

Interdisciplinarity as a sustainable pedagogical tool

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ABSTRACT: It is well established that most sustainable goals require the cooperative effort of a variety of disciplines, both in regard to expertise and outlook. This tendency holds true regardless of scale of the problem. True sustainability is a delicate balance between competing paradigms of success. Solutions must take into account not only a large number of factors but must be able to predict, analyze, and control the interactions between these factors. Few specializations have the breadth of knowledge to adequately address all aspects of any sustainable issue.

Interdisciplinarity, much discussed among academic circles of late, is the condition of cooperation between strict disciplines to derive solutions to problems too complex to be adequately addressed by any one group or type of inquiry. Virtually every professional discipline requires some degree of skill in communicating and cooperating with other groups, yet this aspect of professional life is rarely specifically addressed in academia. Sustainable objectives almost always require a higher order of collaboration skills than normative practice. Descriptive words like “integrated” or “holistic,” often associated with sustainability, indicate the depth of inquiry required to fully address this goal.

This paper will explore two recent case studies of educational initiatives at KSU that were based on interdisciplinary collaboration. Issues discussed will include the problems addressed, the strategies created to foster collaboration, and the results of the efforts. Recommendations for incorporating interdisciplinarity in curricula will also be discussed.

If we are to adequately inculcate sustainability, we must not only focus on challenges, strategies, tools, and desired outcomes, but also invest in curricular paradigms that foster relationships across traditional academic disciplines. Exposing students to collaborative ventures as part of their basic curricular requirements will help better prepare them to address the complex problem sets prevalent in the pursuit of a sustainable world.

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INTRODUCTION

In many ways, sustainability transcends traditional disciplinary boundaries, instead requiring the cooperation of several different constituencies. In an article discussing sustainability at a large scale, Neil Adger (et al) attempts to describe the scope of sustainable decision making. In essence, they argue that sustainable decision-making is “akin to policy-making,” that the resolutions derived from this process have impacts on many disparate constituencies (2003:1095). It might be argued that the same result set is true of large-scale decisions not based on sustainable metrics for success as well, and that sustainable decision-making only reveals the true extent of influence of seemingly innocuous or local resolutions.

Adger and his collaborators do not attempt to prescribe the conditions of decision-making in a holistic, integrative manner, but instead analyze the process of decision in an attempt to parse out metrics that can describe the relative success of various sustainable

initiatives (Adger 2003). The technique this group has adopted to analyze the sustainable decision-making process is “thick description,” a term they borrowed from anthropologist Clifford Geertz (Adger 2003)

Thick description can be defined as meta-analysis that attempts to understand and evaluate complex constructs. For Adger and his fellow anthropologists, the constructs studied are social in nature – environmental decision-making at the level of policy, to be precise. This analysis attempts to identify many if not all of the factors and constituencies involved in a particular decision-making process. In order to fully account for these various factors, “a complete, or at least fuller or thicker, analysis of environmental decisionmaking would seem to necessitate interdisciplinary research” (Adger 2003:1096). Architectural theorist and researcher David Wang, in an effort to frame the range and scope of architectural theory, included thick description as a bracketed set of theoretical approaches to architecture (2006). These approaches straddle the line between purely scientific, “predictive” theories, in which a set of rules is

established by which outcomes can be anticipated to a degree of accuracy, and “empathic” theories, which speak more to the intuitive, subjective nature of the discipline. Empathic or non-empirical theory concerns itself with framing data in a wide variety of ways, including manifestos, subjective observation, even storytelling (Wang 2006).

Interdisciplinarity, sustainability, and experiential learning models can each be described as “thick” approaches to problems. This shared quality is the basis for the link between them, and provides an avenue to move from one state to the other. In essence, the notion behind this paper is that through an interdisciplinary, experiential model, students can learn how to incorporate sustainable decision making into their approach to design.

Geertz advocated thick description as a way to counteract the proclivity of specific schools of thought in his discipline from unintentionally predisposing themselves to particular conclusions when studying various phenomena. He termed this tendency “universalization,” a sort of homogenization of results and conclusions.

Adger et al extrapolate this idea. They state that universalization is not only an academic but an all too practical danger to which any decision-making body might be vulnerable (2003). Architectural designers, for example, might have a tendency to see every problem as a design problem, while building engineers might focus on technological issues. The tendency towards universalization of results is, Adger argues, a structural issue – an artifact of strict disciplinarianism.

Single-discipline approaches to understanding environmental decisions have typically aimed to produce universally relevant observations and understandings. We argue that the emphasis on the universal can be counterproductive.... Approaches that emphasise the universal overlook the specificity and contextuality of environmental decisions (Adger 2003:1099-1110).

A far more desirable outcome is generalization, again defined by Geertz and adopted by Adger. Generalization is a middle ground, in which decisions are tempered by the acknowledgement of context and other localizing conditions (Adger 2003). Again, Adger and his colleagues were trying to identify a method to analyze environmental decisions made by others. This paper posits that the conditions desirable for the analysis of decisions can and should also be applied to the decision-making process itself.

In their final analysis, Adger and his colleagues identified four metrics with which to judge sustainable decisions: efficiency, effectiveness, equity, and legitimacy. *Efficiency* deals with the maximization of the strategy and the resources allocated to achieve it. *Effectiveness* indicates the relative success of a strategy to achieve its stated goal. *Equity* describes the notion of “distributive justice” – essentially, a study of the relative impact of decisions on affected constituencies. These impacts may be costly one or

more constituent groups or beneficial, or both. Equity attempts to identify whether the environmental decisions made are balanced properly, or if they favour or disfavour certain parties. Finally, *legitimacy* measures the acceptability of decisions to the parties making the decisions as well as constituencies affected by the decisions, or simply those observing the decisions and their effects (Adger 2003).

These metrics possess several compelling attributes. First, each measure requires a breadth of analysis that seems to necessitate the review and input of several disciplines. Taking effectiveness, for example, from Adger:

An economic interpretation of effectiveness relates to the cost of achieving a given goal, or to the outcome achievable for a given cost.... [E]nvironmental decisions (however) can be analysed for their effectiveness independent of economic welfare concerns (Adger 2003:1098).

Another attribute of Adger (et al)’s set of metrics is the potential for replicability and valuation. This approach incorporates the intrinsic properties of generalization into the analysis, and in doing so provides a framework that can be used to compare different instances of environmental decision-making.

It has often been said that architectural pedagogy, and the discipline of architecture itself, is on the whole not incredibly self-reflective. This state of affairs becomes of increasing concern when considering the requirements and potential impacts of sustainability, which often supersede the goals of a particular client or architect. Sustainable architecture attempts to balance client considerations, aesthetics, environmental impact, and social and cultural concerns. The metrics outlined above can be helpful in identifying the overall success of different scales of architectural endeavors, from specific projects, to the decision-making processes of specific firms, to the relative effectiveness (for example) of large scale organizations.

This paper will utilize this set of metrics to (in part) evaluate two projects that use interdisciplinary, experiential exercises as a means to inculcate the principles of sustainability in the participating students. Ideally, this analysis will reveal attributes that have some objective, repeatable value. The focus of the paper is the educational processes themselves. The results of the exercises – in one instance, schematic designs, in the other, a built work – will be exhibited as a means to evaluate the exercises. One artifact of the lack of introspection referenced above in the architectural realm is a tendency to “categorize” the final iteration of design projects (as described by Adger), as if their relative value was presupposed and self-evident. This paper will attempt to eschew this normative analytical technique in regard to architecturally pedagogical projects, and instead move towards the “golden mean” of generalization.

1. DEFINING TERMS: INTERDISCIPLINARITY & EXPERIENTIAL LEARNING

1.1. Interdisciplinarity

Interdisciplinarity is the communication or collaboration of two or more distinct disciplines. This cooperative approach is normatively established (or prescribed) to jointly pursue a common goal or objective. Interdisciplinarity has relatively recently been established as a viable model of practice, and as such there has been some encouragement for educators to institute opportunities for student designers to obtain experience working in tandem with their peers while still in the academy. The 2004 student performance criteria established by NAAB mentions both interdisciplinarity and the ability to work as a team as required educational objectives.

1.2. Experiential learning

Though in its broadest sense normative architectural studio education would be styled 'experiential' by educational circles, here experiential learning is offered as an alternative to traditional design studio offerings. While design studios do have some compelling educational attributes, requiring a great deal of investment on the part of students and teachers alike, Jay Garrott identifies the limitations of the conventional studio approach, which has been 'scarcely altered since its origins in the Ecole de Beaux Arts' (1983:116). This 'master-apprentice' model is an autocratic one, Garrott argues, substituting a very narrow set of values for empirical knowledge (Garrott 1983). Criticism of traditional studio settings continue to this day. Garrott offers a different studio-based model: experiential learning. In essence, experiential learning requires students to be active participants in the learning process. This may mean that students may have to respond to non-academic objectives, such as a construction or real-world design project, or that they would be involved in crafting the assignments or evaluation aspects of the course.

This experiential inquiry method stresses the facilitation of an action-oriented educational environment which promotes the skills of questioning and systematic problem-solving...unless an inquiry is perceived as relevant by the learner, no significant learning will take place (Garrott 1983:118).

Interestingly, the experiential learning model frames a new role for the educator – that of facilitator (Garrott 1983). This role may include directing students' efforts, providing a logistical framework, or validating student responses, but usually doesn't include roles such as disseminator or "master," as Garrott describes. To use an aphorism, students learn what they do.

1.3. Calibrating the metrics

As mentioned above, this author has co-opted the set of metrics Adger and his colleagues identified to establish a framework of analysis for the projects listed below. It should be readily evident that academically-

based projects, however rooted in reality, have a somewhat different role than public realm projects. Academic projects, especially those that are curricular in nature, tend to be somewhat removed from, rather than completely embrace, the client constituencies they target. Perhaps the most compelling reason for this detachment is the dual nature of curriculum-based experiential projects – namely, that there are certain pedagogical objectives that must be addressed. These objectives seldom completely align with the requirements of a client group. This common state of affairs indicates that the metrics used to gauge fully realized projects fully engaged by a wide variety of stakeholders cannot be applied as is to the somewhat abstracted nature of academic projects.

Thus, the four metrics identified above have been somewhat modified to better fit the "local" conditions of academic projects, for the purposes of this paper. *Effectiveness*, in this case is concerned with the success of the pedagogical model, not with the end result of the exercise. *Equity* will examine the perceived and objective measures of satisfaction amongst the various groups participating in the project. What is the worth of the project to the students involved, contrasted against the amount of effort they invested? *Legitimacy* takes a critical view of the project. This measure incorporates reflection on the project from a position of some distance by a variety of groups.

2. CASE EXAMPLE: GREENSBURG ENVISIONED

2.1. The design problem

This project was prompted by the almost complete obliteration of the town of Greensburg, Kansas, by an F5 tornado in May 2007. Over 90% of the town's building stock was severely damaged or destroyed. Town leaders, local professionals, and FEMA collaborated on a "long term recovery plan" to chart the rebuilding of the town. The residents decided to adopt a sustainable approach to the revisioning of Greensburg. This sustainable approach was evident in a wide range of projects, from the scale of planning to individual buildings and landscape features.

The recovery plan identified a wide range of initiatives that the town would need to invest in to re-establish itself. The nature of most of the proposed projects made the collaboration of a variety of disciplines an extremely viable option. Two professors at Kansas State University, one in architecture, the other in landscape architecture, decided to collaborate to produce meaningful, comprehensive responses to the town's list of priorities.

2.2. The approach

It was agreed that the students' efforts would not be considered to be actual design proposals, but instead be a "pre-design" exercise. The projects would help the citizens and designers of the new Greensburg to identify possibilities, to see what form their town might take. The collaborative studio was seen as an ideal place for this to occur.



Figure 1: Greensburg, Kansas: the aftermath of the tornado. Very little of the town was unscathed. Source: (FEMA 2007).

The professors were each responsible for separate design studio classes. It was decided that the two classes would work together in small teams to identify projects to develop. The professors would retain grading autonomy, but would otherwise integrate the two sections.

Students were encouraged to form groups of any size or type to tackle the project. The students arranged themselves in groups of one to four. Roughly half the groups were interdisciplinary; the rest were intradisciplinary. This self-selection provided a means to judge the results of the two group types, discussed further below.

Logistically, the studio maintained contact with building officials in Greensburg, but remained autonomous in regard to direction. The only document the students responded to was the long-term recovery plan itself. This allowed the students to focus their work on ideas, rather than respond primarily to any overly-exacting requirements of the client constituency. The notion was that the studio was in a 'brainstorming' rather than responsive mode of design.

The studio received some funding to cover travel and document production. It was understood that the final iteration of the project would be a gallery display of the work.

2.3. Student responses

As mentioned above, the students formed groups to engage the project. These groups chose a particular project from the long-term recovery plan to study. The only stipulation in regard to choice was to look for projects that were on the high priority list, as these would be most likely to be funded and prosecuted first.



Figure 2: Site plan of educational/community campus, with an elementary school at lower right and secondary school at upper left. The yellow areas would be reclaimed prairie areas that would serve as natural laboratories. A greenway with a natural stormwater swale cuts a diagonal between them (below). Source: (Gabbard 2007).

An example of the work of an interdisciplinary team would be the group that chose to provide design direction for the new public school and recreation complex. Sixteen blocks in the southeast sector of Greensburg were allocated for a new elementary, middle, and high school, as well as a number of community-oriented amenities (FEMA 2007). The scope of the project included overall planning, large and small landscape development, and the schematic design of a number of building projects. From the recovery plan:

The new school campus in conjunction with a new community park will strengthen the school's importance as a community-gathering place and allow convenient opportunities for shared uses and events (FEMA 2007:77).

The proposed scheme addressed all the various scales. A cohesive overall campus plan was created (Figure 1 above). The scheme was able to balance

programmed buildings, recreational and natural areas. Moreover, the approach of the project was to link the educational and recreational programs to the restored natural areas, which would function in part as teaching labs for the schools. In order to maximize efficiency and use, the recreational features were shared by the schools and the public.

It appeared to the professors that this group integrated well. The differing foci of the architecture and landscape architecture students allowed the group to tackle a wide range of issues; as a group they were able to balance their proposals and create a holistic design for the site. The students' individual strengths and emphases meshed rather than clashed, allowing the students to create a much more fully realized scheme than if they had undertaken the project separately or as independent disciplines.

2.4. Outcomes

Effectiveness. In evaluating the work of the various group types, it became evident that the interdisciplinary teams were far more successful in resolving their schemes. By contrast, teams of one discipline or individuals did not, on the whole, arrive at a similarly satisfactory resolution. Another project that was undertaken was a sustainable housing resource office (SHRO) within a newly established city park. The SHRO was conceived by the long-term recovery plan as "a 'one-stop shop' for sustainable information and resources (to support) the community goal to achieve the highest standards in energy efficiency and sustainability" (FEMA 2007:16) The site chosen for the office was a new city park, an amenity around which the new commercial and civic center of the town would be organized.

Two teams undertook this project. Each had two members; one consisted of architecture students exclusively, the other had one landscape and one architecture student. Figure 2 indicates the latter, interdisciplinary team, while figure 3 is representative of the former team's work. It was evident that the interdisciplinary team's work was not only more polished but exhibited a greater depth and resolution. Considering that all other variables were, more or less, the same, this seems to indicate that interdisciplinary collaboration does hold some value.

Efficiency. The basic issue here is this: does the extra layer of complication caused by the introduction of interdisciplinary collaboration as a mode of learning and working enhance or detract from the experience? At issue is the learning curve associated with not only working as a team, but finding ways to communicate with those outside one's discipline. Students had five weeks to work on this project – very little time to devise solutions to very complicated problems. The quick nature of the project may have deterred some from attempting to form interdisciplinary teams. It appeared, though, that those interdisciplinary teams that were able to navigate through the team building process were able to undertake more complex strategies,

capitalizing on the strengths and perspectives of their constituents. This became evident to all involved.

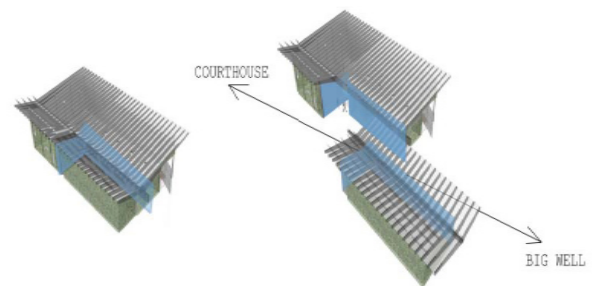


Figure 3. Proposal for SHRO by interdisciplinary team. At top, view of office from park with living walls evident. At bottom, diagram of building concept, split to allow linkage of important contextual features across site and to reveal normally hidden systems to the public. Source: (Gabbard 2007).

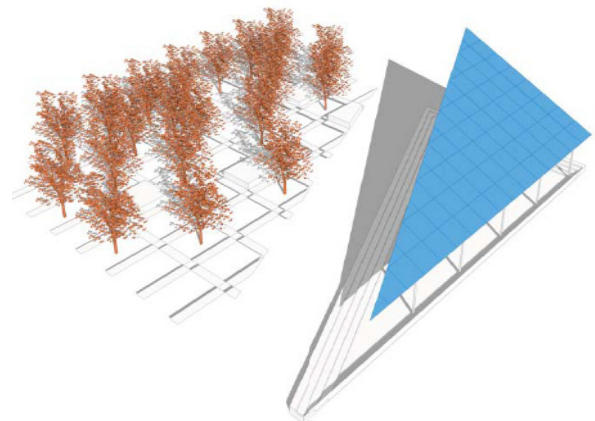


Figure 4. Proposal for SHRO by monodisciplinary team. Far less developed. Source: (Gabbard 2007).

Equity. Though there was a significant amount of effort on the part of the professors to manage the logistical aspects of the project, the students were given a relatively free rein in regard to project, group configuration, approach, and focus of their work. This dovetails with one of the precepts of Garrott's approach to experiential learning: "to assist students in their understanding of personal values (and) ascertaining their particular strengths and interests" (Garrott 1983:118). In essence, students helped to formulate the format of the problem-solving as well as their own particular solutions. In essence, part of the students' charge was to step outside the familiarity of faculty-programmed projects, and to develop the frame for their own work. This state of affairs heightened both the responsibility and the ownership of the project for the students involved. The faculty embraced the role of "facilitators," forcing the students into an active learning mode. Anecdotally, the level of satisfaction on the part of the students seemed to be directly linked to the level of self-direction the students were willing to invest. As Garrott quotes Postman, "No one will learn anything they don't want to learn" (1983:120). This self-directed project underscored students' willingness to participate in their own exploration and growth.

Legitimacy. This analysis is based on two factors: the legitimacy of the project to its constituents, discussed above, and the legitimacy of the process. Experiential projects in educational settings are obligated to both the curricular and the public realm. In regard to the former, the project was initially set up to help the residents of Greensburg envision how sustainability could be integrated into the planning of their town at different levels. At the beginning of the project, very little work had been done towards visualizing many, if any, of these projects. Many of the projects had not been realized beyond being identified as concerns. As such, there were not specific clients to whom the students could respond. In a few cases, design teams were contracted during the period the students were working on the project. Either condition served to marginalize the projects in regard to input to actual design processes – a trade-off for the freedom that characterized the process of the studio.

As a way to pedagogically introduce students to interdisciplinary work, the project did seem to hold value. The limited involvement with client groups helped to limit the scope of variables the students had to respond to. This softened this project, for many the first collaborative design project they had engaged in. In this case, then, the legitimacy of the project as an academic exercise is heightened as the legitimacy to the "client" is curtailed.

In regard to the inculcation of sustainability, this project did seem to expose students to the notion that many sustainable issues are enhanced by cooperative design. The "living wall" that was proposed by the SHRO interdisciplinary team, for example, was a landscape-based approach to the building envelope – a hybrid strategy. Including such a strategy became a negotiation between the disciplinary students – a

cooperative venture. If nothing else, the exercise became a way for students to exercise this necessary aspect of sustainable design. "The insights provided by this experiential approach do not yield any clear and conclusive answer to the student. They make (the process) more complicated" (Phenix 1973:42). Collaboration simultaneously broadens the design problem, provides a wider range of solutions, and, ideally provides deeper solutions. None of these attributes simplify the learning process, but instead makes the process of learning begin to align with the process of doing.



Figure 5. Close-up of living wall. Source: (Gabbard 2007).

3. CASE EXAMPLE: PROJECT SOLAR HOUSE

3.1. The design problem.

In November 2005, faculty from the College of Engineering and that of Architecture, Planning and Design proposed to compete in the 2007 Solar Decathlon. The Decathlon challenges university-based teams to design, build, and operate a small home powered exclusively by the sun. KSU was one of twenty teams selected to participate.

3.2. The interdisciplinary approach

This two year project required a great deal of organization. The basic strategy towards the project resolved itself into a network of constituent groups from a range of academic disciplines, chiefly design and engineering, but also including business and journalism. A project schedule was worked out so that particular academic units would be 'activated' when appropriate. This approach was taken for pragmatic reasons, so as to capitalize on the existing curricula of the various units. The overall requirements of the project were divided into chunks suitable for the various disciplines. For instance, the solar system was designed by electrical engineering students. Though work on the project as a whole began in Spring 2006, the solar system design wasn't undertaken in earnest until Fall 2006, when the students involved took a solar system engineering class. It was at this time that the details of integration with the overall house design were resolved. The mechanical system design was undertaken by a group of mechanical engineering students as their task in a class called "interdisciplinary design projects." This required class challenges student

teams to take on real-world projects. Both of these courses, incidentally, were set up quite similarly to architectural design studios.

At the core of the project was a continuing series of architectural design studios. Students in these courses were charged with not only the overall design of the building but the integration of the various systems and other concerns being addressed by other academic units. Similar to the Greensburg project above, the design was ever more cooperative, as various system designs were undertaken. Each architectural student took on the added responsibility of acting as a liaison to an external academic unit, updating both groups as to the latest design details and concerns. This activity was imperative to the success of the project.

3.3. Student response

The final design highlighted the integration of active solar, passive solar, building envelope, and spatial systems. The solar array, for example, took on additional roles beyond its mandate to produce energy. It was used as a facade system. The requirements of the array (i.e. that it be tilted to maximize electrical production) deformed the shape and ultimately the interior of the house, affecting the composition and the experience of the house. The solar array also acted in conjunction with the shell design to provide a thermal barrier for the home, which helped to keep the home quite cool by absorbing the radiant energy from the sun. Only two openings were cut in the south facade, one to give access to a sun porch (figure 5) and one to provide reflected light to the bedroom.



Figure 5. South and west elevations, Project Solar House. Note the form has been canted to maximize solar production. Source: (Gabbard 2007).

In virtually every aspect of the design, the display of systems became a priority. The building shell, for instance, was composed of relatively thin, pure planes. The only interior partitions were around the bath and bedroom. The itinerary through the house was designed to expose visitors to all of the spaces of the house and many of the building's systems, including a building automation system.

3.4. Outcomes

Effectiveness. One measure of effectiveness for this project would be whether or not the design was fully realized. The designs proposed, at the overall scale, as well as at the system, component, and detail level, were, in the end, successful. The various designed components and systems, by and large, met their stated objectives. One example would be the building shell. It was designed to drastically reduce the heat load on the house in the summer, often the period of time with the highest electrical demand. The design preferred passive cooling techniques, especially by reducing radiant loads. When modelled, it was noted that the summertime energy requirements were far less than at other times of the year, essentially an inversion of normally constructed energy use curves. Another consideration would be whether or not the approach prescribed achieved its goals – to inculcate sustainable skills through the practice of interdisciplinary collaboration skills.

Efficiency. While effective, the design process was relatively inefficient. Most if not all students involved were uninitiated in many of the technological intricacies of the elaborate systems that comprised the house. Each student had a relatively steep learning curve to become competent in the components, systems, and processes they were charged with designing. It could be argued, however, that though this learning process made the project more inefficient, it heightened the efficiency of the learning objectives. Essentially, the students got more educational value from the project. One student's reaction:

The experience also required me to gain the confidence to ask the important questions to the appropriate people, even if that meant contacting industry professionals. At my current job, I have to call at least one expert a day, and that is not always easy.

The exercise of designing these systems required students to adopt new forms of knowledge and modes of thinking and valuation outside pure design considerations, essentially "illuminat(ing) the diversity of values between themselves... and society" (Garrott 1983:39). In this project the inherent inefficiency of the process stood testament to the broadening attention being afforded to the demands of designed systems and elements.

Equity. Perhaps the least controlled aspect of the project involved this subject. The project was voluntary, in that students chose to participate by enrolling in classes that were charged with the solar house or some portion of it. As students were in classes, they could be held, to some degree, responsible for their actions. Without question, the project was a far more herculean effort than a more academically oriented class of similar type.

Certain inequities came to light as the project began to be constructed. The design of the house was a long process, involving periodically evolving sets of

students. Each successive semester's participants took on the task of realizing the designs of the previous group, while their ability to influence the design lessened. Simply put, the earlier student designers were absolved of the responsibility of building what they had designed. In many cases, the designs were sufficiently detailed and integrated with the overall project as to be successfully translated into construction with a minimum of complication. Certain other systems, however, proved to be untenable when the realities of construction presented themselves. Interestingly, the problems associated with systems and components that became issues during construction could be traced back to the zealotry with which student designers pursued the integration of their piece with associated systems. One example was the storage wall that ran alongside the short hallway connecting the living area to the bedroom. The overall design allowed that this casework would be used, partially, to house equipment associated with the solar system. As such, the student designer was charged with ensuring that the casework would be able to accommodate this equipment. Later on, it was discovered that the cabinets as designed would not fulfill this necessary function, requiring some extensive redesign during the construction phase.

Legitimacy. Again, legitimacy is concerned with two arenas: the ratification of the product and of the process. It is hard to frame a discussion of the house as an object due to its impermanence. The house was designed to be taken to the competition and then it was sold to an agency. It has yet to be reused.

Another aspect of product would be the competition itself. It was during this period that the building was most scrutinized by a large, varied group of examiners, including experts in engineering, interior and architectural design, energy, fire safety, and so on. While this project did not perform as highly as others, it was quite successful in some arenas. Its interior and architectural qualities were commended, as were the integrative strategies.

In regard to educational process, there were many learning experiences incorporated into the project. The interdisciplinary bent of the project was considered of great value by the students participating. One student stated the project "helped me consider the realities of the needs of other disciplines, not just assuming they would work." Another mentioned "I would have to say (I experienced) a change of values when it comes to sustainability and collaboration. The importance of collaboration in any project cannot be emphasized enough." These perceptions ratify the main thrust of the approach: that design imperatives need to be inclusive, holistic – the basic requirements of sustainable decision-making.

CONCLUSION

This paper has attempted to discern whether interdisciplinary projects can help inculcate sustainable design principles. While interdisciplinarity does not

necessarily connote sustainability, it does appear that the processes associated with collaboration have a great deal in common with sustainable objectives. The cases seem to indicate heightened investment in sustainable features when students are organized in interdisciplinary units.

The author grants that the system used to evaluate the effectiveness, efficiency, equity, and legitimacy of the projects above has been used on an extremely provisional basis. It is hoped that this discussion will spark some discussion about how best to evaluate complex student projects. Determining some basis of generalisation of sustainable or experiential pedagogies can only benefit these growing fields of educational pursuit.

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