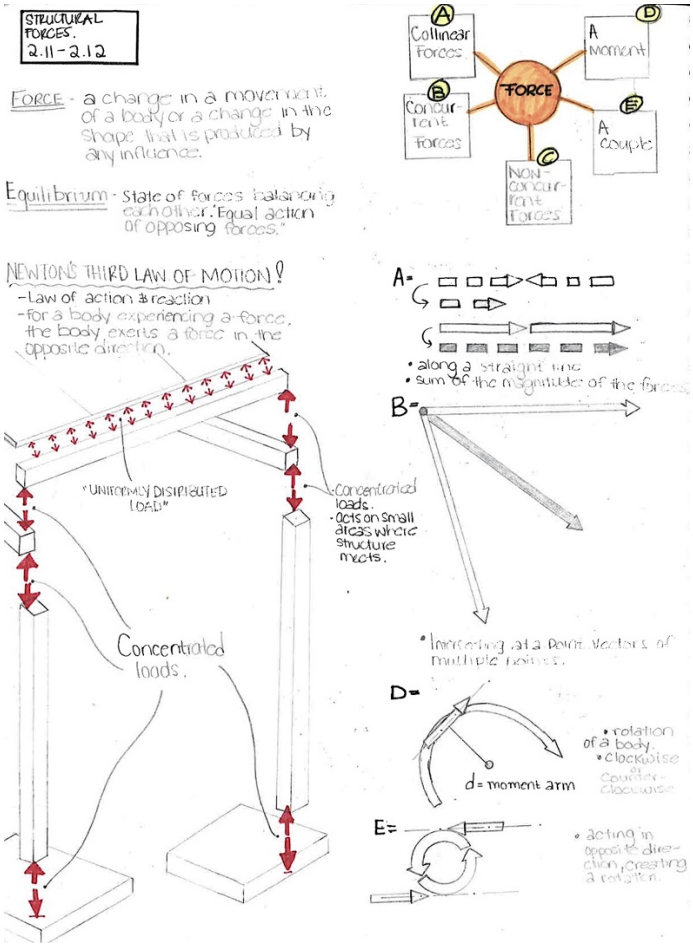


Figure 5.3 Example of student application of graphic diagramming and concept mapping to their note-taking.

Motivating student reading. With reading and learning through text serving as a central activity for building disciplinary literacy in architecture, every course in architectural education offers the opportunity to find ways to build the students' motivation to persist and commit themselves to reading and learning through text. As student motivation is often linked to grades, one strategy can leverage this motivation by tracking student reading through note-taking, graphic organizers, and concept maps that are submitted on a regular schedule (see note-taking tracking discussion below). This strategy demonstrates the importance the faculty member places on reading in the course, hold the students accountable, and helps establish a base value of text-based learning for the students (Ambrose et al., 2010).

Another strategy for motivating students to commit themselves to text-based learning is to require regular reflections on the readings. Asking students to reflect on each reading helps them contemplate and recognize the value of reading to their learning. Reflection can also serve to increase confidence in reading and learning through the text, working towards a positive feedback loop motivating increased commitment to reading (Ambrose et al., 2010). Reflection can also promote analysis and synthesis skills that build disciplinary literacy.

Architecture faculty can also seek to motivate students to read by linking the course content to real-world issues to help students see higher value of their academic learning to their future professional career path (Ambrose et al., 2010). Faculty integration of recently published articles or studies on important issues concerning the built environment demonstrates the relevance of the course content to the students. The use of articles or studies published through mainstream media sources, trade publications, and academic journals expands the available reading materials to this wider range of literature beyond the classic textbook.

For example, in a course presenting materials of construction, the reinvigoration of the use of timber in construction for its environmental benefits and innovative use in urban high-rise construction can be presented through main stream media articles in outlets like the BBC. While the textbook outlines the well-established properties of wood and its typical applications, the news articles can report on cutting edge applications written for a general audience. This strategy provides text that is less intimidating than the technical density and style of the textbook prose, serving as a scaffolding strategy to build reading motivation and confidence.

Deeper learning through linking text, first-hand experience, and visual thinking. Deeping learning in the discipline is enhanced when students can associate text-based knowledge with other contexts. One strategy is to include direct experiences of the built environment as a purposeful component of the course. At a building or construction site students can apply their skills of careful observation and visual thinking to construct knowledge from first-hand experience and see connections between this knowledge and the concepts and ideas discussed in the readings. Visual thinking provides an excellent alternative approach that balances with text-based learning, and acts as a scaffold to help visual learners improve their reading effectiveness (Arnheim, 1969).

Local sites can be selected for their relationship to the course readings. For example, a course on structures can incorporate site visits to bring students up close to salient examples of the concepts and systems reviewed in the text, such as the compressive and tensile stress in the structural components of a bridge. A visit to a renovated historic warehouse offers the study of walls, arches, lintels, beams, joists, and posts working together as an integrated system. Standing below the arches while observing carefully the post and beam system that structures the space for modern offices allows the students to connect directly to the volumetric nature of the elements,

sense their distribution of the heavy loads of the building, see them in a contemporary context, and analyze the role of each component as they are prompted by probing questions of the faculty member. This approach is intended to embolden active participation of students, where discussion and careful observation in the field draw them into a high level of engagement with the concepts and vocabulary discussed in the course (see the discussion of the walking seminar below).

Applying metacognition to reading strategies. In order for text-based learning to be meaningful to the development of disciplinary literacy, reading skills must be nurtured and developed incrementally (Bean, 2011) in combination with metacognitive skills that help students look at their reading and study habits with a critical eye (McGuire, 2007). Explicit discussion with students can help them understand that reading may be challenging and that there are strategies and various approaches to the reading process that may help them (Bean, 2011). This discussion should include the presentation of the taxonomy of different types of learning to help students recalibrate their views of the learning process and their role in it (Bloom, 1956; Ambrose et al., 2007; Mayer, 2002; McGuire, 2007, 2015). Strategies can be applied to the course that embed the metacognitive aspect, such as learning logs and exit slips.

The metacognitive skills that improve reading effectiveness enhance disciplinary literacy in architecture more broadly. The discipline of self-critique and metacognition helps architecture students develop their strategies for problem solving and the design process through a critical lens, evaluating the effectiveness of their strategies progressively so they can improve their learning (see problem-based learning discussion below). It creates a synergy between improving text-based learning and their overall development and application of metacognitive processes in the discipline.

Developing active reading strategies. Among the most important strategies for enhancing disciplinary literacy through improving student reading effectiveness is the integration of active reading strategies. While common strategies such as annotation of the text are useful for developing discernment of the hierarchy of information and keywords and definitions, strategies that focus on the big picture and the connections between topics are particularly useful for this broad discipline.

One active reading strategy that helps focus the students on the big picture of the text is SQ3R (Survey, Question, Read, Recite, Review). This strategy guides students of architecture to start their engagement with the text at a macro scale, supporting their formulation and focus on the overarching nature of the topic, establish its context, and see the critical relationships of the topic before delving into details. Surveying technical readings on building performance, for example, by previewing headings, drawings, diagrams, and photographs, helps the students understand the nature of this technical concept as well as the multiple layers of subtopics that fit within this category before tackling the highly technical concepts such as R-value, thermal bridging, or condensation. Similarly, architectural history texts can be surveyed and previewed to help students move beyond a chronological understanding of periods and memorization of names and dates to see more universal themes of stylistic characteristics, cultural contexts, and theoretical movements. When they are not clear on context and big relationships, this strategy encourages them to identify questions and actively search the text to answer them. This strategy can be facilitated with worksheets and guides provided to the students. The worksheets can be reviewed together and demonstrated in class with a sample text. Students can be encouraged to submit their completed worksheets for extra credit. The discipline of seeing the whole and understanding its nature before diving into the details promoted by SQ3R is a synergistic skill

valuable to managing the complexity and diversity of architectural texts and making connections across the discipline.

Concept mapping, noted above for its benefits to knowledge organization, should also be noted as an active learning strategy that has similar benefits to SQ3R. The graphic mapping of concepts and their relationships expressing a hierarchal order is a powerful tool for students to mine the meaning of the reading and to activate an analytical cognitive process while reading (Lei et al., 2010; Bean 2011). Concept mapping, like SQ3R, naturally links to core aspects of architectural thinking, like the analysis of design problems and client space and flow requirements, where organization and study of relationships in a hierarchal structure are critical skills.

Active reading documents (ARD) are another variation of these strategies that offer a structure for student interaction with the text. ARD prompt student attention to genre, hierarchy, and organization of the text, identification and definition of keywords, concepts, and vocabulary, and activation of cognitive analytical processes seeking connections both within the text and beyond the text. This strategy encourages faculty to develop customized worksheets that guide the students reading, encouraging multiple levels of interaction with the text. For example, students can be asked to answer questions focused on foundational knowledge found in the text and identify the genre of the text. They can then be asked to construct a lecture to teach the content in the reading to others. Finally, they can be prompted to diagram how the reading content integrates with larger themes in the course or across courses (Barkley & Major, 2018). This strategy also encourages use of diagramming and sketching that allow visual learners to explore the relationships graphically (Dubas & Toledo, 2015). Like the other active learning techniques discussed, ARD are well suited to the support of disciplinary literacy in architectural

education, especially through the emphasis on identifying the genre and relationship of the text to the larger discipline so that students keep this context and awareness of intent and purpose in the foreground while they read (Cabral & Tavares, 2002).

Design Studio Pedagogy: Applying Problem-based Learning to Integrate Text-based Research and Apply Metacognitive Skills

The heart of contemporary architectural education, the design studio, is an environment for learning that stresses the creativity and aesthetic vision of the student but also their conceptual, analytical and synthetic thinking and the logic of their argumentation. The history of architectural education reveals a wide range of possible modes of learning while recent examinations of architectural education encourage innovation and creativity in the reform or remaking of design studio pedagogy (Anthony, 1991; Boyer & Mitgang, 1996; Salingaros & Masden 2008; Ockman, 2012). There is room for exploration, integration, and application of approaches to learning that either draw from enhanced historical modes or from other disciplines, including learning through observation and research, problem-based learning, experiential learning, and inquiry-based learning (Ware, 1866; Salama, 2010). Within this range of approaches there is likely significant untapped potential for both leveraging the unique nature of text-based learning in architectural education and explicitly supporting active reading and overall disciplinary literacy.

Problem-based learning (PBL) offers a structure that can guide the integration of text-based learning into the design studio as a regular and significant component. PBL is intended to be structured as an explicit cycle of learning that includes the following steps: problem scenario, identify facts, generate hypothesis, identify knowledge deficiencies, apply new knowledge,

abstraction, and evaluation (Hmelo-Silver, 2004). The application of this structure offers a solution to a common critique of design studio pedagogy: the potential for students to come to see their efforts to solve the problem as the end in itself, without consciously building on their existing skills and knowledge and integrating new knowledge and skills as they progress in their education. In this way, studio exercises may become rote rather than meaningful, self-referential rather than transferable (Anthony, 1991; Salama & Wilkinson, 2007). Application of PBL to design studio pedagogy addresses this critique through the critical steps of the learning cycle of identifying the limits of existing knowledge, identifying what new knowledge is necessary to solve the problem, conducting the research that constructs this new knowledge, and reflecting on the learning process to prepare for higher level execution in the next project. Research here is a key strategy that many reformers recommend for integration in the design studio (Anthony, 1991; Salingaros & Masden, 2008). The integration of text-based research in combination with an explicit metacognitive learning approach has great potential to be a central feature of the reform of the design studio, taking advantage of PBL pedagogy.

Another significant critique of the current culture of design studio education is that studio pedagogy creates a barrier to synthesis of knowledge, as the focus on abstract and subjective creativity "seduces" students to the extent that they are unable to see links between the practical and evidence-based knowledge from other parts of the curriculum, reinforcing the silo effect (Salingaros and Masden, 2008). To counter this subjectivity and reinforce integration of knowledge, studios can apply the PBL learning cycle with an integrated seminar that combines with an initial assignment to serve as the research component of the learning cycle, providing a review of the key literature on the studio topic, exposing students to critical thinking on the topic

through text-based learning, and offering a foundation of knowledge that they can apply more objectively to their design process.

Case Studies on Restructuring Design and Technical Courses with Text-based Components

With the above explorations of enhancing disciplinary literacy in architectural education, two case studies are presented here as examples of the application of a number of these strategies in live courses in an undergraduate architecture degree program.

Urban Design Studio with an Integrated Research Seminar

In a studio that introduces students to urban design, the PBL cycle was applied to explore the question of how to develop new neighborhoods in urban centers. As a starting point, a literature review would provide students with grounding in urban theory to begin to formulate guiding principles for their design approach. To this end, a research seminar was integrated to provide a review of seminal writing on cities and urban design including Camillo Sitte, Le Corbusier, Jane Jacobs, Colin Rowe, Leon Krier, and Rem Koolhaus. In addition, an interdisciplinary module was introduced, focused on happiness research and its application to cities. This seminar and module ran parallel to a series of studio assignments that started with neighborhood analysis and led up to a large-scale masterplan.

Students who are working at the urban scale for the first time often lack the knowledge base and experience that allows them to shift from the architectural project to the neighborhood or city scale. In this case, students were asked to reflect on the brief and their site analysis and develop a list of key principles that should guide their neighborhood design. Together these activities comprised the initial stages of the PBL cycle, with the establishment of the problem scenario, identifying base facts (site analysis), and developing a hypothesis (design principles).

Reflection on prior knowledge and experience continued in the PBL cycle, identifying the limits of existing knowledge. Initial reflections revealed the students had little knowledge and experience of thinking about and designing at the neighborhood scale. The first assignment worked to address this. It asked students to research their own neighborhoods, documenting the key features: urban structure, building and block typologies, use patterns, nodes and networks, boundaries, public space, centers of activity… The students then zoomed into the scale of a block, documenting building massing, figure ground, building typologies, and street sections. This research assignment provided students with a deeper knowledge of urban neighborhoods and helped them understand what knowledge they needed to continue to acquire to design a new neighborhood in the city.

Parallel to this initial assignment, the seminar introduced them to a wide range of theoretical views of cities and neighborhoods, serving as the literature review of the research. This included the interdisciplinary module on happiness scholarship, which consisted of seminar discussions, a visit to a museum exhibition, and outside-the-class readings. The contrasting urban theories and happiness research presented the students with multiple theoretical viewpoints to draw upon while the neighborhood analysis gave them an objective understanding of an extant urban condition to help them interpret and evaluate the urban theories. The seminar, while serving this critical role in the PBL cycle, also facilitated enhancement of the reading effectiveness and text-based learning through discussion, argumentation, and evaluation, challenging the students to think and interact with the texts at higher levels of learning taxonomy (Mayer, 2002).

From this stage of the PBL learning cycle, the students began in earnest to develop their projects, applying the new knowledge gained from the research seminar and assignment.

Working in teams the students reviewed their initial set of principles and re-evaluated them with the new knowledge they gained from the neighborhood analysis and the seminar. Their revised set of principles then guided their execution of the masterplan, representing the abstraction and summary of their new knowledge.

The student reflections on the seminar experience provide important insight to their view of this approach, and the key impacts on their learning. A range of responses reveal that some students benefited from the seminar as they would not likely have read the text independently while others expressed discomfort with reading out loud in the classroom. The students also gravitate in their reflections to the module on happiness studies, noting that this contemporary research made the project feel more relevant and helped them understand how urban design impacts people's daily life. It was also more accessible to many students compared to the urban theory presented in the seminal works. Overall the students reflect positively on the benefit of the research seminar to provide context and alternative viewpoints that can help them form a deeper view of the subject of urban design and help them develop a design strategy that builds on this new knowledge.

Integration of reading through the PBL learning cycle in the studio is a natural response to the critique of the shortcomings of contemporary design studio pedagogy and supports four important goals:

- Text-based research in the studio allows faculty to embed seminal scholarship in the studio pedagogy, elevating students' critical thinking past the practical or form centered concerns of the presented problem.

- Second, it emphasizes research as a standard component of the design process. This is particularly important as the disciplinary knowledge is rapidly expanding with new techniques for building based on the changing environmental conditions across the globe.
- Third, it encourages students to build their knowledge base in directed manner following the PBL cycle, both in and outside the classroom.
- Fourth, with the dominate position of design studio in architectural education, integration of reading as a critical component of learning in the studio is a significant opportunity to improve student reading effectiveness for architecture students.

Focused Text-based Learning in Building Science Pedagogy

A first-year building science course in an open enrollment architectural technology degree program provides a case study of the factors that may impede text-based learning in these important courses. In open enrollment programs, many students are less prepared for college and have not developed strong study habits and skills in their high school years. Working while taking classes, an increasingly likely condition for many college students facing high education costs, may compound these students' challenges, resulting in reduced time for out-of-classroom work, especially weekly reading. Students facing these challenges are often eager for the least demanding and most efficient path to pass the course. Additionally, students who are inexperienced with self-directed learning may take a relatively passive approach to their coursework, waiting at each stage of the class for the professor to tell them what they need to do. The combination of the desire for efficiency and passive dependency on the professor does not

serve the interest of the student developing meaningful learning goals and self-directed learning skills, and likely results in neglect of text-based learning outside the classroom.

This course previously followed a traditional building science course format, including weekly lectures, out-of-class readings, and quizzes in combination with drawing assignments where the concepts presented in the lectures are applied. The quizzes were administered with the intention to "force" the students to read each week. A final exam of 60 questions largely taken from the quizzes was given on the last day of the semester. A study of three sections totaling 56 students over two semesters revealed a 69% average across the 9 quizzes. The average on the final exam in the same three sections was 64%. The passing rate for this course, below 70%, was among the lowest in the department.

The poor performance in these sections raised the question of the effectiveness of the learning in general, and in particular the dedication to the weekly reading assignments and the general effectiveness of student reading. The results of the final exam were evidence of poor understanding of important concepts presented in the course and/or poor study habits and exam preparation. Depending on motivations and learning goals, students may have been choosing the path of least resistance and accepting a low score on a quiz in exchange for the release from spending out-of-class time reading and preparing for the quiz (Roberts & Roberts, 2008; Ambrose et al., 2010; Burchfield & Sappington, 2000). Alternatively, students may ascertain from experience that everything they need from the text is presented in the lecture, relying on the professor to sort and provide a structure of the information covered in the text, thereby making actual engagement with the text superficial or in their view unnecessary (Wambach, 1998; Bean 2011).

In addition, the lecture format suffers from the general critique of the tendency for a passive learning environment (Bligh, 2000; Michel, Cater, &Varela, 2009; Roehl et al., 2013; Werner et al., 2018; Cummings, 2018). The combination of lecture focused class time and poor reading dedication out-of-class generates a feedback loop, where faculty tend to try to compensate for the lack of reading by covering the material in their lectures (Wambach, 1998; Bean, 2011). If students neglect the reading, the efficacy of learning through lecture-based courses is adversely impacted and opportunities for students to practice and improve reading effectiveness is diminished. Faculty and students alike can fall into a trap of conscious but tacit acceptance of insufficient or outright abandonment of reading (Hoeft, 2012; Ryan, 2006; Carkenord, 1994). Lecture-based building science courses, therefore, are likely fertile places for exploration of re-emphasis on engagement with the text and nurturing meaningful text-based learning.

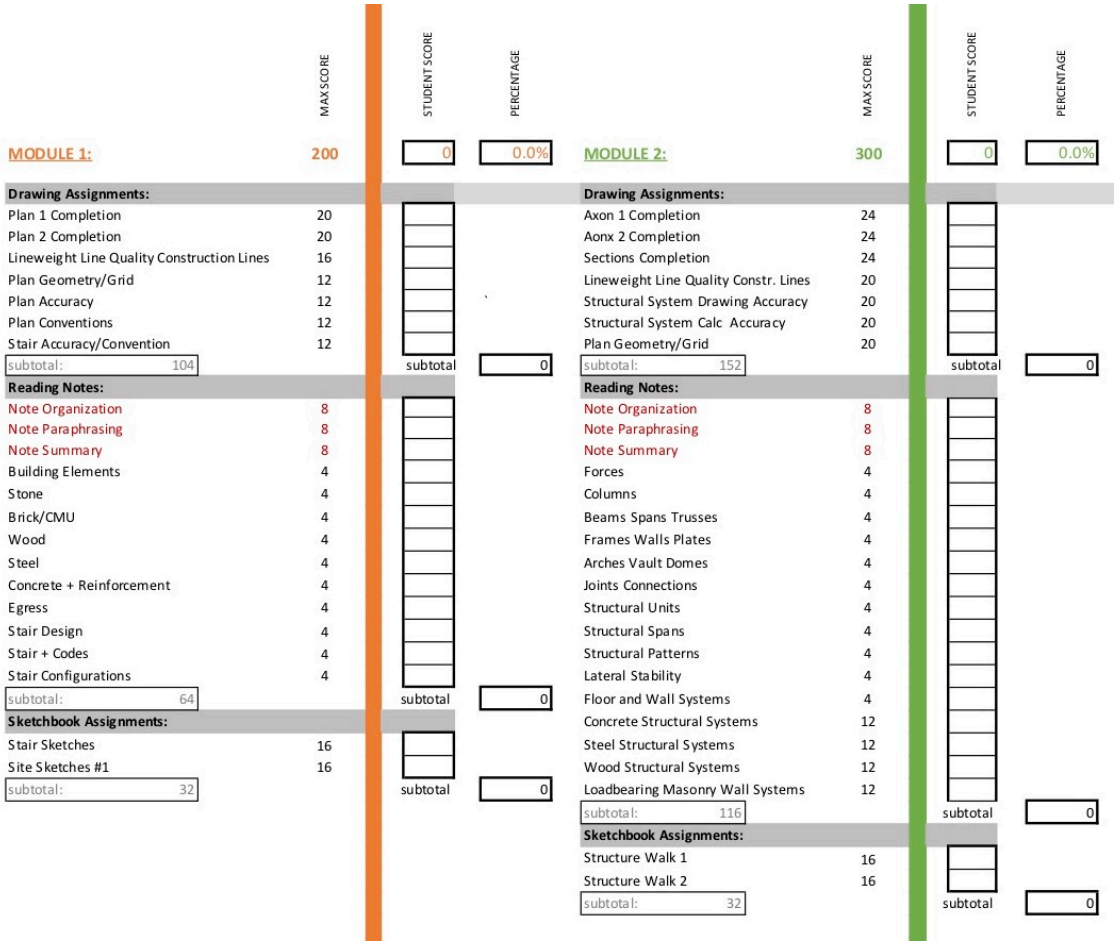
If lectures, reading, quizzes and a final were not resulting in meaningful learning in general and brought into question the dedication to reading outside the classroom, a different strategy could be developed with the goal to reinforce the central role of the text in the learning process and be designed to allow more direct monitoring of the student engagement with the text. Five strategies were adopted to refocus the dedication to text-based learning in the course: a major emphasis on note-taking, reflection utilizing open pedagogy (post a reflection and/or summary), application of reading material directly into the lab assignments, on site investigations/seminars (the walking seminar), and discussion rather than lecture.

Note-taking from the text out-of-class. With students often neglecting out-of-class reading, finding a mechanism that motivates students to engage with the text is important. Note-taking can be a scaffolded process that builds a structure and method for student interaction with

the text with multiple benefits. As students may not have good techniques for effective note-taking entering college, scaffolded strategies can provide a step by step guide that builds this skill for application in any course (Katayama & Robinson, 2000). As care and completeness of notes co-relates to higher levels of achievement, emphasis on tracking note coverage supports students' learning beyond the particular course (Jairam et al., 2014). Note-taking while reading offers students an active reading study strategy with the opportunity to build a concept map that organizes the new information (Ambrose et al., 2010). It is a central activity to the encoding and recall of knowledge, (Katayama & Robinson, 2000; Kiewra et al., 1989; Dyer et al., 1979), especially students lacking prior knowledge (Kiewra, 1989). Note-taking combines with reading strategies like SQ3R (described above) or SOAR to help students work through a text with deeper learning (Huber, 2004; McGuire & McGuire, 2015; Jairam et al., 2014). The SOAR study method is particularly useful for architecture students as its process utilizes cognitive practices that are highly applicable to disciplinary practices (Fang, 2012; Jairam et al., 2014).

In this course, readings are carefully selected from Francis Ching's *Building Construction Illustrated.* The reading assignments take advantage of the organizational structure of the textbook, where topics are covered in short focused and heavily illustrated sections, often one to two pages in length. This focused subdivision of the text in the assigned readings allows more meticulous tracking of student reading through their note submissions, with points allocated for each focused topic. Each submission of notes can earn points against a rubric score they are given at the beginning of the semester to make clear the expectations for their submissions. For example, students can earn points for their note organization, paraphrasing, and summary, as well as section coverage (Figure 5.4). Models of note-taking best practices (Cornell notes, graphic organizers, concept mapping) are presented to the students to scaffold development of a

clear structure for their notes that reflects the hierarchy and structure of concepts discussed. The models also reinforce the benefits of paraphrasing and the value of summarizing. Coverage can be measured based on inclusion of the major and minor headings in the text with key concepts noted or diagramed and key vocabulary defined. With the fine grain coverage tracking, students see grade value in covering all the sections of the required readings, and the faculty can monitor directly how engaged the students are with the text. This approach, similar to the emphasis in the SOAR study method, places a priority on completeness of the notes (Jairam et al., 2014).



	MAX SCORE	STUDENT SCORE	PERCENTAGE
MODULE 1:	200	0	0.0%
Drawing Assignments:			
Plan 1 Completion	20		
Plan 2 Completion	20		
Lineweight Line Quality Construction Lines	16		
Plan Geometry/Grid	12		
Plan Accuracy	12		
Plan Conventions	12		
Stair Accuracy/Convention	12		
subtotal: 104		subtotal	0
Reading Notes:			
Note Organization	8		
Note Paraphrasing	8		
Note Summary	8		
Building Elements	4		
Stone	4		
Brick/CMU	4		
Wood	4		
Steel	4		
Concrete + Reinforcement	4		
Egress	4		
Stair Design	4		
Stair + Codes	4		
Stair Configurations	4		
subtotal: 64		subtotal	0
Sketchbook Assignments:			
Stair Sketches	16		
Site Sketches #1	16		
subtotal: 32		subtotal	0

	MAX SCORE	STUDENT SCORE	PERCENTAGE
MODULE 2:	300	0	0.0%
Drawing Assignments:			
Axon 1 Completion	24		
Aonx 2 Completion	24		
Sections Completion	24		
Lineweight Line Quality Constr. Lines	20		
Structural System Drawing Accuracy	20		
Structural System Calc Accuracy	20		
Plan Geometry/Grid	20		
subtotal: 152		subtotal	0
Reading Notes:			
Note Organization	8		
Note Paraphrasing	8		
Note Summary	8		
Forces	4		
Columns	4		
Beams Spans Trusses	4		
Frames Walls Plates	4		
Arches Vault Domes	4		
Joints Connections	4		
Structural Units	4		
Structural Spans	4		
Structural Patterns	4		
Lateral Stability	4		
Floor and Wall Systems	4		
Concrete Structural Systems	12		
Steel Structural Systems	12		
Wood Structural Systems	12		
Loadbearing Masonry Wall Systems	12		
subtotal: 116		subtotal	0
Sketchbook Assignments:			
Structure Walk 1	16		
Structure Walk 2	16		
subtotal: 32		subtotal	0

Figure 5.4. Fine-grained tracking of assigned readings in student grade spreadsheet. Jason Montgomery

Student notes for grade credit can be submitted directly through collection of the notebooks, but this requires a quick turnaround in the review and grading process as the notebooks are an everyday tool throughout the semester. An alternative strategy is to require scans or careful photographs of the notes organized in a pdf file for digital submission.

This strategy of note-taking from the text is enhanced when note-taking is handwritten for similar reasons that handwritten notes during lectures have been shown to have an advantage over typed notes (Mueller & Oppenheimer, 2014). In addition, architecture students are able to integrate sketches and diagrams from the text into their notes, combing text-based and visual learning. Handwritten notes encourage discernment in the information recorded, helping students recognize the hierarchy of information from the text. This is particularly important in technical texts on topics like building science, where major concepts need to be understood before nuanced details can be grasped.

The notebook in this strategy serves as a critical tool in class lectures or discussions. Note-taking out-of-class builds experience that can be leveraged when taking notes in class during a lecture or discussion, encouraging more active engagement. Faculty can continue the scaffolding of note-taking with in-class activities, including reflection on learning at the end of the class.

Note-taking from the text as part of the grade for the class generates a personal learning artifact in the hands of the students that they can use every day and carry forward, building on knowledge from one class to the next. This strategy can be coordinated across multiple courses either within a linked sequence of technical courses on building science or across all courses, including design studio.

The out of class site visits (like the walking seminar mentioned below) offer opportunities for developing the skill of taking visual notes, capturing data from observed conditions in the built environment. This reinforces a core activity for architecture students, serving as a critical tool and process for visual thinking and learning (Arnheim 1969; Crowe & Hurt, 1986). Linking visual note-taking and text note-taking cultivates an integration of learning across domains and contexts in the architecture curriculum, breaking down silos and encouraging students to transfer and apply knowledge from one context to another.

Note-taking strategies are powerful tools that contribute to building disciplinary literacy. The SOAR study method in particular, with its focus on selection, organization, association, and regulation, mimics steps commonly applied in a design process where selection and organization are key activities in the formation of the parti. The SOAR method also includes overlapping components with place-based learning where associations are made between text-based learning and real examples in the field, as well as problem-based learning where metacognitive reflection critically identifies what was learned through the design process (Jairam et al., 2014).

Open pedagogy: posting reflections and summaries. Faculty can further track student engagement with the reading through reflections and/or summaries of the readings posted to an online course site. These posts can be made public so students can see each other's posts to motivate their participation and to provide some peer perspectives on learning in the course. Reflections serve as a learning log, aiding the development of a critical view of their learning process (Baker, 2003; Wagner, 2003).

Application in drawing assignments. Application is an excellent measure of student understanding of the critical concepts presented in the text. Assignments can be tailored to

require specific knowledge from the text, with variables added to avoid rote reproduction from the text. One example is a structural exercise using a case study building as a base for exploration of span, material, and structural system configurations. The assignment builds on a series of readings from Ching's *Building Construction Illustrated* that start with the materials of construction and their properties for use in structure, discussion of forces and fundamental structural elements, spans, and finally structural systems. Each student is assigned a specific structural system and set of variables. Each structural system description includes rules of thumb that students can use to size each element. The variables and different assigned systems provide a diverse set of solutions across the class, facilitating a rich discussion in the review of the assignment.

To complete the assignment, students must have acquired the requisite knowledge from the text for their assigned system. They also need to demonstrate both two and three-dimensional understanding of each element in axonometric views of the system as well as dimensioned sections of each element (Figure 5.5). Each student is further required to include their calculations for all elements of the system and to provide a reference for the page(s) in the text where they found the rules of thumb. The drawing assignment replaces the quizzes as the tool for both motivating engagement with the text as well as assessment of the quality of that engagement.

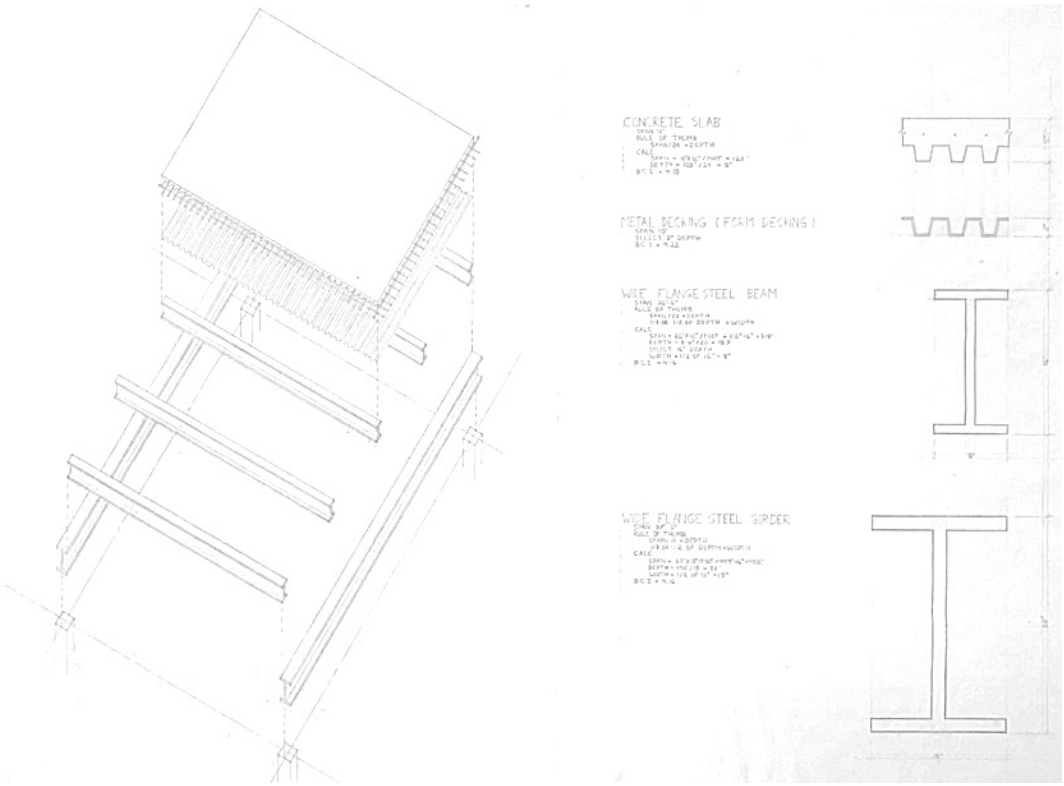


Figure 5.5 Student application of reading materials in structural assignment. Tasfia Amir. Spring 2018.

The walking seminar: adapting a form of experiential learning. The dual goal of addressing the shortcomings of the traditional lecture and the cultivation of students' text-based learning offers the opportunity to seek strategies that link these learning modes with each supporting the other. In architectural education, the built environment is a laboratory for learning that provides direct experience that can be a powerful aid in activating prior knowledge (Salama, 2010). Students of architecture may understand that the built environment is the focus of their education, but they may not be experienced in looking carefully and making observations when they are out in the streets of their neighborhood, town, or city. In addition, they may not intuitively draw from their prior experience of the built environment until prompted. Direct experience of the built environment is particularly efficacious for building science courses.

Taking the students out of the classroom into the streets offers students sensory and dynamic interaction with the built environment, helping them see aspects of it that they have not really paid attention to in the past, and make real-world associations with the concepts in their readings. This approach has great potential to activate what they know about buildings and gives them a platform to construct new knowledge.

The lecture taken out into the streets becomes a "walking seminar" where the faculty member can coordinate an active experiential learning environment that either supplements the classroom lecture or replaces it altogether (Salama, 2010). Working with the students in the field, the faculty member can actively assess the prior knowledge of the students, determining its accuracy and if it is sufficient for the concepts and topics presented in the course. Where it is insufficient, the gaps can be filled through drawing special attention to particular aspects of the buildings in the field, using direct sensory experience, careful observation, sketchbook documentation (visual and text notes) as the tools for learning. This experience is supported by and in turn supports engagement with the text, linking the text to the real world and helping students visualize concepts that may have otherwise challenged them.

The walking seminar can be highly interactive, with the Socratic dialectic method of questioning and probing used in place of didactic methods. Students can see and feel the elements and spaces discussed in the text, directly experiencing their materiality and volume. The directness and specificity of this experience connects the walking seminar to the practice of place-based learning, where students can begin to construct knowledge for themselves rather than merely receive knowledge (Smith, 2002). It models self-directed and independent learning where the students can begin to pay attention to the built environment they experience every day

in a new way on their own, making their day to day experience of the built environment a part of their life-long learning (Salama, 2010).

Faculty can curate the walking seminars to hone in on particular content of the course. In this building science course, many aspects of building systems and performance are observed and studied in the field, including a survey of the commonly used building materials (wood, brick, stone, concrete, and steel), or structural systems (lightwood frame, load-bearing masonry, steel or concrete frame), or building envelope approaches (masonry cladding, curtain wall, window wall). For example, to explore exterior envelopes, students in the case study course were taken on a walking seminar of the neighborhood of downtown Brooklyn, where buildings of various age and construction types offered close up examination of the performance of the exterior walls. Students were able to examine buildings exhibiting signs of problems in the envelop, including a curtain wall with severe condensation buildup inside the insulated glass unit and an exterior cladding with impact damage revealing its delicate cross section of Styrofoam insulation with a thin stucco outer layer which made plain its vulnerability in an urban environment. The student observations and discussion were highly animated, demonstrating a high level of engagement. Student reflections confirm that these experiences motivate them to pay more attention to the built environment on a regular basis.

The walking seminar, while an obvious approach to teaching architecture, is not leveraged as much as it can be, with logistical steps required, time limitations, and inclement weather as potential barriers. Nonetheless, this approach is a powerful mode for learning, and offers a rich experience that reinforces, clarifies, and illustrates the topics learned through the text.

Discussion rather than lecture. Although the distinction seems subtle, it is important to recognize the difference between a lecture and a class discussion. Faculty focused on discussion rather than lecture can reconfigure the classroom to de-emphasize the hierarchical arrangement and bring the students into a more intimate setting. Discussion opens the door to a less formal sequence of review of the topic and the use of questions to draw out students' knowledge from the readings. Faculty can work through the topic with a series of prompts and questions to the students, who can use their notebooks to bring their knowledge gained from the text into the discussion. This approach holds students more accountable for their engagement with the readings and their preparation before class. Discussion can eliminate the passive presentation of the same content as the reading material and focus more on helping students with the difficult concepts brought up through their feedback.

Student Testimonial on the Impact of These Strategies on Her Learning

Student feedback on the integration of many of these strategies demonstrates they appreciate the impact it has on their study habits and growing confidence with disciplinary literacy. This student was eager to share her feedback:

> The understanding of summarizing, highlighting and sketching in any reading is important for a student's education. In my second year of college I was taking many classes, most of them requiring reading. One of the courses caught my attention, Building Technology II with Professor Montgomery. This class combined drawing assignments and weekly reading. This course required us to take notes, highlight the text, and sketch important concepts from the paragraphs, sentences, and words in the book. At the beginning, because of my lack of knowledge, I thought it was a waste of my time as a

student; I thought ‘it’s a lot of work’. Little did I know that later on while I was constantly doing this, my brain was capturing and understanding how building codes, materials, wall details, and construction all come together when buildings are assembled. At the end of the semester I was able to engage in conversations that I was avoiding before taking Building Tech. The learning process was difficult but the reward I will carry with me for a lifetime. Although summarizing, highlighting and sketching is not a requirement in other classes or in my daily life I use it as a weapon against my mental laziness. Every time I apply summarizing, highlighting and sketching my mind holds the information unconsciously; now I just don’t memorize, I learn. (Arianna Kevelier, 2019)

General Critiques of Architectural Education and the Role of Reading in Curriculum Reform

A number of critical examinations of architectural education call for reform of curriculum and pedagogy (Anthony, 1991; Boyer & Mitgang, 1996; Salingaros & Masden 2008; Ockman, 2012). An extensive survey of architectural programs published in1996 revealed a deficiency in the emphasis on a liberal education balance to the practical and technical teaching in architectural curriculum, with general education skills lacking, especially among students graduating from undergraduate architecture programs (Boyer & Mitgang, 1996). A more recent study charts the role of text in architectural education, but ponders the current and future role of text-based learning (Ockman, 2012). These studies document a well understood reality in architectural education: design education dominates, with other courses seen as expendable by students. Students make the effort to pass these courses but meaningful learning is sacrificed for

efficiency so that more time can be dedicated to the design studio work. General education skills, especially writing and communication skills are particularly called out as deficient both by faculty and professionals working with new graduates (Boyer & Mitgang, 1996). Disciplinary literacy stands at the core of these critiques, where students are not just struggling to communicate but to think and communicate like experts. Reading is rarely explicitly mentioned in these critiques but is clearly linked to the students' deficiencies in disciplinary literacy. But text-based learning is also linked to the deficiencies scholars find in design studio pedagogy. Reform of architectural education that responds to these critiques would see text-based learning permeating the full curriculum with explicit support and close attention to its meaningful integration. Placing reading and text-based learning at the core of architectural education opens up its full potential to help students both balance their skills but also go deeper into the discipline.

To reflect on architectural curriculum at the macro level, it is useful to finish this chapter using an armature of key conditions for effective higher education learning to guide thinking on architectural curriculum reform. This armature includes: cumulative learning, integrated learning, progression in learning, and consistency in learning (Engel, 1997).

Cumulative learning emphasizes the repetition of concepts and skills, following a model of introduction and reinforcement with increasing sophistication. Information that is only presented once in a degree program and never applied is hardly useful to students. Student reading will trend towards the superficial if students perceive its relevance is short lived in the curriculum. This is where coordination of text-based learning around critical texts across multiple courses can provide a structure for building knowledge and a more sophisticated

knowledge organization that is appropriate for the complexity and breath of architecture as a discipline.

Integrative Learning requires effort to bring important concepts to bear on the problem at hand anywhere in the curriculum, breaking the barriers that separate content knowledge in architectural education. This issue has been adopted by NAAB as a central component of student performance criteria used to evaluate architecture programs for accreditation. Text-based learning offers a means of bridging gaps and transferring concepts through their application in different contexts. Using multiple texts or text-based research can engage students in developing interdisciplinary connections and a deeper understanding of the interdisciplinarity of architectural practice (Klaassen, 2018).

Progression in Learning requires the expectation of deeper and broader knowledge and skills exhibited in the student work as they move higher in the curriculum. Higher order thinking should become apparent. This is especially important in the design studio, where the range and depth of issues explored should be increasing with each project. Text-based research is uniquely positioned to support this growth through the learning cycle structure offered by problem-based learning.

Consistency in Learning can be applied to faculty working together across the curriculum in a coordinated effort to support and motivate student learning through texts. Faculty need to be trained and supported to facilitate effective, active reading in their classrooms, collectively emphasize its importance to their students, and, through application of agreed upon strategies, enable students to engage in the reading process with consistent discipline-specific literacy strategies (Engel, 1997).

It is also important to reflect on the impact of divergence in architectural education where disciplinary literacy or lack there-of can perpetuate a lack of diverse representation and participation in the discipline. Guided text-based learning, since the establishment of the earliest architecture collegiate programs in the United States, offered a step ladder to higher status in the profession for students that previously may have been relegated to the role of draftsman. A profession seeking increasing diversity needs to pay critical attention to the educational structures that impact the development of disciplinary literacy for students from all backgrounds and at different levels of academic program.

This review of reading effectively in architectural education to promote disciplinary literacy demands both a micro and macro examination of pedagogy and curriculum. Reading effectiveness supporting text-based learning and disciplinary literacy cannot be handled or solved in a small corner of the curriculum, it must become a pervasive, ever present component that offers access to knowledge and fosters growth. Only then will reading be able to fulfill its structural role in each students' educational foundation for disciplinary literacy and a life-long career in the discipline.

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