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# Hidden in Plain Sight: Campus Scavenger Hunt to Teach Structures and Technology to Architects.

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# Hidden in Plain Sight: Campus Scavenger Hunt to Teach Structures and Technology to Architects.

## *1. Introduction*

Look down the street, what do you see? Buildings with windows and doors, a road surface probably, cars, busses, pedestrians maybe, perhaps some trees. Now look again, what did you not see the first time? Telephone wires? Electricity cables? Air-handling machinery on the roof perhaps? Grills and grates? These are often the aspects of building design that the public, or even the average architecture student, only notices when it is a problem. In these authors' experience these are also the aspects of building design that never appear on the beautiful renderings at the end of the semester studio pin up. Meanwhile, big aggressive structural moves are a very common sight. However, such moves are rarely accompanied by any real acknowledgment of the constraints of gravity and material strength, or how much structure would really be required for the 200ft cantilever or the tower with massive atria. Grand claims are made about thermal masses, day-lighting, light-wells and airshafts, unaccompanied by the knowledge and detailing necessary to fully examine such issues. So we set out to design an assignment that was an exercise in noticing.

This paper describes ongoing efforts at Syracuse University to integrate structures and technology teaching into design teaching for architects. This specific assignment was given in two courses, Structures II and Building Technology II, to the same group of students (third year of a five year program). Students were assigned a building on campus and required to investigate. They were charged with finding, photographing, and analyzing the visible evidence of both structural and building technology design of those buildings. Their efforts were collated into an exhibition displayed in the school for some weeks. Both the assignment and exhibition were intended to generate thought and discussion of how mastery of technical knowledge is vital for good design. Many students (and indeed the occasional studio critic) view the "support courses" of structures and building technology as ancillary at best and as an obstacle at worst. However, those students who fail to engage with this material are far less prepared for the real world of design and as practicing architects will cede control of their designs to engineers, contractors, and outside consultants.

This study describes the assignment and its place within the curriculum at Syracuse University. Examples of student work are presented alongside the evaluation of the project, including student response data.

## *2. The Assignment*

This assignment was given to approximately 110 third year students in a five year BArch program at Syracuse University. The assignment was given in both the Structures II lecture course and the Buildings Technology II lecture course, which had a shared population.

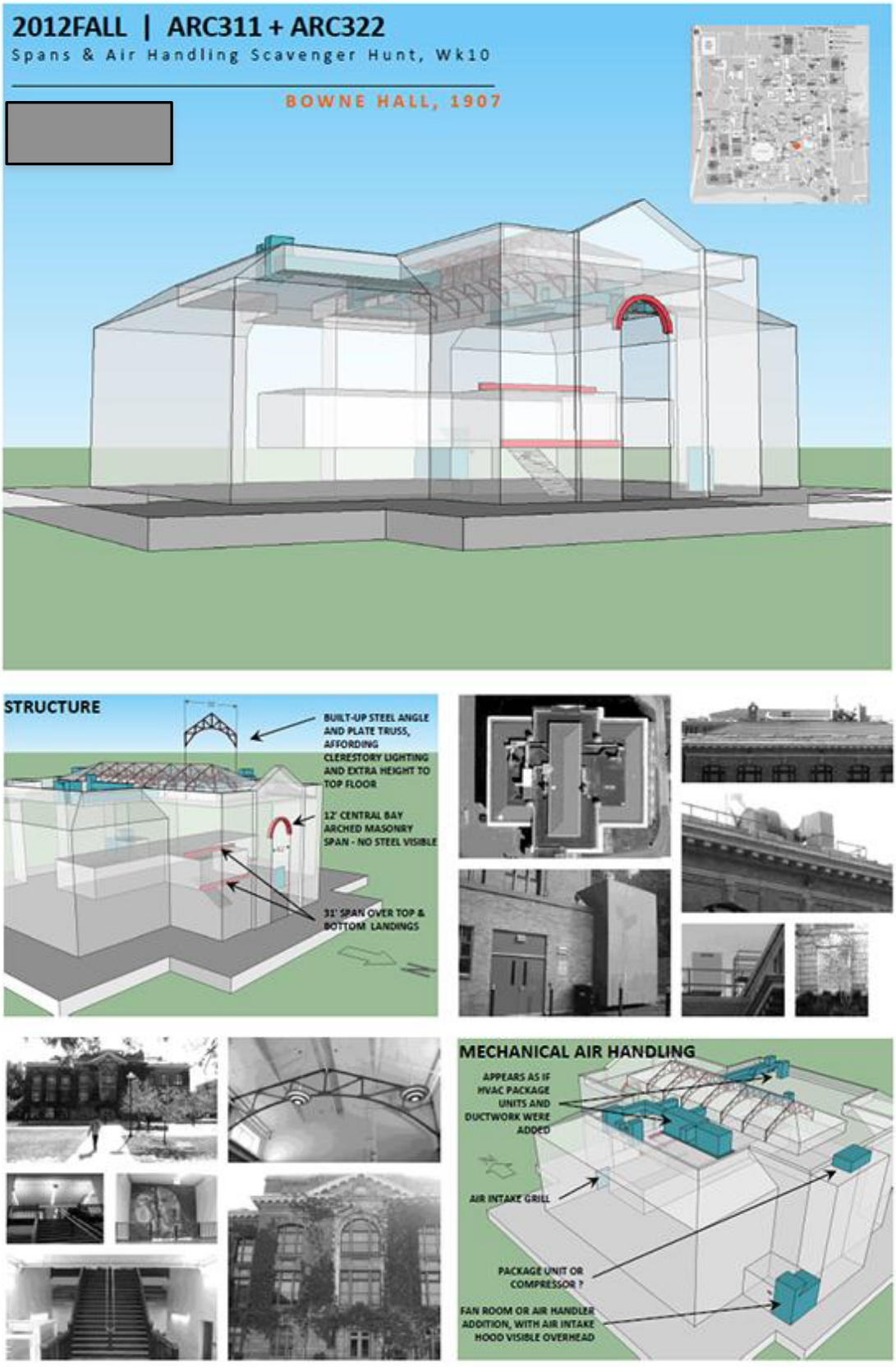
Quite simply, this "in plain sight" scavenger hunt proposed to the students that it sometimes takes a willing eye to notice the proliferation of structural and mechanical building system elements that are all around us. Among many of the period buildings on the Syracuse University campus, structural and mechanical elements are often "overtly hidden" within the tectonic language of the building's style, such as with lintels, beams, arches, chimneys, or light monitors. This is to say that these elements are not hidden at all, but rather they are so integral to the architectural whole we might not notice them as also distinctly technical components. Meanwhile, among contemporary buildings these same elements often vanish quite intentionally, so that buildings might seem to "float" without structure or altogether deny the necessity of mechanical systems. Cutting across these period distinctions, we further hope that the students might begin to notice that while significant structural elements are often directly affiliated with major architectural surfaces (front elevations) and/or spaces (entries or assembly areas), mechanical systems are most often banished to the basements, roofs or backs of buildings. In this way, structural moves often step right out of hiding, except when the smooth articulation of space demands that they recede or even disappear from view; and on the contrary, mechanical systems often lurk undetected, except when their size grows so large that they can't but be forced out of hiding. With these considerations in mind the task we set the students was simply to see these otherwise "hidden" system elements, then put them on notice by documenting, highlighting and annotation.

The students were assigned in pairs to study building on the Syracuse University campus. Almost all of the students (over 95%) were enrolled in both the structures course and the building technology course. It was the first time that both courses were taught at the same time to the same group of students and this project was an effort to capitalize on that. There were two teams per building (there was a large class size and this still required 30 buildings on campus to be scouted by the TAs for suitability). The students were given 10 days to complete the assignment. They made a site visit to document the building and its structural and technical aspects. They sketched the massing of their on site to begin the abstraction needed for simple computer modeling, and noted key building span and equipment dimensions for drafting to scale.

While documenting, students were cautioned to think carefully about what exactly they were photographing. The aim was not just to document but also to reflect on the degree to which these elements are visible or hidden, carefully integrated or artlessly stuck on, and located by an architectural vision or an engineering necessity, or even both. Students rarely show such structure and mechanical elements in studio designs, and yet they must be present in any real building. It is our hope that as the students leave our lecture courses on structures and building technology they will begin to take ownership of these elements. For if they do not take ownership of such design elements, control will be ceded to the dreaded engineers! (in which category the primary author includes herself).

Digital copies of a sample sketch up model and sample layout for the assignment were posted to the course website (see Figure 1) and the completed assignments were collated into an exhibition that was displayed in the School of Architecture for the closing weeks of the Fall term.

**Figure 1**


2012FALL | ARC311 + ARC322
Spans & Air Handling Scavenger Hunt, Wk10
BOWNE HALL, 1907
STRUCTURE
BUILT-UP STEEL ANGLE AND PLATE TRUSS, AFFORDING CLERESTORY LIGHTING AND EXTRA HEIGHT TO TOP FLOOR
12' CENTRAL BAY ARCHED MASONRY SPAN - NO STEEL VISIBLE
31' SPAN OVER TOP & BOTTOM LANDINGS
MECHANICAL AIR HANDLING
APPEARS AS IF HVAC PACKAGE UNITS AND DUCTWORK WERE ADDED
AIR INTAKE GRILL
PACKAGE UNIT OR COMPRESSOR ?
FAN ROOM OR AIR HANDLER ADDITION, WITH AIR INTAKE HOOD VISIBLE OVERHEAD

### *3. Student Response Data*

A survey was administered to the students after both courses had ended and grades were filed. In order to gain some contextual information about students' attitudes to the role of technology and structures in design the students were first asked a series of questions about the way they use technical knowledge in their design work. The results of these questions are provided in Figures 2-4. The majority of students report that they do not include technical details in their representations of their design work with any regularity, nor do they often seek out precedents specifically to resolve technical issues, and when visiting architecture they do not consistently document technical aspects. There were a small number of students who reported the opposite. These results are not surprising to the authors who teach large lecture courses in structures and technology, but are also involved in design teaching. Asked about their motivation when they DO include technical systems in their representations students cite a variety of factors with the most significant being a chance to test out systems recently encountered in lecture courses or a specific requirement by either the studio critic or the project brief. When they DO NOT include technical systems the most common reasons cited were a lack of confidence in their ability to do so well, and a lack of any real requirement from the studio critic or the project brief to do so at all. Less than 20% of students are willing to admit that they are not particularly interested in technical systems as a design challenge, while 40% claim to have such an interest.

**Figure 2**

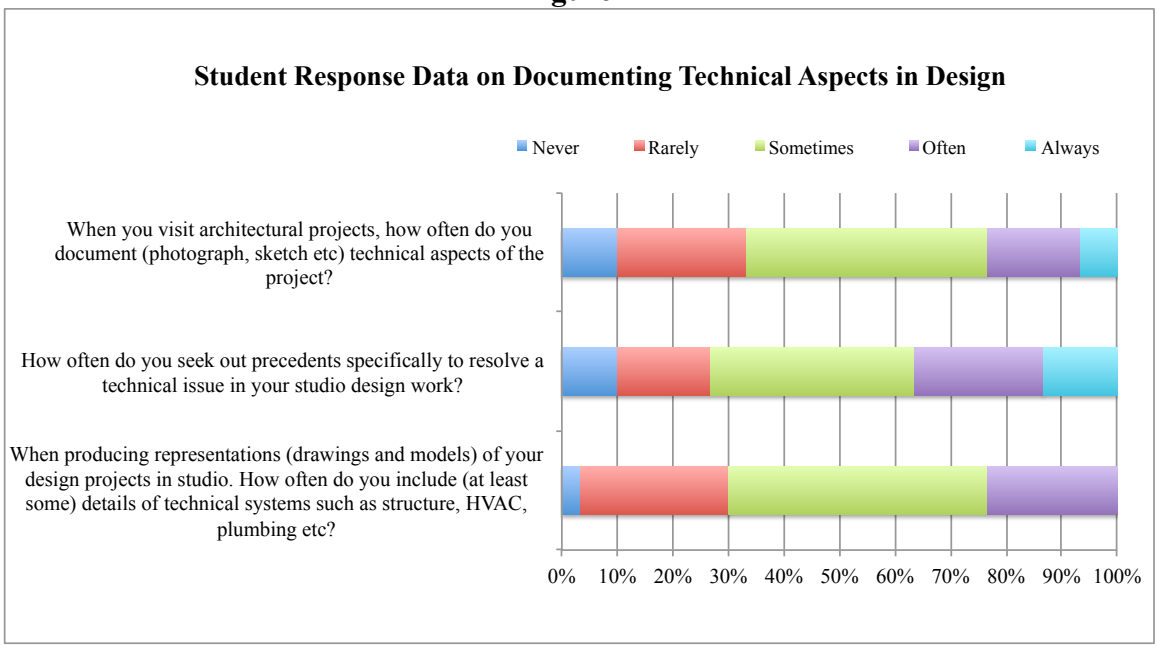


**Figure 3**

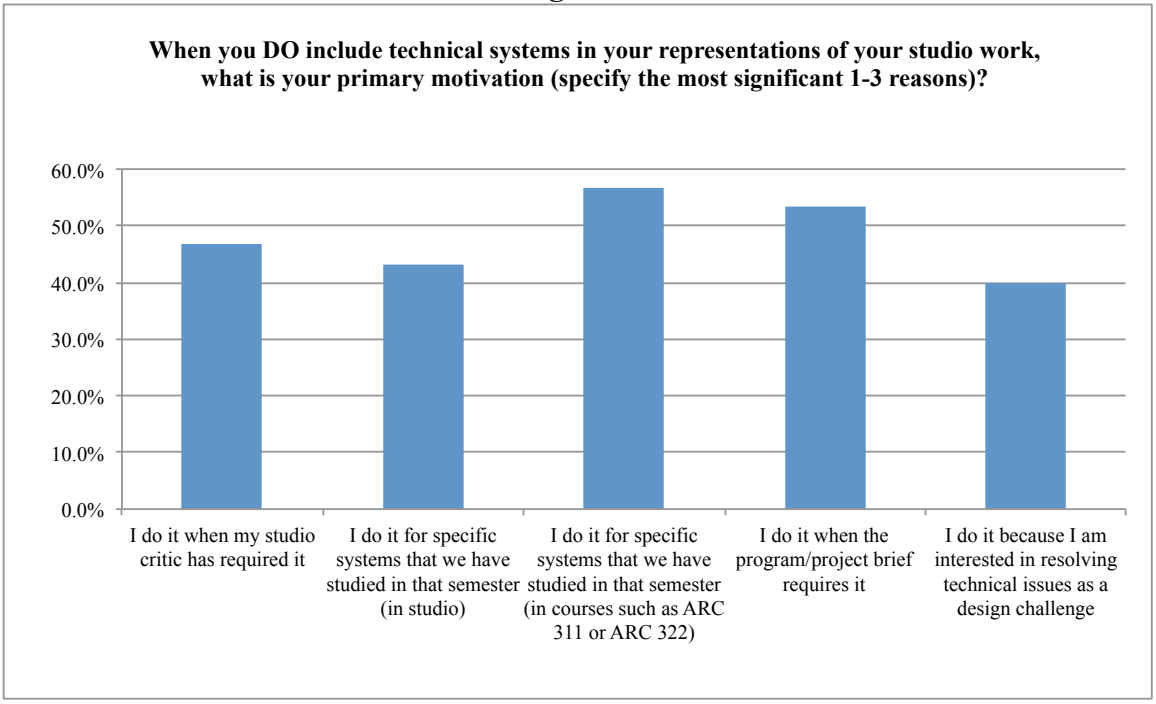



**Figure 4**

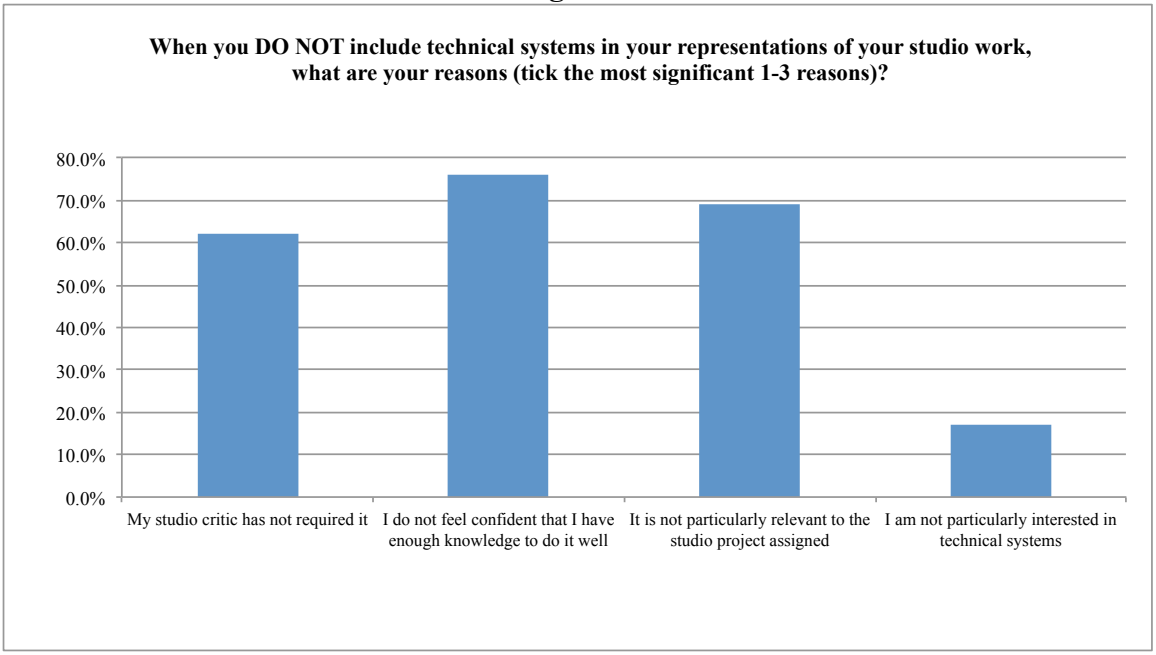



Figure 5 shows the student responses to a series of questions about the impact of the Scavenger Hunt project. The students were split 60 - 40 with the majority disagreeing that this assignment was the first time they had tried to figure out the structural system of a building by walking around it and the majority claiming that the task was not beyond them. However, for a significant minority this assignment was a realization that they do

not normally look at structural systems, and most encouragingly, a large majority (over 75%) of the students agreed that this assignment made them look around themselves more often in new buildings to identify and speculate about the buildings' structure.

With regard to mechanical systems over 50% of students said this is the first time they actively went looking for them in a building and similar to the findings about structures, a large majority (almost 80%) of the students agreed that this assignment made them look around themselves more often in to identify and speculate about buildings' mechanical systems.

**Figure 5**

The students were also asked a series of questions where they were asked to play studio critic with regard to the building they had studied and speculate as to how they might have improved it. The answers to these questions were revealing. On the whole, the students were critical of the structural systems saying that they would have designed more ambitious structural systems and less heavy structural members. Similarly, they assert that they would have gone to greater pains to minimize the visual intrusion of the mechanical systems. These results get to the heart of the assignment we designed. As we the instructors know, the kinds of technical systems for which the students might display greater approval are often either very difficult or very expensive to implement. It is important for students to constantly engage with and critique normative building conditions to truly understand this issue. When they spend much of their time looking at expensive high-end examples of historical and contemporary practice, they are less likely to encounter this issue. We hope that this assignment will spur our students on to constantly note examples of technical systems deployed well and deployed badly and that in doing so they will be better architects and better able to work with technical experts.

**Figure 6**

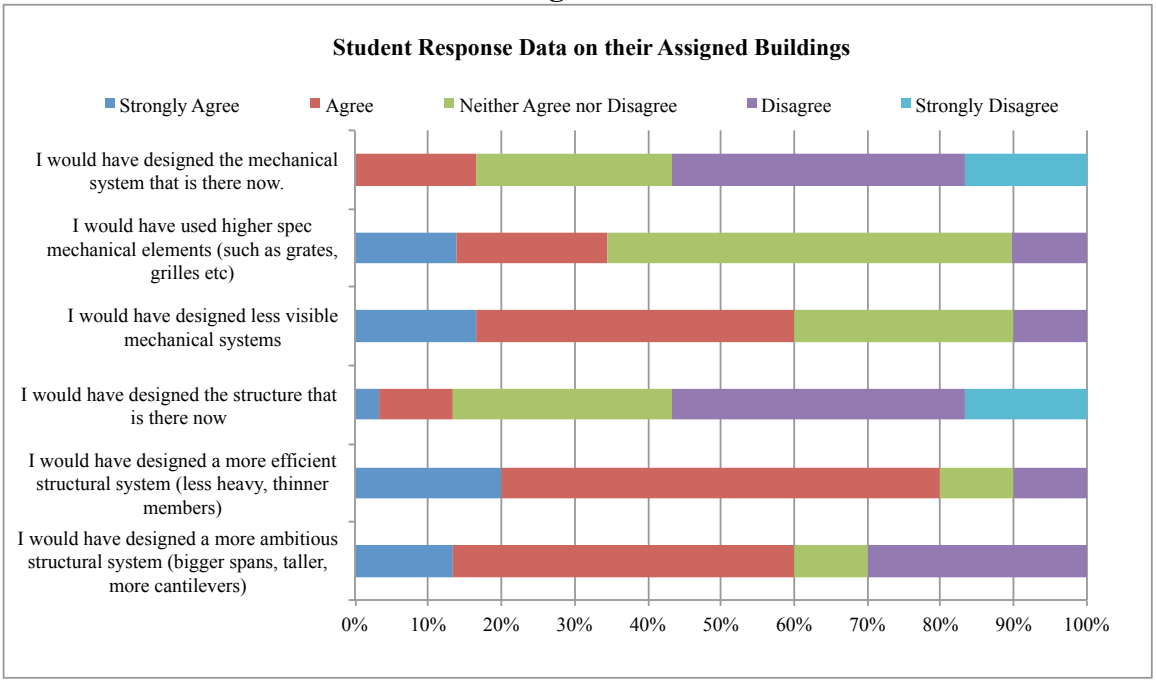
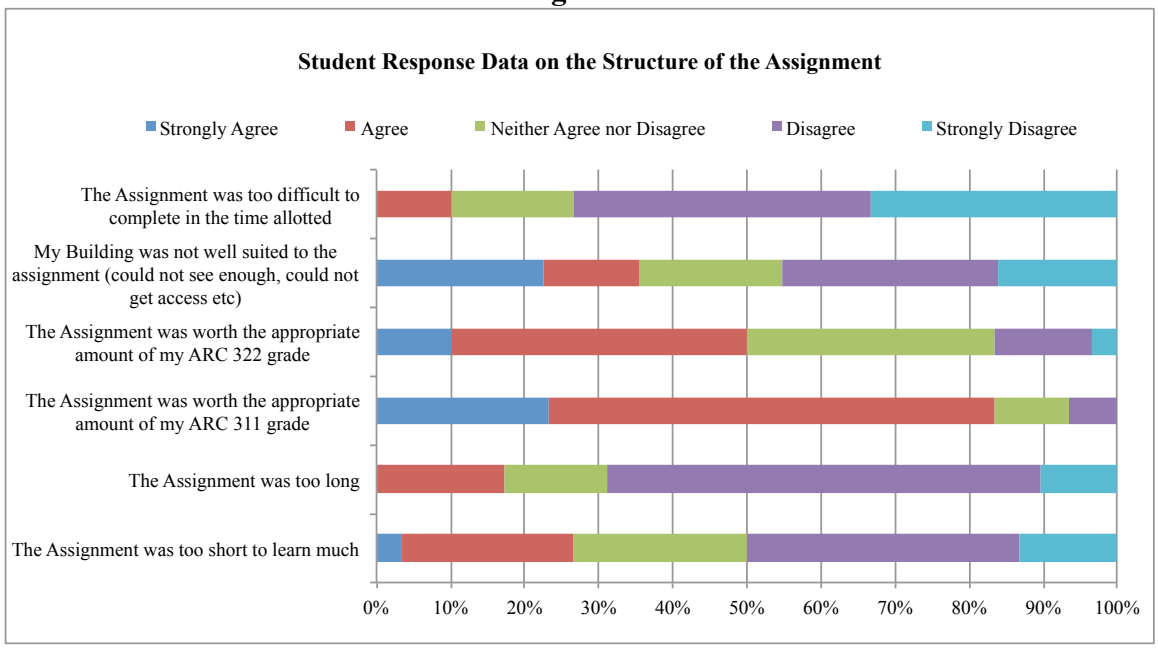



Figure 7 provides us with some useful information for future iterations of the assignment. Students were generally happy with the length of the assignment and the length of time allotted to complete it. There was no great dissatisfaction with the percentage of overall grade in either class for which the assignment counted. There is evidence from this survey question and from the open comments section of the survey that some of the buildings assigned were less suitable than others in terms of access and what was visible. Also in the open comments section a number of students suggested that their building

was “boring” (and by this they seemed to mean had very normative systems and was not otherwise architecturally interesting) and that the assignment would have been more enjoyable with a more inherently interesting building. These results bear further study and discussion and may argue for limiting or changing the list of buildings for future iterations of the assignment. There could well be some value to integrating this assignment into an off campus site visit to a location with a greater diversity of buildings for the students to investigate.

**Figure 7**




## 4. Conclusions and Future Work

This assignment was a first attempt to link both the structures and building technology courses at Syracuse University. The results from the student survey are encouraging. The students admitted that they do not normally actively search out these systems in buildings, or strive to include them in their design work. They assert that the assignment has made them more aware of noticing these systems in future. The next step is to see if this noticing translates into improved emphasis on technical systems in their design work. It will be important to survey the students in subsequent years and to repeat the assignment to gather more data.

We teach in a school with considerable overlap between lecture faculty and studio faculty. As such, assignments such as these are visible to the studio faculty and those faculty who teach building technology lecture courses also teach design studio and so there is good overlap in subject matter between the lecture and studio environment (this is less true for structures). It is too soon to tell what, if any, impact this assignment has had on students willingness and ability to accurately include technical systems in their studio work, but previous educational experiments by both authors have yielded positive results

and we intend to offer the assignment in subsequent years and to assess its impact in the studio culture, in particular in the comprehensive studio (note the population of students involved in this experiment will take comprehensive studio in the Spring of 2014.