



WARMING-UP EXERCISES IN SUPPORT OF OPEN BUILDING EDUCATION

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Abstract

Teaching students of architecture an open building way of designing in a studio setting can be fruitful. To be even more fruitful, however, "warming - up" exercises are useful, but take time to do properly and are not an easy fit in the studio setting. This paper offers some examples of both open building studio projects and "warming-up" exercises given in the studio setting. It also offers comments on lessons learned over the years in teaching in such a way in architectural studios and argues for the development of courses specifically focused on "warming-up" design exercises, not only in support of open building but more generally. These may be most helpful if offered outside but supportive of the design studio. But such opportunities are rare, because "design skill" courses do not exist in architectural curricula.

Keywords: Architectural Education, Design Studio, Warming-Up Exercises, Task Partitioning, Open Building Design Skills.

INTRODUCTION

Often, warming-up exercises are a good way to ease into studio teaching, especially so when it comes to principles such as those embodied in an open building approach that are not in currency in the conventional professional or academic discourse. This paper is concerned with that and other lessons drawn from many years of teaching in which I have grappled with the challenge of teaching "open building" in architectural design studios. The principles of open building I refer to should not be strange to most readers of Open House International, but the teaching methods might be new and are therefore worth trying to describe.

I have taught a number of studios directly involving open building, starting in 1981, and first published in Open House (Kendall, 1982; Kendall, 1984). Early efforts focused entirely on residential open building and urban design, while more recently the focus has been the design of academic buildings, office and mixed-use buildings and even a hospital laboratory.

Two studio projects taught in a recent 15-week academic semester illustrate the approach I take to teaching an open building way of designing. Several student examples are shown. Following that, I discuss several "warming-up" exercises that I

have done in other studios, exercises I now believe should be taught outside studios for reasons I will discuss briefly.

TWO STRAIGHTFORWARD OPEN BUILDING STUDIO PROJECTS

The Rehab Hospital Laboratory Addition

Students were given a statement outlining the teaching goals and the project scope for an existing rehabilitation hospital that needed a laboratory addition. A class of fourteen architecture students worked on this project for seven weeks (4th year students in a 5 year BArch first professional degree program).

This was a "real" client that wanted us to help "envision" a 15,000 sq ft (1500 m²) lab addition, the drawings of which they could use in their fundraising campaign. In interviews with the client group (administrators and research faculty), the students found that the funding for such rehabilitation research (muscular, bio-mechanics, and rehab after strokes or injury) is "soft" and uncertain. The client therefore expressed the importance of having a "flex" building whose research laboratories (layout and equipment) could be adjusted quickly and affordably when a new research program is fund-

ed. The client therefore wanted a "serviced shell" building with certain fixed amenities such as a lecture hall, administrative cluster, and mechanical equipment spaces, main entry and circulation and so on. The research laboratories, however, needed to be "agile".

Following several lectures, including study of several precedents (Kahn's Salk Institute, the INO hospital in Switzerland, among others), students were asked to set about designing such a laboratory extension. They were required as a class to develop a range of "location" options (where to attach the new facility and thus how to "embed" it in the existing hospital) and several "scenarios" of use, based on interviews with the client group (Brand). As the designs developed and in final presentations, each student was required to demonstrate, in drawings and scale models, the capacity of the shell building to accommodate the various research scenarios.

Two proposals were selected by the client group as most interesting, and were subjected to schematic cost estimates by a construction company estimator. All fifteen of the student proposals were assembled along with the "programming" information, cost estimates, precedent studies and conclusions into a large format report with accompanying CD. (see Fig. 1 right page)

THE CAMPUS "LINK" PROJECT

This project proposed the addition of a new campus building linking two academic colleges - each in their own building - on our campus. Elsewhere on the campus, new buildings are being inserted between older ones, physically linking parts of the campus into a sort of mega-structure. A class of fourteen 4th year architecture students worked on this project for 6 weeks.

The point of departure set for this project was that an architecture that is connective, relevant, site-sensitive and inspiring for today must also be suitable and accommodating to future academic programming needs.

I brought to the class the campus architect and the University Vice President of Business Affairs, responsible for the university physical plant. We

probed the architectural standards they currently use when selecting architects to fill in new buildings. We asked: "What architectural constraints do you give, in addition to a budget and a basic program of spatial requirements?" "How do you instruct your architects about "flexibility" for future programmatic changes?" "Do you require them to demonstrate accommodation capacity by actually running alternative scenarios of use?" and "What guidelines about materials, energy conservation and site footprint do you impose?"

My pedagogical goal had two parts. First, I wanted to put my students into the position of the campus architect, charged with selecting and directing the chosen architect to make good architectural decisions in respect to larger campus architectural standards, sense of place and identity of the existing college buildings. What would the students do if they had the responsibilities of campus architect, to be sure that the new building made sense and added to the coherence of the whole campus?

Second, I wanted to help students gain an appreciation of the power of good rules to support good design, not suppress imagination and creativity. In our case, the rules or constraints were self-imposed under the role-playing scheme mentioned above.

To help sharpen the issues, we read several papers, essays and book chapters, and referred to other campus architecture. Examples were used such as like the main building at MIT, which subsumes individual departments into one large mega-structure. We read a provocative article (STEIN 2004) about two new buildings being added to the campus of Princeton University. Frank Gehry has designed one of the buildings. Another was designed by Dimitri Porphyrios, an architect whose proposal follows the tradition of Princeton's Collegiate Gothic style. The contrast could not be sharper in terms of attitudes toward adding to a campus with strong coherence.

The studio progressed in the following phases:

Developing "constraints" to be shared by all student proposals

In this initial phase (about one week), our task was to devise a set of constraints or rules concerning

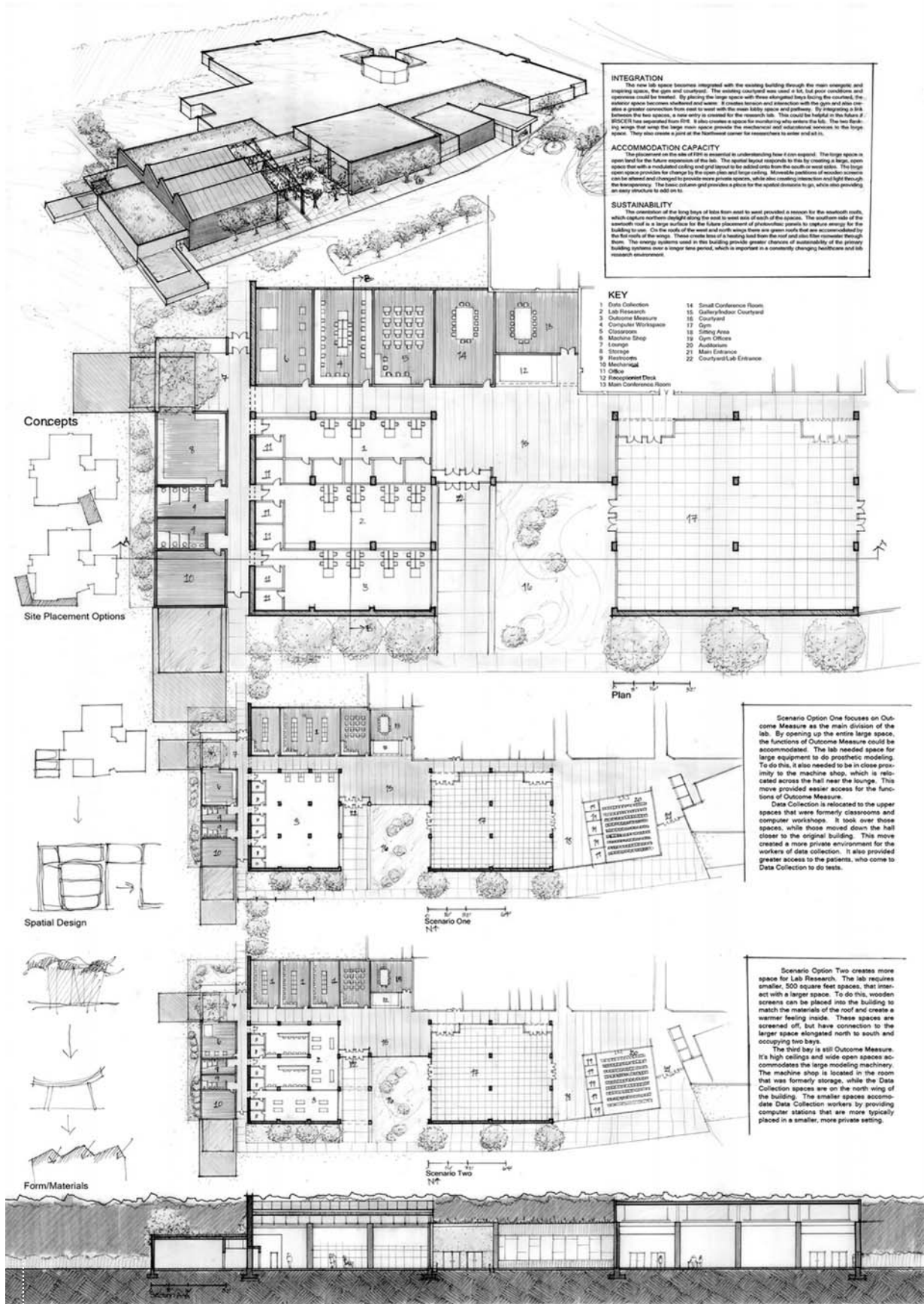


Fig 1. Proposal by Stephanie Helfrich

basic architectural form and materials, constraints reached by consensus that we all agreed to operate with in this project. The students' job was to hammer out these agreements and to record them graphically, as the context for each student to individually explore built form. I saw my role in this as one of pointing out what to think about, how to record agreements and to help the class understand possible consequences of the constraints they put in place.

Exploring these constraints in making building proposals

The second phase was making building proposals in the context of these constraints. This was individual work using study models and drawings. The emphasis was on structuring architectural form and space, articulating a hierarchy of public spaces, considering issues of energy effectiveness, natural illumination, and keeping in mind accommodation capacity for both "normal" size spaces such as classrooms or their subdivision into offices or labs and perhaps one or two "large" sized and special spaces, e.g. the big lecture hall, or the big gathering space. The project was made more complex by the necessity to connect to two architecturally dissimilar buildings each with different floor-to-floor heights and building systems.

For two weeks, each student made designs. This enabled the students to seriously question the con-

straints they had developed, finding some aspects wanting and some sound. After adjusting the rules during several argumentation sessions that were sometimes contentious, the students continued to design with more drawings and study models. During this stage, the issues of accommodation capacity emerged strongly. At the end of the seven weeks, and at intermediate reviews, we could fruitfully discuss both the quality of the individual proposals and the constraints, in respect to each other. New light was shed on the often contentious issue of criteria for evaluation of student design work, and students found themselves more active than usual in evaluating their own and their classmates work, as well as the constraints that framed their individual design work.

OBSERVATIONS

Students doing these open building studio projects have to overcome a number of habits of mind. First, there are constraints. Working with constraints was, not surprisingly, a subject for heated and important discussion, revealing the extent to which some students had learned to think of constraints as enemies. To bring added substance to the discussion, I suggested we see three kinds of constraints:

- a. First, there are constraints imposed by physical forces (gravity, etc), the unique geotechnical

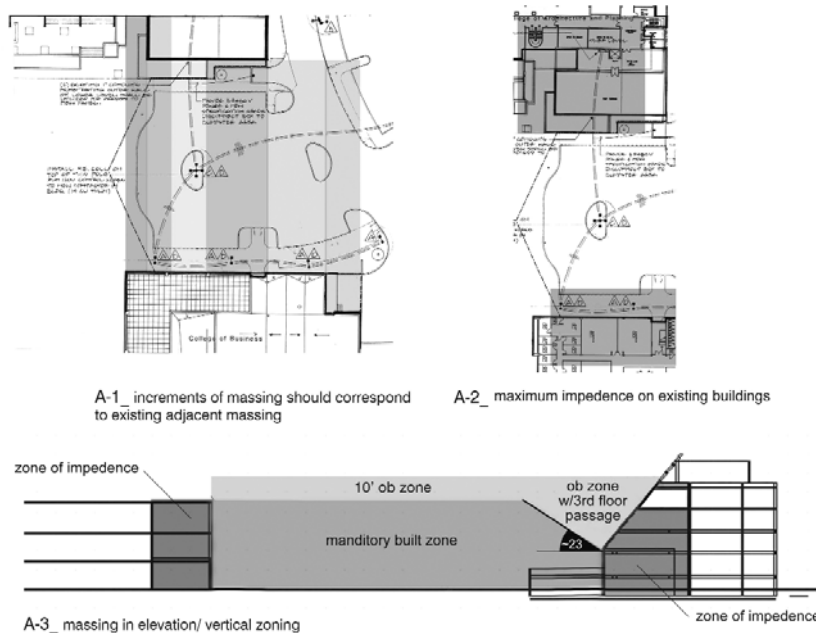


Fig 2. Built-form constraints as developed by the students

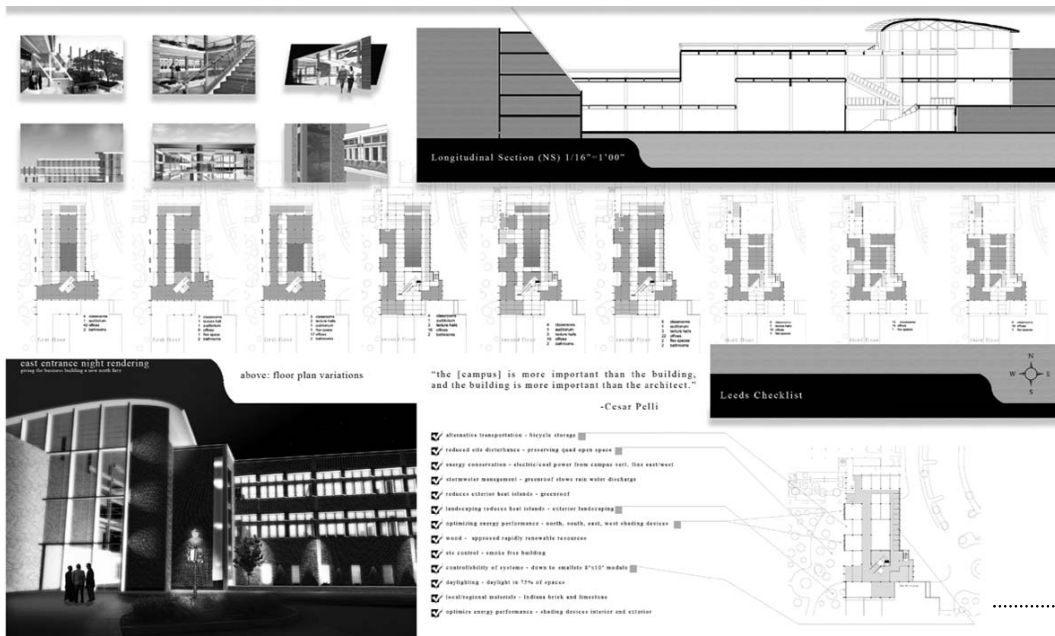


Fig 3. Part of a scheme designed by Josh Pabst

properties of the site, the climatic forces, sun angle, and wind. Everyone agreed that these can't be ignored.

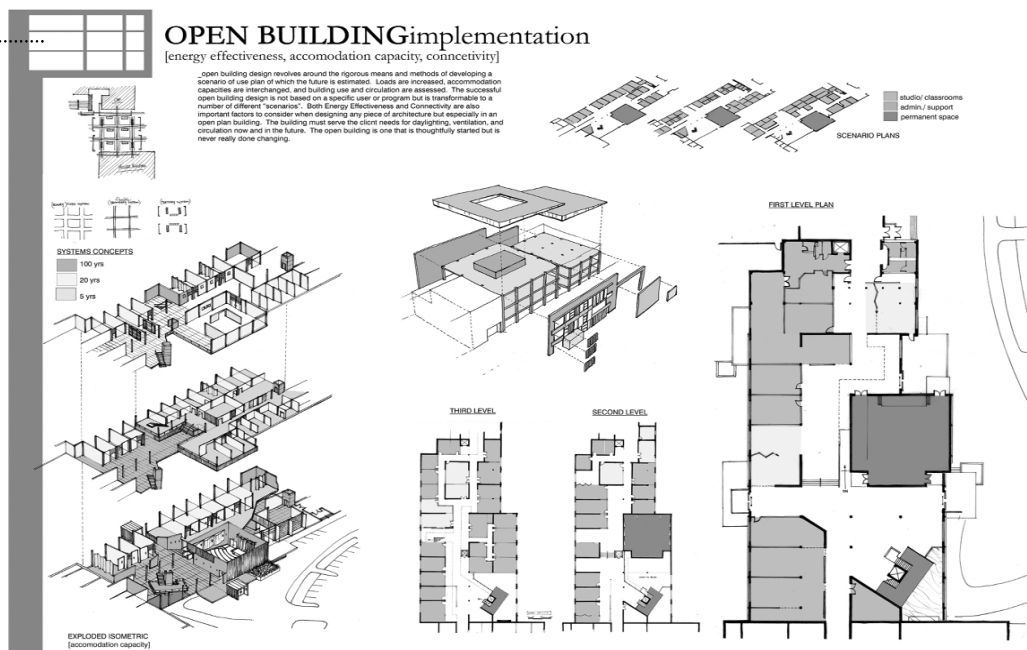
b. Second, there are constraints whose origins are more social, including building codes, client requirements (uses, budget, appearance preferences, etc) and the explicit or implicit conventions of the local building and design "culture". These students found most objectionable and easiest to "break" when they felt like it.

c. Third, there are self-imposed constraints or design concepts that the architect brings to the

project to help organize design moves. The idea of architectural concepts as constraints was a new and to some difficult way of thinking.

Grouping constraints this way turned out to be helpful. It turns out that this view of the place of constraints in designing was new. Students had previously been taught in a virtual "constraint vacuum", or at least with some confusion on the subject. With a major emphasis on self-expression, certain "poetics" of architecture and breaking rules rather than working with them, the difficult of the discussion

Fig 4. Part of a scheme designed by Caleb Shafer



was not surprising. To explicitly embrace constraints or rules was a source of consternation to some students but to others, this knowledge was a source of assurance and was appreciated as having to do with "the real world", especially when I showed that even "breaking" rules meant setting new ones.

The second attitude that needed to be addressed was that in this project, there was no fixed program of functional relations on which to make form-moves. This begged the question of where the form the students propose comes from. We discussed possible relationships between form and function (Venturi, 2004; Habraken, 1996). Some claimed that "the site" or "the context" will give them all the necessary answers, but when pressed, students fell back on abstractions and declaration of concepts like "meaning".

While having been taught the importance of "listening to the site", no specific methods of observing or recording such lessons had been taught. While students instinctually understand that a program cannot give rise to form, they nonetheless have always started with a detailed program given to them, and have been conditioned to think there is some direct and specific causal link between the two. Here, our class effort to observe and record rules having to do with connecting to the existing buildings was useful as a way of learning from and adding to the extant context.

The third attitude that came under scrutiny was the idea that some design decisions - about the buildings' spatial layout - may be made later by someone else. This naturally casts doubt on strongly held notions of design "integrity" and "integration" of a proposed scheme. Students asked how "integration" and "wholeness" could be achieved if they could not control the whole themselves. These questions generated useful conversation and raised more questions that led the more inquiring students to do further reading and studying. I referred to an important statistic from the American Institute of Architects that predicts that soon 75% of architects' fees will be for renovating and renewing existing buildings rather than building new ones. (Boehland 2003)

Finally, I suggested that as architects, we are sometimes asked to develop constraints for someone else to use, as when an urban design is pre-

pared on behalf of a public agency, offering conditions to which subsequent building designs in the course of time must adhere. This become familiar in campus planning (Drexler 1971) and has continued since. An architect for a shopping center will be asked to design the public space and rules for individual shop designs that are prepared by still other architects. The architect of an office building will follow constraints that she was not there to determine, and will offer further constraints about which subsequent architects, working for individual tenants, will have no choice.

By knowing constraints, we are more capable of negotiating about them as well as wisely and effectively exercising freedom in designing, in their context.

MAKING AND USING RULES: CONFORMITY AND INDIVIDUALITY

In the "Link" project discussed above, I experimented with the idea of having students develop - together - the rules or constraints they would work with in the design of the building. This took the "edge" from the idea of rules, which, on first blush, students bridle at having to accept, for the reasons already mentioned. It somehow worked to get the students - as a class - to accept the idea that they were advising the University administration in developing the constraint package, with the interest of the architectural character of the campus at heart.

The discussions leading up to the consensus on the constraints were very important. They were, in essence, reflective of the widespread confusion in architectural circles - and within the public - in balancing conformity and individuality in the making of environment. In reflective essays written after the project was completed, each student wrote about this experience in compelling and interesting terms. There is something in this teaching method that works well in raising these issues for discussion. Supported by selective readings, students grapple intellectually with the important lesson of limits to freedom in designing. All came to recognize that even within such limits, there are almost endless design moves available to them. And, finally, and with new enthusiasm, students found pleasure and

satisfaction in going into more detailed design moves, when the overall "big" form moves were constrained - and simplified - by the agreed upon rules.

WARMING-UP EXERCISES

I would like to conclude by describing several shorter exercises that could be called warming - up exercises. These are not full-blown "projects", but are highly constrained exercises just like a musician would do when practicing etudes and scales.

One is the "Window Exercise" and the other is the "Street Space Exercise", for the latter of which I show two examples. Both were used in a studio setting, but both were difficult to do because of the studio "mindset" that the studio is for the design of site-specific projects, not the exploration of certain constrained design skills and moves.

The "Window" exercise

In the introduction to this exercise, I wrote: "Design moves are all about taking an idea about built form

and moving with it, from simple beginnings to something more elaborate and rich. It's the idea of starting with a simple flush door, for example, and, by a series of reasonable transformations, moving toward a more mature interpretation without knowing from the beginning where you will end up. For example, we might first introduce the idea of "two recessed panels of equal size", one above the line of the door handle, one below. Given that, we may explore a number of variations of panel proportions or shapes, with different surface decorations and details, even different materials. We explore a few variations on the theme at a time. We may then move to a "three panel - two large and one small" door, and continue the elaborations until we have a fully elaborated series of doors.

The idea is not that one "move" is better than another, but that by doing these transformations, we are able to explore the form and its properties and attributes, and be in control of it at all times. I insisted that students wouldn't know how to do this successfully without knowing how doors (or artifacts of any kind) are made. Design moves are enabled by a good understanding of how technical systems work - how buildings are constructed should inform our designing.

Students started with a very simple idea but one rich with potential. The idea is the window space of a house on an urban street. It is not anywhere in particular, but students were invited to imagine it to be somewhere specific if they wanted, in a given culture, in a given climate with a specific orientation, etc.

In this exercise, students were given a simple, asymmetrically placed opening with a double-hung window, in a thick masonry wall with a lintel, and asked to explore a series of transformation of this simple configuration. A few simple rules were also given limiting the dimensional scope of the transformations. Students are encouraged not to bring in parts that are not intrinsic to the initial, given form. Students are also told not to conceive of a specific solution, but to work with the given configuration of forms and materials to see what they suggest and where they might lead, thus seeking to avoid pre-conceptions or "solutions" per se and instead to focus on developmental "design moves".

Beginning from this starting point, students were asked to make a series of scale models transform-



Fig 5. A window in Philadelphia

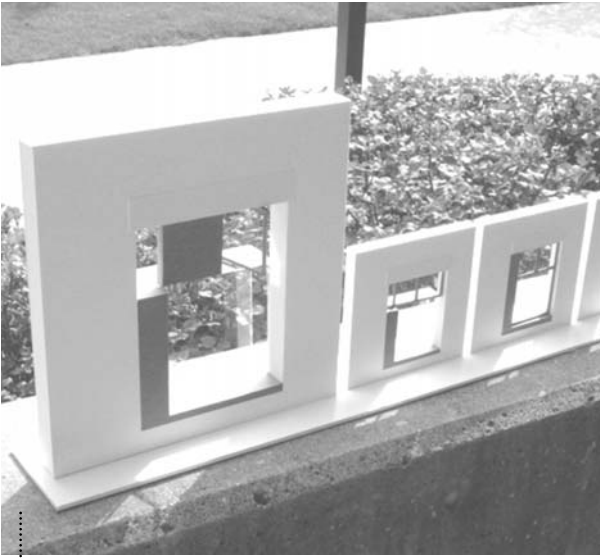


Fig 6. Mike Perso's study

ing the double-hung window into something that evokes the idea of a window space.

The idea was to help students become comfortable and confident in making "moves" that explore possibilities and that follow from the dimensions, properties, types, patterns, systems and technical nature of what was given. Each move should have a family resemblance with the former, so that, when five moves are made, all will be part of a lineage and each successive move will be more sophisticated and mature. None are "solutions" but "explorations" of possibilities.

For the students, and for me, this turned out to be more difficult than it initially appeared. Students' tendencies are to "think" a design solution and then invent "moves" to get there, to satisfy the requirement of showing several moves. I asked that this be

avoided. What I wanted was that students gain confidence in making transformations without knowing exactly what the result would be - to "work with" the starting point. I also encouraged thinking in terms of "what would a certain space/form offer a person or user" and to think in terms of basic principles such as proportion, contrast, balance, asymmetry and symmetry, and so on, as well as materials, build-ability, weather-ability, and other technical factors.

We spent less than two weeks and at the end, with only models to show such as those shown here, nearly everyone had been able to make form moves and transformations, without depending so heavily on preconceived designs. Written comments from the students revealed how very difficult this way of thinking was to them.

THE URBAN STREET SPACE EXERCISE

It's generally the case that no single party designs an entire neighborhood, from urban design to furniture. In fact, the real situation is that many designers are involved, one following the other in a complex sequencing process, some coordinating their work in the same time, all in a built environment that is continuous in time while its parts change.

In this exercise, the idea is to help students gain an understanding of how built environments come into being and transform when design work is distributed yet follows certain conventions and rules, and to learn some architectural skills needed to successfully support the cultivation of environments seen in this dynamic way. Because both conformi-

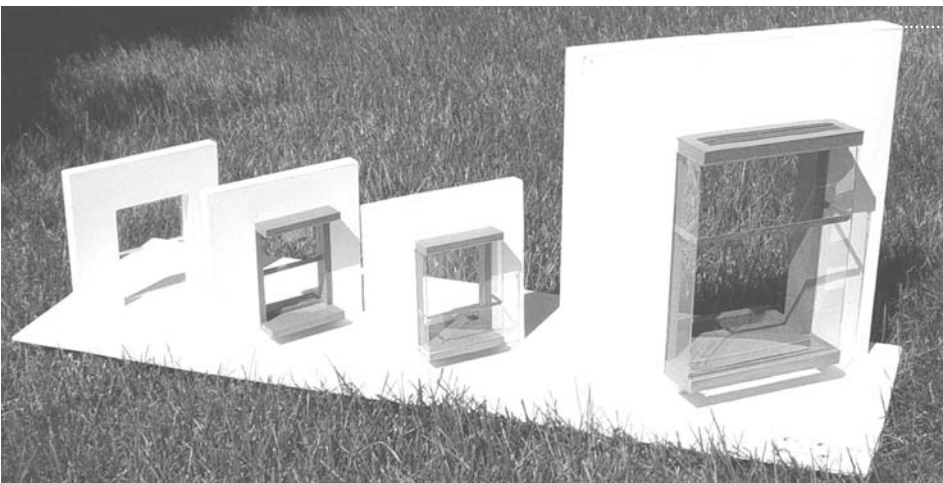


Fig 7. Chris Killinger's study

ty and individuality are at work, I wanted students to learn about their interplay in the making of architecture. We took several steps:

1. We worked hard to agree on shared patterns, types and systems for an urban street space - a set of "rules of the game". To get this process going, we selected an urban "theme" or "model" to use as a starting point. The "inner structure" of the theme was the subject of study for about one week or so, with the objective of "drawing out" the basic constraints inherent in the theme, using notation methods to record them graphically (with occasional notes).
2. We used a fictitious site slated for wholesale renewal. Each student explored an individual interpretation of the agreed upon rules in the design of individual buildings making a whole street space. However, we will tackled the "façade zone" of +/- 15 feet in depth from the building line, but also incorporated everything from façade to façade across the street; we also studied how buildings on individual territories or plots meet, side-by-side, while nevertheless being independent;
3. Students revisited the initial rules and made revisions or adjustments;
4. The students then returned to their individual schemes and adjusted them according to the revised rules.

So far, I have used this exercise twice, both explained briefly below. Most work was done in model (both study and final models), but also sectional axonometric drawings were required for final presentations. In both, I wanted students to attend to 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

► 50

spaces upstairs (access to the space behind the façade zone; public and private separation)

An Urban Street Space: Montreal

Montreal has marvelously rich neighborhoods that are coherent in some respects and wonderfully, even playfully varied at another level. Old and new at the same time, these are truly "living" fabrics. How could so many individual buildings, built by different people, and transformed over time, share so much yet be so "fine-grained" and differentiated?

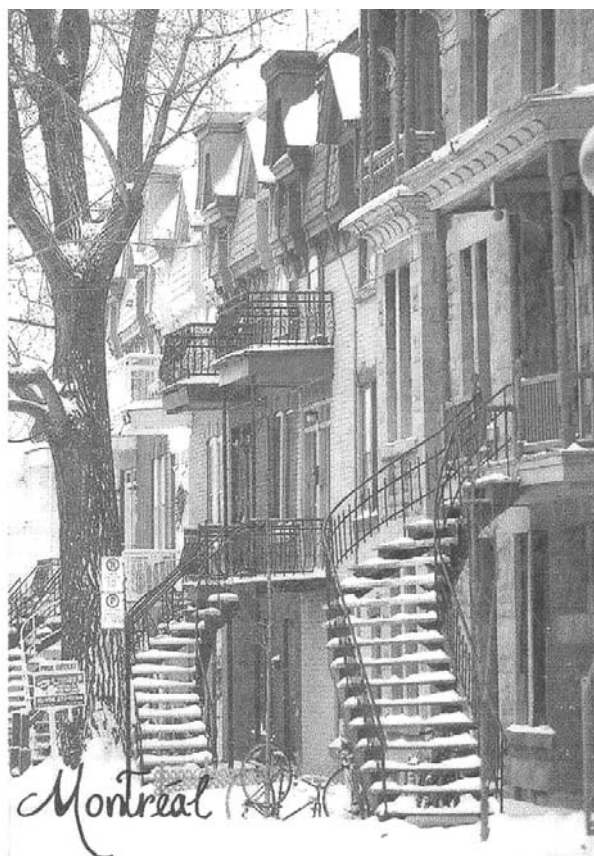


Fig 8 & 9. Montreal neighborhoods shown on refrigerator magnets purchased at the airport

These are some of the questions we explored in a two-week exercise that was done mostly with $1/4" = 1'-0"$ models. We wanted to explore:

- 1) What sorts of design rules are at work in such an environment?
- 2) What sorts of construction / building technology rules are evident?
- 3) What rules can be devised - based on what we observe - to guide the redevelopment of part of that neighborhood?

The students wrote short essays reflecting on this experience, which followed immediately upon the completion of the "Window" exercise described above.

An Urban Street Space: Bern

This exercise, like the exploration of Montreal's urban tissue, was designed to help students develop skills in understanding and elaborating a certain theme. In this case, two independent studio classes at the same year level (second semester 3rd year) undertook this exercise during the final five weeks of the academic semester. One focused on a typical Amsterdam canal façade, while my class of thirteen students used a typical street façade in Bern, Switzerland, as a starting point.

As in the Montreal exercise, only the most general "uses" were defined: commercial space on the ground floor and mixed use or residential on the



Fig 10. Students with their models



Fig 11. A view of the proposed street space



Fig 12. A street scene in Bern today

upper floors. "Reading" each theme would indicate whether separate entries would be needed for the ground level and upper level spaces, for example.

No case was made that the Amsterdam "theme" or the Bern "them" are "correct" in some absolute way. We were, however, saying that they are worth understanding and working with. By looking closely at them, by seeing their elements and relationships, proportions, ways of building, ways of claiming territory, and so on, we could come to know their thematic properties.

Students were not being asked to adopt a neutral position vis-à-vis these themes. On the contrary, the explorations we undertook asked each designer to make value judgments and to "improve" and "enhance" the given "theme" as much as possible. Each designer was expected, nonetheless, to accept the themes for what they are. We asked the students not fight the themes, but to explore what they want to be. Thus, if the basic concepts were allowed to "come into their own" we would be better able to judge them afterwards.

Both classes used the same "site": a gently sloping east-west street. Its location was declared by the two faculty members to be unimportant. This made a number of students very uncomfortable, because they thought it impossible to design without a specific site from which to draw clues.

CONCLUSIONS

These "warming-up" exercises - the window and the street space exercises - were full of opportunities to make "big" moves so much of interest to students today. The overall composition of each intervention mattered very much and as did how each intervention relates in the large sense to the whole. There was also architectural designing to do at a smaller scale - the window, the steps, the doors, and territorial boundaries, and so on. The point, after all, was to learn to identify elements, their properties, their relationships and their dimensions. Doing this methodically and to have fun doing so is the point. In that sense, these exercises were enough "like" studio projects that students and faculty could understand what was being done.

Learning to design and use constraints is a skill

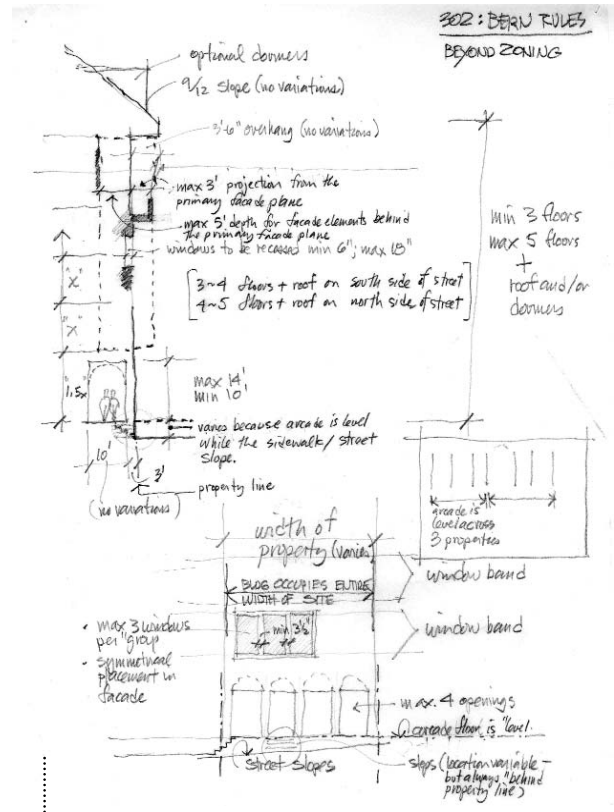


Fig 13. Rules of the Bern theme



Fig 14. View of the street space

architects need in order to successfully cope with the complexity of contemporary practice that increasingly depends on the distribution of design responsibility. It is certainly not the only skill we need, but is an important part of an architects' tool kit. In particular, it is part of the knowledge and skill set needed by an architect who wants to make an



Fig 15. A street scene in Bern today

open architecture.

Knowledge of the way various kinds of constraints work, how to make them, the variety of their sources, and how to use them is fundamental design knowledge, and is particularly needed in an open building way of designing, I have found. Of particular interest is the iterative way this worked. We "deduced" rules from an extant place, used them, adjusted them and used them again. Being able to revisit the work made them "exercises" rather than "projects".

The paper has focused on the question of developmentally appropriate teaching methods in architecture that are thought - by this author - to be congruent with the way the built environment behaves. The open building studios discussed first worked well enough, but lacked sufficient rigor and adequate preparatory work to bring them to the level of sophistication I would like for that year level in the curriculum.

The experience with the "warming up" exercises - both taught at the third year level - showed me that students can get interested and can find something new and useful in them after awhile. Initially, these exercises were a source of confusion and consternation. But later, it was not unusual to hear a student say something to the effect that these exercises were really about how to design, something they had not experienced before in quite that way before.



Fig 16. A street scene in Bern today

With these experiences, it seems only natural that further design exercises could be devised by different faculty colleagues, and offered in classes outside but supporting the studio, where they can be put to use by still other teachers. This would be similar to the exercises done in classes in building technology, structural and mechanical systems design and even in some history classes, where the knowledge and skills gained are brought to bear on design projects by students, in classes taught by a variety of faculty members.

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