Collaboratively Crafting a Unique Architecture Education Through MODEL Assessment

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INTRODUCTION

There is a need for a procedure to identify a faculty's collective theory of how architectural expertise develops that does not dilute each faculty member's unique contribution. We show that this is actually a complex of three problems and provide our solution to all three:

1. How can we obtain individual faculty member's theories of the development of architectural expertise?
2. How can we obtain consensus among the various theories provided by the faculty members?
3. How can we align this consensus with the Student Performance Criteria of the National Architectural Accreditation Board (NAAB)?

Architecture expertise is both backward looking and forward looking. It integrates multiple academic disciplines including design, engineering, ethics, ecology and the social sciences. Consequently, architectural education needs to be simultaneously instructivist and constructivist. The challenge for both students and programs comes in the synthesis of these two methodologies. On top of the extensive knowledge base necessary to practice architecture, effective architectural education depends on education related sciences such as cognitive science, educational research and cultural psychology. Accreditation agencies for both architectural programs and general higher education support the natural integration of disciplinary expertise with educational science. Such agencies demand accurate public description of program benefits to students and assessment research designed to enhance these benefits. In addition, the NAAB requires that programs develop a unique educational identity. The challenge addressed by this project is how to integrate senior faculty architectural expertise with educational science expertise in order to collaboratively craft an innovative program that affords maximum benefit to students.

THE SCAD ARCHITECTURE PROGRAM

The Savannah College of Art and Design (SCAD) Department of Architecture is one of eighteen United States architecture programs that confer a five-year Master of Architecture degree, including Cornell University, Tulane University, University of Oregon, et al. First year degree-seeking students at SCAD begin with a curriculum similar to the Bauhaus program that emphasizes exposure to the entirety of design disciplines and arts. The shared foundation platform ensures all graduates a fine arts exposure where students manipulate the principles and elements of art while developing technical skills with various tools and media. Through foundation studies, students expand their critical thinking abilities and deepen their understanding of visual language. They are prepared to evaluate and consider new concepts and materials, encountered in the professional world, (SCAD

course catalog, 2007). The course work during this time of enrollment includes Drawing I, Two-Dimensional Design, Three-Dimensional Design, and Color Theory, taught by Foundations Department faculty. Students seeking degrees in Architecture must also enroll in 'Graphics for the Building Arts' and 'Introduction to Architecture', which are taught by architecture faculty alone. Following the foundation year, students enroll in architecture courses within the architecture program and under the full guidance of the architecture faculty group, with subsequent studios that build design knowledge and complexity as well as companion lecture and seminar courses focusing on technologies, history, and theory.

The SCAD Department of Architecture is rich in faculty member professional and personal experience influencing the pedagogies and learning outcomes of the student body. While the objectives of the syllabi never vary between course sections, the experiences of the student differ due to the individuality of the faculty members. As the institution is a teaching institution, faculty are responsible for research and publication in support of better teaching methodologies and pedagogies. Previously the faculty members relied on their own peer groups of similarly minded faculty to judge student work during critique and final evaluation; typically those faculty members focused on design topics, segregating more concrete knowledge to the lecture hall or classroom. That is not to say the work is not critically reviewed or judged, but rather that the student may not experience the challenging and rich exchange of ideas of higher education and the influencing dialogue available through course and studio faculty linkages.

This project involved collaboration between the Office of Assessment and the Department of Architecture. The first aim of the project was to improve the linkage between studio courses and lecture/seminars. The desired outcome for the 21st century student to think critically and laterally, to create connections between the courses within the curriculum, cannot be the burden of the student alone. The faculty teaching at various levels of instruction must engage such thinking across the curriculum more creatively and analytically. A parallel primary focus is the development of an independent vision of the department and program to relay accurately to the profession, academia and NAAB, which is responsible for accrediting professional degree architecture programs in the United States. Thus, NAAB asserts, "Programs are encouraged to develop unique learning and teaching strategies, methods, and materials to satisfy these criteria…provided the school has a formal evaluation process for assessing student achievement of these criteria and documents the results" (NAAB, 2004). The challenge of this focus was in defining the independent vision of the program, while considering the thirty department faculty members, simultaneously addressing the thirty-four criteria by which NAAB would assess the program, without becoming subservient to the criteria; to not 'teach to the test'.

CODING EXPERTISE DEVELOPMENT

Since many of the NAAB criteria require creative work, the development of unique learning and teaching strategies while assessing student achievement produces two problems. First, reliable assessment has for centuries been equated with objective testing. But objective tests identify answers ahead of time obviating any chance for creativity. Secondly, developing teaching and learning uniqueness has traditionally been based on specialization. But specialization produces jargon and the negative impact of linguistic confusion on architectural collaboration has been known for at least four millennia (the Sumerian legend of Enmerkar's Ziggurat preceded the story of the Tower of Babel by a millennium). The distinction between lecture-based and studio-based learners is an example of specialization inhibiting collaboration.

We solved both problems of reliable assessment and of collaborative teaching and learning uniqueness by creating MODEL rubrics. MODEL is an acronym for Matrices Organized Developmentally through Expertise and Labeling. The solution begins by recognizing that at core they are coding problems: how to easily remember and quickly identify the millions-fold diversity of architectural strategies. Table 1 provides an overview of the origins of MODEL rubrics.

Matrices make possible unique titles for a great variety of items using a relatively small number of terms. Using matrices with only a few terms per dimensions enables very efficient selection within the entire system.

Table 1. MODEL rubrics origins.

Term	Problem	Solution
Matrices	How can we label millions of items without using millions of terms?	Use a multidimensional matrix with each dimension containing several keywords. Label each item by selecting one word from each dimension. Three dimensions with 100 words each provide a million 3-word labels (Dirlam, 1980).
Organized	How can we choose multi-dimensional terms quickly?	Use 4 terms per dimension so that 10 dimensions provide a million 10-word labels (Dirlam, 1973, Simon, 1974)
Develop-mentally	Where can we define terms in multiple dimensions?	The law of succession in developmental research gives a few strategy levels for a great variety of dimensions (Dirlam, 1997 and Dirlam, Gamble & Lloyd, 1999).
Expertise	How can we identify multiple developmental dimensions of strategies?	Ask experts to reorganize their experiences with learners using key ideas from the law of succession (Dirlam, 2007, Gattis & Dirlam, 2008; see Figure 1 and Table 2).
Labeling	How can we combine the insights of many experts?	Group their dimensions together by using keywords and write abstracts of the grouped descriptions (Dirlam & Leong, 2008).

Once the power and efficiency of matrix organization is recognized, the next problem for coding human expertise concerns the source of dimensions. Dirlam (1980) suggested using theories from human development and history as sources. To test this idea, Dirlam (1997) studied 1,222 children's drawings (ages 5 to 19) and Dirlam, Gamble and Lloyd (1999) studied research methods in 912 developmental journal articles (1930 to 1992). There were six drawing dimensions and eleven research dimensions. Each dimension had 4 to 6 codes. Independent raters agreed 85% of the time on each dimension of codes. Ordering the codes by their frequencies over time made them developmental levels. Analysis of the results required a mathematical model of the changing frequencies.

The surprising finding was that in both cases ecology's law of succession fit the data. That model (also called the Lotka-Volterra law) describes the changing frequencies of competing species over time within an ecosystem. Thus, we can describe the changing frequencies of evolutionary, historical and developmental strategies using just four parameters (see Figure 1). These are the initial frequency, the growth rate, the competitive strength and the resource level. The first strategy in a dimension (e.g., scribbles) of course begins with a high frequency, but it neither grows nor competes with other strategies. The second strategy grows fast but is easily replaced or overshoots the resource level and collapses. The third strategy increases in frequency at a moderate rate and is fairly resistant to replacement. The fourth strategy grows very slowly and is highly resistant to replacement. The drawing and developmental research studies were the first to document scientifically an idea discussed since the 19th century. They showed how development is similar across domains in that cognitive development recapitulates history. They also showed that developmental theories are more general sources for human behavior codes than previously imagined.

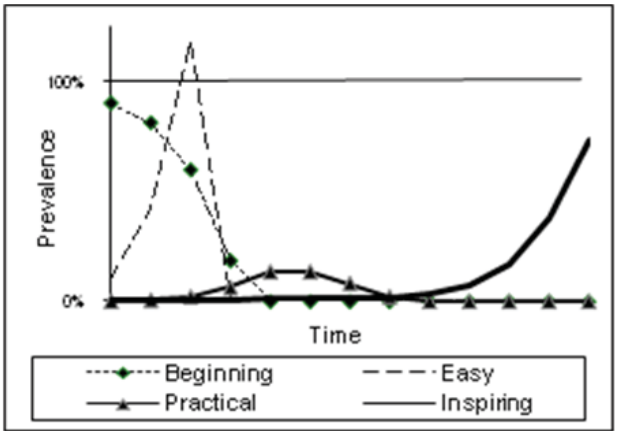

Figure 1. Law of Succession

The third impediment to coding human expertise is the scarcity of developmental theories. There are not enough published theorists on the planet to cover even remotely the range of human expertise.

One way to solve this problem might be to turn experts into developmental theorists. To test this idea, we taught experts the basic concepts of the law of succession using Figure 1 and Table 1. Then, we asked them to reorganize their experience with learners into several dimensions of four levels each. Dirlam (2007), Dirlam and Leong (2008) and Gattis and Dirlam (2008) found that 1 to 2-hour interviews were enough for experts to produce an average of 10 dimensions each. Clearly, as people become experts, they also learn how others develop their expertise.

METHODS AND RESULTS

Nine senior faculty members of SCAD's Department of Architecture were interviewed. The interviews began with the development principles using Figure 1 and Table 2 and proceeded in an improvisational "Yes-and" style, as defined by Sawyer (2008). This style affirms and often adds to participant comments. The additions served to broaden the context or remind the participant of earlier ideas that they intended to develop further.

Level (example)	**Beginning** (scribbles)	**Learning** (stick people)	**Practical** (sketches)	**Inspiring** (fine art)
Beginner Use	Common	Rare	Rarer	Extremely rate
Growth	Almost none	Extremely fast	Moderate	Slow
Competitive Strength	Almost none	Very low	Moderate	Very high
Decision	Try	Learn	Become proficient	Make contributions
Practice Time	None	Weeks to months	A few years	10 years to regularly use

Table 2. Key ideas for organizing expert experiences.

The interviews resulted in 96 dimensions of the development of architectural expertise. There were eleven steps to organize them.

1. Identify links where keywords in dimensions coincided with keywords in the 34 NAAB Student Performance Criteria.
2. Manually code the links as primary, major or minor.
3. Create a criterion-by-criterion matrix and sum the codes to create a single score to represent the number of connections.
4. Reorganize the matrix into groups having the largest connection scores.
5. Use step-3 results to create a network where nodes represent criteria and edges represent the connection scores (see Figure 2).
6. Combine the criteria together with high connection scores to group dimensions.
   a. A major group of *Integration* with six subgroups,
   b. A second major group of *Culture* with four subgroups
   c. Two minor groups combined into a *Presentation* group with three subgroups.
7. Use the major groups were used to define student learning outcomes
8. Use the thirteen subgroups to form a rubrics framework for their assessment.
9. Code each interview dimension to the subgroup it fits best.
10. Write 50-word abstracts for each subgroup level to meaningfully include as much of the thinking of the underlying dimensions as possible.
11. Give 1-3 word titles to each abstract.

The resulting rubrics are contained in the Appendix.

SIGNIFICANCE TO THE FIELD

This paper provides the first rigorous, testable, multidimensional theory of the development of architectural expertise. The MODEL rubrics process is a new social science method. This project is the first use of it to create a collective theory. The theory is a testable and developmental language. Because it is testable, it will facilitate discussion in architectural education. Because it is developmental, it will help directly to improve education. Applications include curriculum development, program evaluation, project critique, and student advisement.

While NAAB articulates the criteria believed to be most significant to the education of an architecture student, the means and methods of arriving at their successful understanding and ability is wholly the responsibility of the architecture program in which the candidate is enrolled. Architectural education as a concept is rather new. Historians accredited it to the L'Ecole des Beaux Arts program of France, which relied heavily on the precedent of antiquity and trained students to practice conceptual sketching and highly refined finished drawings. The Beaux Arts manner of education was influential in American architecture and architectural education until the immigration of the Bauhaus model of Ger-

man educators during the period up to and including World War II. Bauhaus education methodology emphasized a relationship to the craft and industry framework that the graduates would ultimately employ. The modern movement in architecture and design gave way to modern architectural education movements, but since the early 20th century, articulated theories on the development of architectural expertise are rare.

With the results of this procedure examined at the SCAD Department of Architecture, other institutions can adapt a similar process for clarifying the identity of the program relevant to the expertise of the faculty, the cultural history of the institution, and the requirements of the assessment organizations. Additionally, institutions may begin to use this material proactively to design curriculums when formulating new program opportunities. With the knowledge of the collective theory of education of the existing faculty members, institutional response to the demands of the profession on the graduates is more accurately reflected in new program offerings. Conversely, faculty search committees may use the material produced through a collective theory of education to gauge faculty candidates for contribution to the program, coinciding to the existing faculty member group, or identify where a faculty vacuum is evident and needs to be addressed are emphasized.

The national average of full-time faculty for NAAB accredited schools of architecture is twenty, and the national average of part-time faculty is twenty-eight. The difficulty of maintaining institutional effectiveness with a majority of adjunct faculty can dilute a program's identity. Providing a collective theory of education in addition to syllabi, assignments, and course objectives, can clarify and focus the pedagogies and focus the energies of adjunct faculty to support the program goals.

Within the established architecture program, the primary role of the collective theory of education is to assist during the review and critique of student work as a self-assessment tool of both the effectiveness of the assignment and the investment of the student. This measure of program performance is never a tool of accusation, but rather a feedback mechanism capable of not only pinpointing deficient occurrences of necessary knowledge but also suggesting more advanced but still accessible new

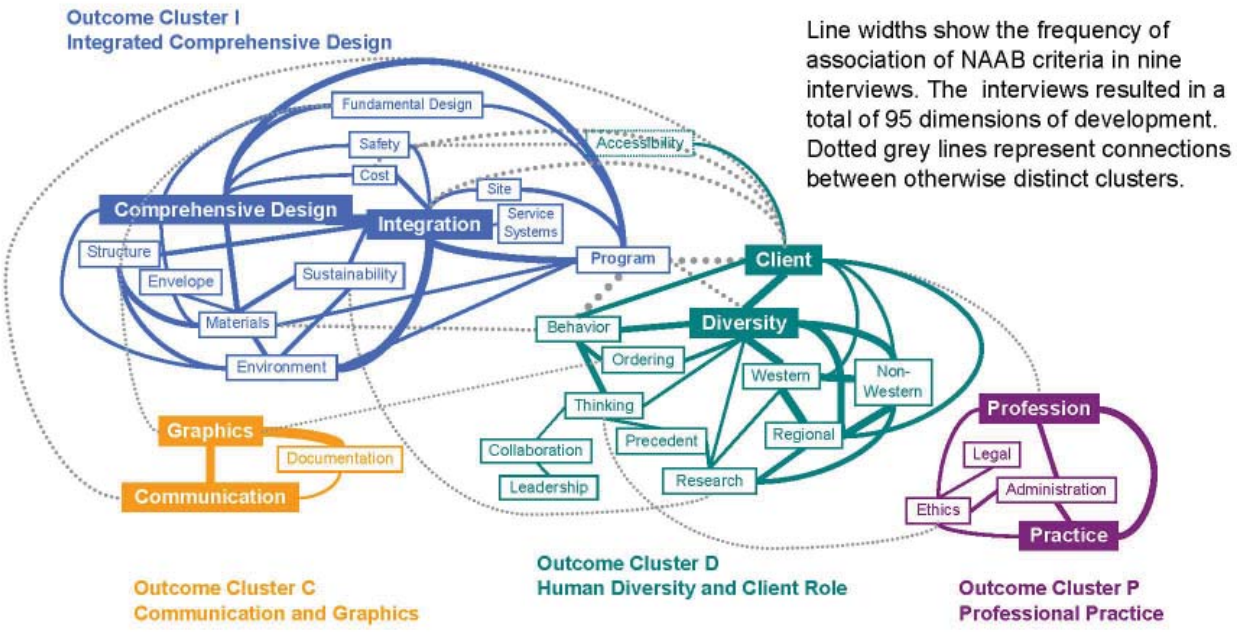

Figure 2. Four Outcomes Based on Keyword Analysis

strategies. Additionally, since the collective theory is self-written and cross-pollinated with the established criteria of NAAB, the independent institution that provides varying products can utilize the findings in support of the outcomes. Student advisement aligns to the program goals and vision when portfolio reviews, program gateways, and graduate applications are accessed using the MODEL rubrics to evaluate preparedness.

CONCLUSIONS

The ultimate benefits of this project are numerous. First, we have articulated an original theory of the development of architectural expertise. Most developmental theories are authored singularly which is apt to introduce not only biases but incomplete coverage.

The second benefit of our project is that it is collective. The process of abstracting ideas from the group dilutes the biases of individuals. The reduced bias allows us to describe an educational plan that the members of the group already own in part. It also increases our chance of creating a program that produces expected results.

The third benefit of the project is the comprehensive theory. The 96 dimensions of our project and their condensation into 13 master dimensions may not be exhaustive, but the fact that both addressed all 34 NAAB criteria attests to their comprehensiveness.

An aspect of the results that was beneficial to the department and the office of assessment was the documentation that each of the thirty-four NAAB criteria is represented in the collective interview material, i.e. through the nine interviews each criterion was mentioned more than once. This fact is a two-way lesson for those involved. The first lesson is that the department of architecture is accomplishing the NAAB criteria through various means and methods, without always using the same language, whether that be between faculty, or between faculty and students, or between the department and NAAB. The second lesson of the research is the validation of the NAAB criteria. This is not to say that it is the position of the department of architecture to tell NAAB they are correct, rather, that the criteria that NAAB has identified as pertinent to the education of an expert in the realm of architecture, is in fact what the educators of those experts are using to convey the elements, principles, and attributes of how to become inspiring practitioners of the discipline.

Therefore, we understand that the use of a collective theory is not in support of criteria from other organizations, i.e. criteria as a checklist to address for the Office of Assessment or NAAB. Rather, the collective theory incorporates the information and outside criteria agencies as a sub-narrative to the vision of the department – without adjusting the department vision and goals, previously composed of individual passions and expertise.

Some questions have arisen for the authors that will constitute the upcoming phases of research. What issues currently do not exist in the chart of dimensions, (see appendix), that may influence the education of future experts in the discipline? Moreover, how will these additional issues become integrated? Additionally, as trends in the profession develop which demand educational shifts and integration of new material, how can this new expertise become influences, and not remain secondary footnotes of information? A re-interview process of several faculty members for integrating new criteria could become burdensome and time consuming, for both the faculty and interviewee. However, the developmental concepts underlying the interview process are now well known by the nine interviewees and are embedded in the assessment rubrics for others to learn. Consequently, the rubrics can act as a template for critical discussion and modification to fit future needs.

Some questions may arise regarding the apparent formulaic enterprise of assessing a large group of individuals into a collective vision; where is the humanistic approach to celebrating the individual's unique contribution? In fact, the process as outlined is just that, a celebration of the unique characteristics that makes each educator different and strong for the various experiences and knowledge acquired over time. Without a process such as this, some of the strengths of a faculty member may be overlooked, never realized, or minimized and under-developed. The process allows invested members to become hyper-aware of the strengths of their colleagues. When this process migrates to the classroom, the faculty will be encourage to share the same identification of the collective theory with the student body, so they too understand the role

of the various members within the institution. Furthermore, the thirteen dimensions defined provide an overview that should be understood as fractal. Thus, each dimension can be divided into a more detailed set of dimensions. Each dimension endures from its collective origin and slow maturation, while still being open to change.

In the case for higher education and the experiences of the faculty members that are being shared with the student body, the fact remains that the whole is greater than the sum of its parts. An educator alone is a tutor; a collective of educators is a faculty. The strength of the department of architecture at the Savannah College of Art and Design is the collaborative Collective Theory of Education of its faculty.

Finally, this approach to encapsulating architectural expertise suggests directions for coding simulations of architect-client-community collaborations. For example, the Inspiring implementation of the dimension of Human and Client Diversity and Behavior specifies that architects… "Add value to clients' desires by helping them re-imagine what they want through orchestrating the multi-dimensionality of architecture into the best possible human experience, accounting for multi-modal sensory experiences, and commenting on or promoting a social condition." All dimensions are relevant to such a re-imagining. Therefore, implementing this strategy requires the integration of all the other dimensions into a Sawyer-like, Yes-and collaboration with the client.

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APPENDIX.

Savannah College of Art and Design Definitions of MODEL Rubrics for Architecture

	Beginning	Easy	Practical	Inspiring
	Stereotypes	*Integrations of Forms and Functions*	*Integrated Systems*	*Integrated Experiences*
Integrated, Comprehensive Design	Comprehensive design equals efficiency, something pretty within the physical context, especially a metaphor of the physical world or stereotypes they grew up with. Have a preconceived solution to a problem or understand intent only as function or suiting client wishes.	Distinguish formal and functional issues. Focus separately on tectonic, technical or theoretical components. Rethink projects using analogies. Identify programs, physical and cultural conditions. Create threshold experiences with transitional spaces involving circulation, in-out, proximities, formal orders, use hierarchies, and basic emotions, but overlook their variability. Express generic intents awkwardly and miss in designs.	Creatively integrate skills, architectural components, qualities into whole systems that communicate both idea and physical reality. Associate emotions with needs of shelter, refuge, prospect and ergonomics. Research behavioral and sensory patterns. Subsume design drivers in one sentence and apply them to every scale of the design.	Discover generative, new connections between social, economic, global, and technology impacts. Aesthetically and pragmatically integrate social ideals, perceptual, emotional, symbolic, ergonomic, historic, environmental and material experiences so viewers can realize the intent at all levels. Richly experience sites to discover the distribution of activities and plan for experiences within them.

	Beginning	Easy	Practical	Inspiring
Environmental Controls and Sustainability	*Unitary Sustainability*	*Added Sustainability*	*Dominating Sustainability*	*Integrated Sustainability*
	Unaware or only vaguely concerned about the environment. Think sustainability is about either materials, comfort, economy, recycling, natural lighting, or bringing nature inside. Rely on professor to provide materials.	Think sustainability an isolated goal or added to finished designs. Conceive systems as environment-changing machines, not designs to work with it. Understand ways cultures and climate inform typology, but prescribe answers from personal experience. Find designs on green websites. Read LEED Guidelines and at least one library book in detail.	Meet environmental, monetary and legal goals in engineering ways, adding sustainable features and materials with minimal toxicity and embodied energy, but designing boxy buildings. Solve current problems with historical or vernacular ideas. Informed by architectural journals, professional meetings and LEED certification. May discover the best application after end of project.	Simultaneously maximize experiential qualities and sustainability. Minimize life-cycle costs, designing for changing functions and future generations. Use research in own projects from worldwide, 30-year comparisons of energy usage and material durability Consider construction management along with land, materials, and contexts.
Design Fundamentals and Costs	*Sites & Buildings*	*Spaces & Users*	*Experiences & Systems*	*Theories & Life-Cycles*
	View architectural design as pursuing solutions to problem that focus on sites and building objects. Design simple inside-outside forms or document a room with a plan. Able to rank order the costs of basic materials and human skills.	Learn that theory drives architecture but treat as intellectual exercise. Design experiences with spaces and consider users, even if artificial. Rely on unitary, isolated tools often given by instructor. Ask many questions about plan, sections and scale. Sometimes fit the human scale, standard sized materials, and assemblies. Can ballpark budgets.	Substitute a familiar methodology for theory and add careful cost analysis. Experiment with what they want users to feel in the space, integrating the various systems. Design sites for diverse users including the handicapped. Create accurate estimates using materials costs, assembly transaction methods, and cost-estimation software.	Illustrate, interpret or test architectural theory. Use different methodologies, some they have to learn, according to objectives, problems and design opportunities. Integrate aesthetics, life-cycle sustainability with client needs, creating great designs even for small budgets. Sensitive to changing material prices, building life-cycle issues and equity dependence on quality.
Site	*Sidewalk Views*	*Documented Places*	*Cyclically Interrelated Dimensions of Places*	*Harmonizable Dimensions of Place*
	View sites as places people walk by not as ecosystems with unseen history.	Consider solar orientation and seasonal changes in built and surrounding environment, and social context. Use documentation (maps, gps, political, aerial). Differentiate story told by each type of map and use personal history from their whole life about similar processes. Linearly go through one type of information after another.	Designs extend into the landscape and respond to a deep understanding of cultural and social differences by cyclically interrelating data, human history, climate, music cultural connections, trade routes, geography, indigenous materiality and quality of light, potential economic use, data driven understanding of human comfort and impact of one's research methods.	Create a harmony of building and land without precedent that shows a respectful, peaceful coexistence, like it belongs there. Select perceptual, philosophical (spiritual) dimensions. Go beyond facts to wonder, inquire and listen to the information to inspire a design reinterpretation that transforms the historical experience into an inspired human experience.

	Beginning	Easy	Practical	Inspiring
Building Systems and Materials	*Non-architectural Building Parts*	*Technical Shopping List Items*	*Components for Placement & Management*	*Components of Design Intent*
	See technology as isolated from design. Know buildings have structural system with varying types of materials. Think math and physics unimportant to architecture. Assume designs will stand up or engineers will make them. Have habitat conception of buildings. Know what they have seen on the shelves of home improvement stores.	Focus on structures and materials for major building systems and address environmental qualities, structural supports, and symbolic, experiential and physical qualities. Use textbook outlines of system choices as shopping lists. Know materials have distinct manufacturing processes and can be put together in nonstandard ways which make people think about them.	See architecture as a system of skills composed of professional practice, client service, culture, precedent, graphics, modeling, environmental controls, sustainability, and building project management. Critically evaluate the placement and distribution of all major passive and active building systems. Know structural rules and standards. Apply them to materials, accounting for availability.	Make technologies serve their design intent. Create new technologies, convincing state boards of their safety to get code variances. Keep skin integrated and supported, but not controlled by structure. Think inside of manufacturing processes to see how they might be able to design new parts. Make choices that enhance specifications.
Accessibility and Life Safety	*Wheel Chairs and Catastrophe Survival*	*Parking Spots, Toilet Stalls and Exits*	*Code Requirements*	*Seamlessly Shared Priorities*
	Lack awareness of social and physical diversity and think the accessibility issue is confined to wheel chairs or survival in case of catastrophe	Address accessibility at the end of the design process often limited to handicapped parking spots and toilet stalls or evacuation routes that are inaccessible or hard to remember.	As a separate, often final, checklist-supported step, meet individual needs and code requirements by considering areas of refuge and common impediments, including elevation, strength needed, door width needed, water fountain height, back bending needed, protruding object elimination, elevator beeps (for the blind), and strobe light alarms (for the deaf).	Integrate accessibility at the beginning and all through the design process, creating designs that allow all users to share space with people with special needs without drawing attention to those needs. Go beyond today's standards to imagine life-safety needs. Create a clear ordering system to allow evacuation.
Human and Client Diversity and Behavior	*Personal View*	*Static Differences*	*Complex Usage Varieties*	*Dynamic Dimensions of Experience*
	Follow directions by providing a rudimentary list of cursory solutions. Look at concrete, grass, massiveness, height, use, style or age. Know how to reference own point of view of visual sensory and social information.	Forget the flexible nature of human nature and programs. See humans as equivalent to their tendencies, needs, basic emotions, and perceptual traits (including auditory). See programs as static. Fulfill simple programs by assuming clients will like whatever they do. Relate building to context, space to form, and material.	Accommodate complex programs by understanding client needs through asking questions that frame the problem. Know the hierarchy of decision levels for construction. Observe site, context and soil options in relation to the program, usage patterns, and human experience (including sensations and ergonomic requirements, differentiated by age, gender and cultural background).	Add value to client's desires by helping them re-imagine what they want through orchestrating the multi-dimensionality of architecture into the best possible human experience, accounting for multi-modal sensory experiences, and commenting on or promoting a social condition.

	Beginning	Easy	Practical	Inspiring
Researching Traditions	*Differences to Judge*	*Sources to Imitate*	*Material for Stimulating Innovation*	*Material for Inspiration, Prediction and Expression*
	Think of architecture as isolated objects. Don't know the word for "precedents", their value in each project or the need to research them. Judge the way things are done in other cultures (especially colors, materials and traditional forms) instead of trying to understand them. Don't ask about basics like sustainability.	Think architecture's goal is giving people gracious designs. Understand we learn from influences behind local contexts. Research keywords of structures, codes, trends, movements and cultures, but imitate them, leave unrelated to their designs, misunderstand what and why their researching them, or need to be given categories to analyze the differences.	Know how much research is needed to understand design problems and the people involved. Research users, journals, organizations by assessing, recording and applying examples of vernacular context, its formal and functional causes, and local subcultures. Work around and with historic precedents (innovating rather than inventing), but still miss key connections.	Discover people's interactions, needs, and how to respond to their culture's evolution without compromising it. Research reasons behind traditional uses and structures (including durability and energy use) and reinterpret in fresh, universal ways. Recombine precedent information finding inspiration, understanding of their building's future changes, and embedding their signature in them.
Critical Thinking and Architectural Ordering	*Self-References*	*Vocabulary Exercises*	*Principles*	*Worldview Transcending*
	Lack theoretical context to inform buildings. Disregard the origins of form, believing beauty and ugly equal like and dislike (self-reference without self-reflection). Unaware of ordering principles, but when told can act within them and draw examples. Critiques fixate on first observation, find flaws, seek parental-like reassurance or become defensive.	Learn architectural language and experience-organizing principles. Solve problems without exploring situations. Connect design ideas by raising questions, interpreting situations, and using abstractions or metaphors, but too literally. Discover how their idiosyncratic worldview impacts choices. Defend views by dissecting their aesthetic reflexes. Critique craft, not persons, but defensive with feedback.	Prefer some theories without practicing them but can evaluate inconsistency. Substantiate preferences using aesthetic principles they easily combine but may confuse with intent. Design efficiently, fulfilling particulars and adding flairs. Embrace (but sometimes miss or reject) input from diverse fields. Critique order relative to the design's context, scale and texture.	Theory and practice inextricably synthesize information from diverse sources into designs with clearly projected effects on multiple dimensions of people's worldviews (observation-use, inside-outside, inert-dynamic, structure & materials-perception). Ordering principles disappear but are readily analyzable and include interdisciplinary dimensions. Critiques transcend the work and add to both designer's and critic's preconceptions.
Collaboration and Leadership	*Unreflective*	*Taking Interest*	*Respectfully Contributing*	*Resource Discovering*
	Work by themselves or frozen into unreflective group processes. Do not know how to resolve conflicts.	Participate in group projects within the studio culture but think their own is the best way. Begin to know themselves as team members by asking others what they think without necessarily using the answer. Try to get an authority to resolve conflicts or resolve by dividing the labor and working separately.	Understand there are other minds than their own and that differences don't imply competition. Respect others' opinions because they have discovered the human resources (varied talents) of the group. Become an equal but unique member of a team. Talk out differences without attacking those who disagree with them. Agree on design, with some compromises.	Lead multidisciplinary teams by managing time, setting standards and direction, inviting ideas different from their own. Help members find ways to learn from each other, using whole world as a resource carried into daily actions. Enable each participant to contribute and the group to take responsibility for the collective experience.

	Beginning	Easy	Practical	Inspiring
Communication and Graphics	*Geometric*	*Realistic*	*Conceptual*	*Attracting and Informing*
	Do not attend to detail and variety of lines. Draw messy, front-and-center views of buildings, with coarse, flat, 2D shapes and no composition. Document a room with a plan. Begin with own home. Know about but don't use AutoCAD.	Distinguish line character for distinct building parts. Draw buildings in various ways (including 3D and models but not human figures), to match their hierarchy, balance and symmetry. Ask faculty to select what to present. View BIM as a faster way of doing things. Accuracy focus on showing real materials creates doll-house appearance.	During design, dynamically mix sketching, drawing, modeling, computer drawings and BIM to test space-experience interrelationships. Represent objects with accurate line thickness and internal/external structural depth with perspective and shadows. Select drawings that support the conceptual framework and show people engaged in representative activities rather than depicting its representational details.	Create confident, beautiful, visuals with enough information layers for designer and audience to understand the space. Risk creative choices of media, colors or other design elements. Use the cyclical interrelation between plans, sections and elevations to explore design options. Embellish software with innovative modules, character animation, and easier form production.
Presentation	*Obvious and Unconvincing*	*Attention Getting*	*Communicating*	*Exciting*
	Don't know where to start, need to be led to do add to a process, or focus on what they "like." State the obvious using common names of parts of the built environment they grew up in. Have difficulty presenting, using too little and unconvincing material. Nervous unless talking one-on-one.	Opening material gets people's attention. Articulate what determined the presentation's organization and walk audience through their design experience. Have many drawings including uninformative ones. Jump into design detail but not structural aspects. Try using words to communicate space. Rely on professor's encouragement and selection of presentation materials. Read notes.	Start with important qualities. Explicate ideas, interpretations, final results, or viability, including time, cost and other client interests. Synthesize research, analysis and concept development using graphics and succinct language. Know names of structural and mechanical components. Select drawings for overall graphic design and object sizes for informativeness satisfying communication needs.	Excite clients with their design's history, surprising functionality, and achievability. Show research for choices extending into allied fields and applicable to future designs. User culture and lifestyle is visible throughout the building. Drawings are selected to best reflect key features and arranged holistically telling a story from concept to detail.
Professional Practice and Ethics	*Lucrative Designs*	*Compliant*	*Marketable and Accomodating*	*Re-Imagining and Synergistic*
	Lack theoretical context to inform buildings so believe all buildings are architecture. Aware of roles in firms only as signing lucrative contracts (with the powerful or with those needing economic, useful buildings), designing to code, and receiving payment when finished. Know manufacturing is going overseas or have experienced emerging companies.	Know categories of theories that underlie designs. Understand that architects run service businesses involving management of diverse roles and contracts. Make restrictions generators of design regardless of the aristocratic or social program. Know that there are code books and references to check compliance. Aware of golden rule.	Develop, but don't practice, a theoretical preference. Repeat design strategies enough to create a marketable image. Work within client's budgetary constraints and available builder skill. Understand architecture's collaborative roles. Revise designs to comply with code rather than incorporating requirements in their original design. Deal separately with quality of life issues.	Continually re-imagine their practice culture including theory, administration, technology, contracts, and ethics. Adapt to global locations, builders and cultural roles. Use discovery processes that transcend firm and clients. Anticipate design implications of codes including possibilities of obtaining safe variances. Design so quality of life issues work synergistically rather than stress users.
From interviews of R. Bacha, J. Keuler, F. Munilla, S. Olin, J. Rogers-Varland, J. Reno, S. Singeisen, T. Woods, and D. Yang.				