Teaching Architecture Students to Work with Distributed Design

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ABSTRACT

The subject of distributed design is important in architectural education. Because no single designer can do everything in large projects, work must be partitioned and distributed. This means that all work is essentially partial. Recognizing that each of us does partial work has implications on how and what we teach. For this reason, my studios are constructed to explore this fact. I have developed what I call exercises to make students understand the idea of partial interventions. This paper discusses these issues by showing examples of studio exercises in which distribution of design is explored. The concept of design exercises is also discussed and carefully constrained exercises are suggested as a necessary first step to learning to design under conditions of distributed control.

KEYWORDS

Architectural Education, Distributed Design, Design Exercises, Levels of Intervention

INTRODUCTION

Why should the subject "design with distributed control" be a subject for an architectural educator? It sounds like a subject taught in schools of management. But in fact, this should be one of the subjects at the heart of architectural education, as it should be in the education of any specialist who wants to contribute to the quality and coherence of the built environment. The age of the "Master" is long gone, if it ever existed. In fact, no single specialist is asked to design everything – the world is too complex, and risk must be shared. Rather, tasks are partitioned - either by consensus or fiat, or by sheer unplanned necessity - whether in the public or private sector. Not only is work distributed to get a given "project" done initially, but also, because the built environment is never finished, the patterns of work distribution stretch out on the time axis, with many hand-offs of work across many levels of intervention.

The continuity-over-time of the built field is self-evident, so some will ask what the problem is that deserves attention. The problem is that in teaching architecture students, it is not self-evident how to bring this subject into the design studio. This is because the studio – with rare exception – is an educational tradition steeped in the comprehensive individual act of "one-off" creativity and self-expression. Some teachers try to bound "design problems" by insisting on adherence to building codes, site conditions, precedents and so on. Some teachers try to get students to work in teams, which are exercises in consensus building or subtle or not-so-subtle games of dominance among students, based less on knowledge than demonstrations of certain personality attributes. When students from different design disciplines are asked to work in teams, there is often frustration, with a resulting tendency for students to follow those with strong personalities and confidence. Students in interdisciplinary teams are given the difficult task to both learn their discipline and to interact with others who are also learning theirs, quite a different situation from seasoned professionals who work out of a well-established knowledge base. In any case, teamwork is difficult in professional education because everyone – students and faculty alike - knows the University system must evaluate individual work – of both teachers and students. While there is certainly nothing wrong with consensus building or teamwork, or learning to work with personalities of different kinds, and while it is good to work with various constraints, the question of how to partition a complex design effort and thus distribute and coordinate responsibility is not well studied as a studio teaching method.

THE IDEA OF EXERCISES

The first task of a studio educator who wants to work with distributed design is to help students become comfortable with exercises. This is akin to practicing

etudes or scales in music education, or doing warming up exercises in sports. (Zuk, 1983)

In fact, all "projects" in architecture studios are better thought of as exercises. None (except the rare design/build project) are "projects" in the formal, professional sense of the word, leading to a real building for a real client under real legal and time obligations. Larger more philosophical meanings of the word "project" aside, the project in professional practice is all about the service of getting a design from shared image to detailed representation to built form.

The reason for understanding studio work as "exercises" is that, like in music education, exercises or practice routines are never mistaken for performances. Nor are exercises in composition confused with complete compositions ready for performance.

The connection I am making between exercises and distributed design is that both are partial. Complete in themselves, both exercises in music and exercises in designing are nevertheless one part of the performance or, in the case of environmental design, part of a design process leading eventually to a built field.

Distributed design means that the "whole" –whatever it is - is partitioned, each part being the responsibility of an "agent". Therefore, as in doing exercises, the essential idea of learning to work with distributed design is to work on parts. This has to come naturally to both teacher and student, and it has to happen with discipline and sensitivity. This takes time, but it pays off.

It will be said that working on parts ignores the wholeness of reality, ignores principles of ecology and integration. Some will say that work on an entry "place" can't be done unless the same person has designed the façade and the floor plan, at the same time. Someone will say that it is not a good idea for one person to design the building's "core and shell" while other people design the tenant fit-out later on. The argument is that wholeness will be sacrificed.

These arguments are a trap and are part of an ideology of centralized control as the only way to get wholeness. They suggest that everything is seamlessly interdependent, which, in a metaphorical sense, is true. But practically speaking, without good task partitioning, every design move would require discussion and negotiation, since in any environment, control is distributed for the different parts and places over time. We would not want it otherwise, since a dictatorship of the environmental game would be a bad idea.

On the other hand, there is no argument that partitioning of a complex task can be achieved without shared values, assumptions, methods and processes. Without that, confusion and disjointed results are inevitable. This only begs the question of what is shared among designers – and the public – in the environment game.

It is also important – like in practicing a musical instrument – to realize

that just because you can do exercises well doesn't lead automatically to a stunning performance, or an environmental design of excellence. But without exercising, achieving excellence will be more difficult, if not impossible.

KINDS OF EXERCISES

In developing architectural exercises, one question has to be what design moves can we practice, without implicating an entire world of design decisions at every move? This begs the question of the relationships and dependencies between the parts at hand in the exercises we decide to do. These are important questions and must be made explicit when an exercise is designed and students set to work.

I made a decision a long time ago to organize studio exercises following a theory of environmental levels (Habraken, 1998). As becomes clear in his writings, the built environment comes into existence and changes over time by human intervention guided by preferences and efforts to gain and maintain control. The built field experiences differential obsolescence – some parts last longer than others. This is another way to say that the built environment sustains itself by allowing its parts to change. Parts change because of decay, or, on the other hand, by peoples' exercise of control. While nature pulls down physical artifacts by, for example, weathering and earthquakes, human beings try to produce, cultivate and improve (or demolish) the artifacts they share space with. As long as there are many people, interventions will be distributed in some way; the relations of agents thus being defined by the parts they control.

Given this, the exercises I've developed correspond to the way both historical and contemporary environments come into being and change – that is, on familiar levels that most professionals and non-professionals alike understand.

LEVELS	PROFESSIONAL DOMAIN
Urban Structure	Urban Planner
Neighborhood or Urban Design	Urban Designer
Architecture (Core and Shell or Base Building)	Architect
Interior Architecture (Infill or Fit-out)	Interior Architect
Furnishings (Furnishings, fixtures and finishes)	Furniture and product designer

The association of a level with a professional domain does not mean that in a given project, one professional domain cannot be responsible for several levels. But convention has it that professions normally only claim one level at a time, in a given "project". That is, after all, why the professions exist and distinguish themselves with their own knowledge bases, even while the boundaries of responsibility and knowledge may be in flux. Using these distinctions is a good idea because they are relatively non-controversial. (e.g. the USGBC LEED Rating System uses these distinctions) Many real

projects are designed according to these levels, such as office buildings, shopping centers, laboratories, hospitals, and some residential projects. The opposite, of course, is the fabled unified control of masters such as Frank Lloyd Wright.

So the idea connects well to practice, if not to most academic discourse.

All of the exercises I have used have these common themes:

1.   Designers need to learn to grasp and document environmental themes, patterns, and systems in such a way that these observations can be shared.
2.   Built environments are never finished;
3.   Design is distributed – no one party is responsible for all levels in one exercise;
4.   Designers need to learn to both lead and follow, in the sense of setting constraints to be used by others, and following constraints that they did not establish;

The following exercises are examples of exercises following these four principles. All involve two or three levels and draw on ideas in Tools of the Trade (Habraken 1996).

THE STREET SPACE EXERCISES
Bern, Switzerland

An architecture studio of 12 students in the third year of our professional program, undertook this exercise, using the Bern, Switzerland arcade typology as precedent.

Agreeing on Themes and Rules and then Playing on Them

The idea we explored was that when constraints or themes drawn from an existing high quality environment are employed to make a new environment, we would find a result thematically similar to the original theme, but with variations suited to the new place. The selection of constraints drawn from an environment we want to emulate can set the conditions for the design of a new environment.

To focus the exercise, only the street space and the "façade zone" adjacent to the public space was studied. The façade zone is 10 or 15 feet "thick". We were not concerned so much with the details of what happens behind the façade. Instead, we are more concerned initially with offering "structure" for what might happen when others fill-in the building plots available. Only the most general uses were described. In our study, we considered at least these constraints:

Ways of building *("heavy" ways like masonry and concrete, or "light" ways like steel and wood, etc.)*
Defining territories and acting in one's territory *(this has to do with the fact that all environmental action takes place in a territory over which some party has control)*
Sharing territory and reaching agreement about its form and use *(the public domain)*
The design of the street façade as a durable part of the urban fabric *(what is fixed and what is variable)*
Thinking in section *(the façade is not flat)*
Entries to street level spaces and entrances to spaces upstairs *(access to the space behind the façade zone; public and private separation)*

The Facade

In designing the "façade zone", the question was, what decisions belong to the higher (shared) level and what to the lower (more individual) level? What was to be fixed and what variable? What are the architectural rules corresponding to this two level approach?

Some examples help to explain these questions. In the NEXT 21 project in Osaka, Japan, (Kendall and Teicher, 2000), built in 1994 and still an experiment for a number of ideas for adaptable building, a facade system was designed specifically for lower level interventions. Using the system, different architects could design the facade of the different dwelling units in the base building's serviced skeleton, expressing their interior layouts. Keeping in mind future changes, the facade system was designed in such a way that it could be taken apart and installed from the inside, without need for exterior scaffolding supported from the ground.

Frans van der Werf's Molenvliet project in Rotterdam found a different balance. Large window frames were part of his design, but within each frame users could choose from a library of components and decide what parts should be glass and which solid, and what parts might be operable windows, and which would be fixed sash. For each dwelling unit, two colors could be chosen from a larger pallette. These choices enabled each occupant to identify their own unit. While allowing variation, it assured (what some think is) a harmonious architectural result. It was also simple to build and was inexpensive. A recent visit confirms this even while the range of colors is less than it was originally.

Making parts of the building skin demountable and replaceable requires careful technical detailing. If the position of the skin is variable (some parts recessed, for example), the technical problems to be solved are complex. To avoid risk, water leaks and other technical problems, a strong case is almost always made that the building skin should be fixed, limiting

unit variety to the inside.

In parts of Montreal, San Francisco and other examples of low-rise neighborhoods, facades invariably express individual dwellings, resulting in a lively and thematic variety along entire streets. In contrast, major streets in many older European cities have uniform and monumental facades that shape urban space without expressing their interior variety. The same can be observed in London and Glasgow. Clearly, different cultures have different preferences throughout history. Using these examples help students see that the question of whether the building skin is part of the higher-level design or should respond to lower level design is cultural, and not just technical.

Students also saw that NEXT 21 project offered something really new: Its facade "kit-of-parts" was designed as a higher-level concept, intended for application anywhere on the facade. But the use of the "kit" is by each individual architect designing a dwelling. This combines lower level variety and change over time with higher-level harmony on an urban scale, aside from the very complex technical systems.

Values

In this exercise, I did not make a case that the Bern "theme" was or is correct in some objective way. I did say that it was worth understanding and working with. By looking closely at it, by seeing its elements and relationships, proportions, ways of building, ways of claiming territory, and so on, I wanted students to come to know its relative merits and problems.

Students were not asked to adopt a neutral position about these themes. Instead, the explorations I asked students to do asked each to make value judgments and to "improve" and "embellish" the given concept as much as possible. Each designer was expected to accept the themes for what they are. I wanted them not to fight the theme, but to explore what it could be. Thus, if the basic concepts were allowed to develop, we would be better able to discuss and evaluate them later.

Figure 1.2 Scale models by each student assembled into a hypothetical street space
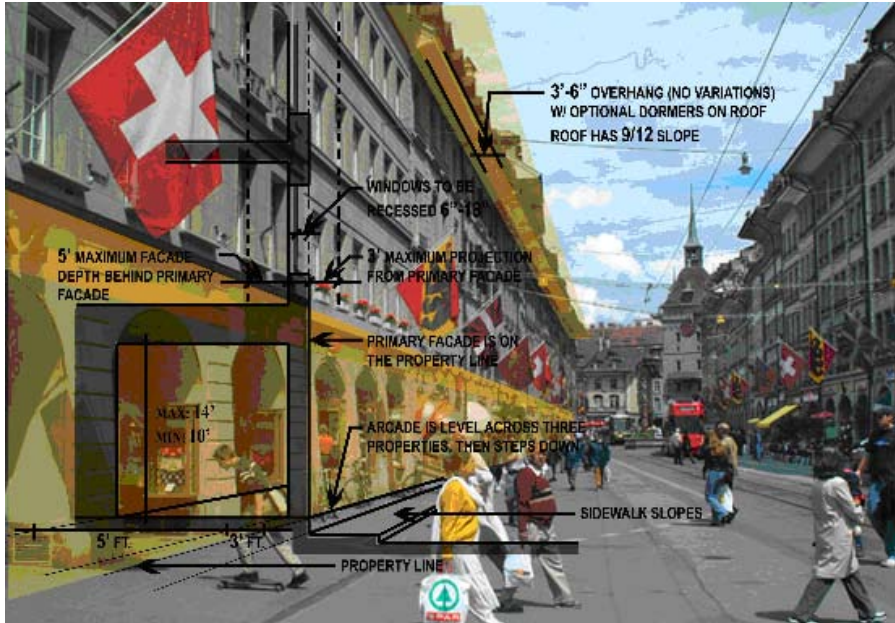
Figure 1.1 Rules or themes of a typical Bernese street

Figure 1.3 A composite series of cut-away drawings of each student's study

THE ACADEMIC VILLAGE
Ball State University

Our subject in the fall 2006 semester was the Ball State University campus. Two graduate studios undertook this study. I report on only one section under my direction. We examined two levels of intervention:

a) **The level of the campus as a physical/cultural whole**, where the issues of architectural / spatial coherence (or lack of it) or "wholeness" play out along with the facts of growth and change, administrative hierarchy, state budgets, pedestrian/vehicular intermixing, residence hall life, distances to walk between classes, relation to the surrounding neighborhoods, etc.
b) **The level of individual buildings or building clusters and spaces**, designed at different times by different architects, meeting the evolving need for "identity" of individual colleges, criteria beyond individual college "identity", matters of sustainability, and so on.

We kept a number of principles in mind:

• **Change:** University campuses are never finished; they are always under transformation, albeit at varying cycles. Campuses exist on the time axis.
• **Distributed Design:** Many different firms are involved in the design of university campuses. This highlights the importance of finding shared values to give coherence to the whole, and good methods to enable sensible task partitioning and good cooperation among independent but collaborating parties.
• **Levels of Intervention:** University campuses, like all complex built fields, are organized hierarchically; the campus "master" design of public spaces and building "zones" dominates the buildings and landscape architecture that come and go in its context; on the other hand, sometimes a new project will force a change to the master plan; the buildings dominate the interior layouts inside; the layouts dominate the furniture. When we act as designers on such "levels", we know our freedom because of the constraints already established (usually by someone else who was there before we came into the scene) while the form we offer to those that follow us constrains their design acts, but clearly wants to leave a certain freedom to design as well. As professionals, we relate to others according to their place in this hierarchy.

Organization of the Semester

Both sections focused on understanding the American university campus as a complex "built field", with its physical, cultural and organizational traditions. Students learned to "read" these "fields" and document them.

Then, each studio group established "form-based codes" (based on Form Based Code Institute's concepts @ www.formbasedcodes.org) that individual architectural interventions in the second part of the semester followed. These "codes" – documented in words and drawings - included building height and typology, ground floor permeability, energy performance, patterns for entryways, or planting, or windows, etc. These codes were based on precedents, but also on shared values that we discussed and debated. Following development and documentation of these codes, students worked on specific building design proposals, individually or in small teams.

Pedagogical Goals

• Learning to "read" and document the qualities and characteristics of campuses;
• Learning to find the "thematic" in the special and the special in the "thematic";
• Learning to see the architectural potential of designing "codes" in the sense of setting the conditions that individual architects will follow, in the sense of distributed design over time, and in the sense of making themes (how to lead) and working with themes that others determine (how to follow).
• Learning to make design decisions with sound technical /spatial thinking and demonstrating that knowledge in drawings and models at a variety of scales and modes of representation.
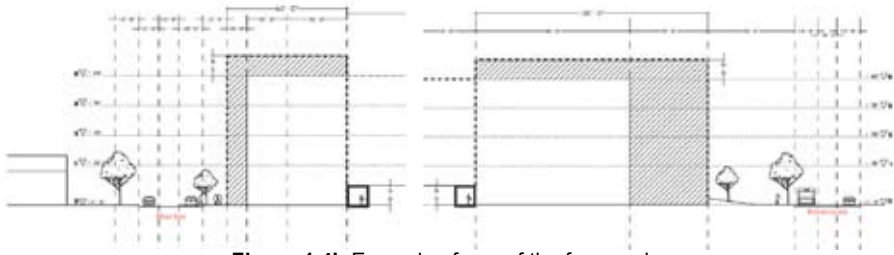

Figure 1.4a Example of one of the form-codes

Figure 1.4b Example of one of the form-codes

Figure 1.5 The site model showing all the individual interventions in the context of the campusand its existing buildings
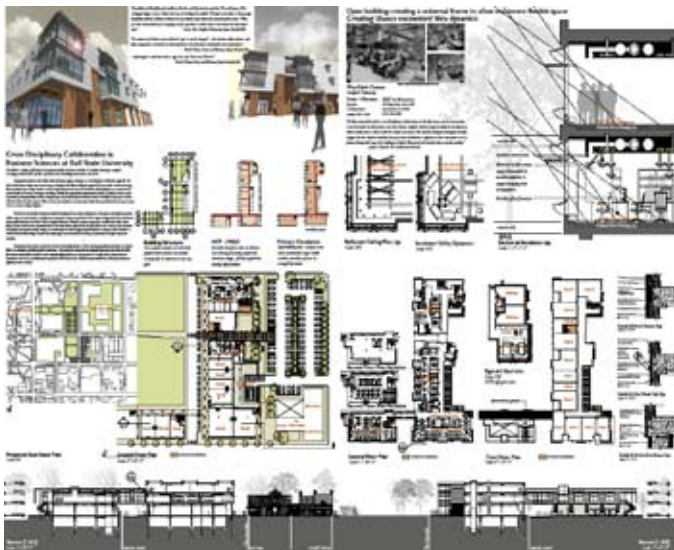

Figure 1.6 Example of student proposals

CONCLUSIONS

These are two exercises I have used in the last few years at Ball State University Department of Architecture. Several conclusions can be drawn:

1. This teaching method does not jeopardize the quality of student work. Talented students continue to excel. Weaker students tend to do better because the constraints set qualities they learn from.

2. Students become impatient with documenting constraints. It is clear that with all the talk about using precedents, students do not have tools for generalizing or abstracting the themes, patterns and systems observed in existing environments.

3. Students do not easily accept the idea that designing constraints for others to use is challenging and creative. This shows the lack of appreciation for "levels of intervention".

4. Students understand constraints (themes or rules) as things to be "pushed" to find their limits. They want to defy the constraints - more clearly so when they are not of their own making. That is why I have students formulate the constraints that they will follow. I say that if the constraints are not to their liking, they should learn to make different constraints and then follow (or watch others follow) the new ones. They then learn to work on a higher level.

5. The question arose about making "good" constraints". While this is important, the question was more about how to record the constraints students found attractive, and then reflecting on what was done and how. That does not mean I was neutral during the development of the constraints. I pushed hard to make rules that would lead to a strong coherence while nonetheless supporting individual and varying schemes.

6. It is important to find a way to give students the opportunity to both make and use constraints, and then to go back and revise the constraints based on what was learned the first time, and then to use them again in the same place under mostly the same conditions. This is hard to do in a semester and to keep students interested.

It would be interesting to find a way for a number of colleagues to experiment with these methods and then to compare notes.

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