

An in-depth look at design students as they embark on teaching architecture to children

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ABSTRACT: Affording higher education design students the opportunity to teach their skills in the community has proven to be a positive and meaningful experience that often benefits both their personal and professional lives. By instating a program at the University, titled *Architecture In Schools* (AIS), students who step up to the challenge of teaching others begin to take on leadership roles beyond any that are offered within the confines of a campus, and responsibilities that push them well outside their design discipline. This program is different from a typical volunteer service program; here students are incentivized by college credit all the while understanding that the particular position necessitates considerable time outside of contact-service hours and professional conduct as representatives of their schools and communities. This paper takes an in-depth look at the learning objectives that an outreach program can satisfy for university students who take part, and in-turn touches on why such engagement is essential to the community at-large.

Evidence shows that the impacts are consistently positive from the recipients of such a program: the primary and secondary students (and indirectly—the community); but it is the study of the higher education students in which primary qualitative measures are being considered. It can be difficult to measure—as discrepancies are hard to come by when evaluating the happiness (or can we call it rewards?) of the college participants, therefore Bloom's Taxonomy has been used as a standard means of assessing learning objectives and justifying the course's viability. This particular endeavor aims to better understand the effects that this type of service (for credit) might have in the midst of a college setting—particular to architecture students—when considering their expectations against actual outcomes related to their experiences with *Architecture In Schools*.

KEYWORDS: Teaching, Architecture, Children, Outreach, Independent Study

INTRODUCTION

Kurt Vonnegut has written in *Cat's Cradle* "... any scientist who couldn't explain to an eight-year-old what he was doing was a charlatan."

This paper delves into a university program—a combination of an Independent Study with *Architecture in Schools* (AIS)—that challenges the aforementioned quote by affording upper-level architecture students the opportunities to shift their typical duties as students into those of a teacher. The Independent Study program is a modification of the AIS model—an already-established outreach program (as will be discussed)—that provides upper-level undergraduate design students an opportunity to receive credit for the participation and leadership roles it necessitates while benefitting the surrounding community. In addition to describing the background and efforts of this Independent Study program, this paper will look at the course's structure, objectives, and evaluation. Please note that from this point forward "university student" is referring to upper-level (4th and 5th year) undergraduate students enrolled in a NAAB-accredited School of Architecture; and unless noted otherwise, "program" is referring to the university's combined AIS-Independent Study program.

Referring back to Vonnegut's quote, we cannot rightfully, substitute the word *architect* for *scientist* because the university students themselves have not yet become professionals in their field, and are still in a learning environment throughout this Independent Study program. However, the program does share the quotes' sentiments as its primary goal is to emphasize the importance of communication (both verbal and visual) within a professional discipline to those unfamiliar to the subject: in this instance to children—on the subject of architecture.

Allowing university students to shift from student to teacher in a supported and organized manner is what makes this program unique and challenging to those interested in taking on the appointment. These students

are not volunteering as teachers' helpers but are taking on the role of course instructor: initiating their own lesson plans and taking on significant responsibilities that move beyond the university campus. This paper hopes to provide substantial reasoning and positive evidence related to this program so that this type of outreach can gain momentum through Independent Studies in other design schools.

1.0 PROGRAM BACKGROUND

1.1. An Architecture in Schools (AIS) program

Before looking at details of the Independent Study, it is necessary to understand some background of the Architecture in Schools (AIS) program and how it evolved into its current state at a small, liberal-arts University.

The basis of AIS is to provide an outreach program with nearby elementary and secondary schools to enrich the learning experience of children. It promotes the idea of "Bring an Architect into the Classroom," advocating that architects can help to make connections between primary subjects such as art, mathematics, science and social studies with the realities of design and the built environment. The AIS model of community service has previously existed throughout AIA Chapters (American Institute of Architects) across the country, and they have had great success in cities like Washington DC, and Philadelphia where they can leverage the vast number of local architectural firms to partner with local elementary schools. Thus, there exists confirmed rationale for implementing the program at the primary and secondary grade levels. In smaller towns, however, with fewer architecture firms, finding professional volunteers to commit to an eight-week AIS schedule (typically, 1-2 hours of class time each week for eight weeks) proves to be more challenging—a predicament of this particular study. Thus, the AIS program was reconsidered as a possible component of the University's Architecture School; leveraging the undergraduate students to participate in what might otherwise be volunteer roles. By monitoring such a program in its infancy, this paper looks at whether or not there is substantiated reasoning for continuing such a program as a three-credit Independent Study within the University.

2.0 UNIVERSITY IMPLEMENTATION OF AIS: AN INDEPENDENT STUDY

Independent studies are often the most viable basis for students seeking information on topics they are curious about and that are not available to them. This particular Independent Study, however, was not born in this traditional course of action. This Independent Study was organized, promoted and advertised by a pro-active faculty member who has professional, teaching, and even prior AIS experience. University students were presented with the challenge of this three-credit course, and those that were intrigued stepped up to be a part of the fledgling program. Such independent studies, depending on their nature and ambition, will require varying degrees of supervision; this AIS Independent Study required that students take charge of lesson plans and instruction without the direct presence of a university faculty supervisor in the classroom.

This type of education and learning is not foreign to most universities. It is, in fact, typical to many University Education programs—requiring students to spend a number of hours in the classroom—after years of study based on approach, strategies, and behavior when entering primary and secondary schools. Not only are architecture students not equipped with this preparation, but supervisors within the department (although higher education teachers) are not likely versed in this preparation either (of which is typically attested by a degree in education). In light of this, the AIS Independent Study program proposes and encourages cross-discipline interaction in the form of interviews with current teaching professionals and with other university students embarking on education degrees.

It should also be noted that while there are creative degree programs that exist to bridge the gap between the education of *education* and the education of *educating subject matter* (such as a Degree in Arts Education), there remain few channels that aim to connect children with such topics as the design of the built environment. STEM, arguably, is the nation's foremost, pro-active attempt at forging this connection with primary and secondary students (Honey, Pearson, 2014). And it is STEM's crucial transition to STEAM, which gives Architecture + Art (Design + Invention) its rightful and integrated place among Science, Technology, Engineering, and Mathematics, that is likely a defining reason why many participating K-12 schools welcome the AIS program (Sousa, Pilecki, 2013). It should be noted that while STEM and STEAM are relevant and related topics, they are too expansive to be dealt with in this particular study.

2.1. A syllabus excerpt

To further understand the nature of the fledgling program, it is necessary to take a brief look at an excerpt from the AIS-Independent Study course syllabus:

Course Description & Introduction:

An Independent Study, this course serves as outreach to and collaboration with the larger community while providing a platform for growth and experience for the [university] students involved. This course brings upper-level architecture students into select classrooms ranging from grades 4-8 and allows them to challenge their abilities of interpreting, communicating and teaching architectural ideas. When in the position of teaching there is inevitably a process of RE-learning and gaining a more substantial grasp on the subject matter; all the while being open to the unexpected lessons that teachers will, no doubt, learn from their students. This class will involve a pro-active research and planning process; real-world experience in front of a classroom; a parallel documentation and reflection requirement in the form of a blog; and a professional, graphic, and photographic record in the form of a book of their entire experience. A requirement is to be met that will involve engagement (through documentation of your choice: transcript interview, video, etc.) with a professional educator and a student in the Department of Education to assist in cross-disciplinary studies, mentorship needs, and applicable assistance relating to primary and secondary education.

2.2. A Lesson plan excerpt by university students

The university students are required to create lesson plans that apply to their target audience and that have set goals or learning objectives related to architecture. These objectives range from communicating through drawing; through hands-on building, and to role-playing as client, architect, or builder. The following is an excerpt from an exercise that demonstrates all three of these goals: *The Tower Challenge* (Figure 1).

Goal: The Tower Challenge provided the opportunity for the students to explore and discover a number of different concepts present in architecture. We hoped they would learn the effects of equilibrium, balance, center of gravity, aesthetics, and scale.

The students were split up into small groups and each given the same set of 6 cardboard boxes. Each box in the set varied in shape, size, and weight. We used the blocks as a teaching tool for two different exercises. In exercise one, the students explored equilibrium, balance, and center of gravity. Given a range of requirements to follow, they were challenged to build block towers as tall as possible. In Exercise two of the Tower Challenge, each group selected one student as the designer. Unable to touch the blocks, they needed to communicate their design idea to their fellow "builders." Each group was given a large sheet of plotter paper and a set of markers. They were instructed to draw the tower at real scale with no measuring devices. They used their hands to measure lengths and angles of blocks, then draw the tower's elevation on their papers.



Figure 1: Elementary Students build towers out of pre-made, odd-shaped blocks that encourage learning lessons related to equilibrium, balance, center of gravity, and scale. Source: (McManus 2017)

3.0 PROGRAM REFLECTION AND EVALUATION

While further study can be had on narrowing down elementary age groups for this type of interaction, this program and evaluation—being in its initial years—is referring to university students who have been teaching

children in grades 4th-8th in both elementary classrooms and after-school programs. This broader evaluation is necessary for the incipient stages to prioritize specific criteria as the program moves forward.

3.1 Relating Assessment and Evaluation to Bloom's Taxonomy

Solely considering the benefits of the university students, it is necessary to seek out why this program might be relevant to architectural discourse and education. The paper will reveal evidence of what the students gain relative to educational objectives as defined by Bloom's Taxonomy: a classification and measuring tool for the assessment of cognitive learning (Bloom, 1956). Evidence in parts 3.2 and 3.3 indicate that through the AIS-Independent Study the students experience an opportunity to recognize (re-know) and to re-communicate ideas and thoughts that they have on architecture, and that they have taken the initiative (an Independent Study) to do so. These indicators and the varying degrees in which the students demonstrate them are part of--not one--but of all three of Bloom's Taxonomy of Educational Goals: *Knowledge-Based Goals, Skills-Based Goals, and Affective Goals* (Armstrong, 2018). Meeting qualifying measurements related to these three goals verifies that there is a definite and viable trajectory for the program to meet the needs of a three-credit architectural course.

In addition to first-person student survey responses that can be found in 3.3, brief definitions of Bloom's Taxonomy of Educational Goals and subsequent scenario examples are provided as follows in order to confirm the meeting of such objectives. Each of Bloom's three goals dives into five varying levels of expertise. Pairing examples for each of these (combined: fifteen) levels will necessitate further comprehensive scrutiny, therefore, for the purposes of this study, only overall learning objectives from the three educational goals will be paired with student examples.

Knowledge-Based Goals can be met through recalling facts and recognizing terms; translating or transferring ideas to other situations; and applying abstractions to general principles. University students in the program demonstrate these principles by recalling, translating, and abstracting architectural knowledge. For example, Figure 1 shows a class exercise where architectural principles related to observation, technical drawing, and building sections were communicated to young kids using relatable, manipulate-able objects such as fruit.

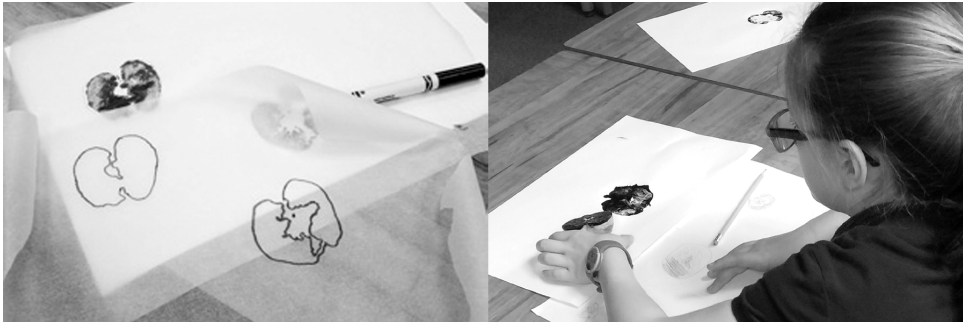


Figure 2: An elementary student practices lessons as instructed by university design students. The lesson indicates knowledge-based learning by relating and translating principles of a building to fruit. Source: (McManus 2017)

Skills-Based Goals can be met through knowing and showing required steps needed to perform a task, and modifying such tasks or creating new ones relative to a situation. In Figure 2 the university student exhibits these descriptions by safely demonstrating the assembly of a stud wall, and by allowing the young kids to take a hands-on approach to learning.



Figure 3: A university student displays *skills-based learning* by demonstrating and teaching methods of constructing a stud wall. Source: (McManus 2017)

Affective Goals are described such that a student demonstrates a willingness to participate; seeks out an opportunity to engage a subject, and adopts a long-term value system related to the subject. These indicators are expressed by each university student through the willingness and initiative that is necessary to take part in the Independent Study. It is not a required course, and therefore it is necessary to seek out enrollment and be an active contributor. Student responses in part 3.3 can more directly attest to a long-term appreciation of the experience.

3.2 Recurring Challenges and Benefits

It is difficult to separate the challenges from the benefits for reasons that align with the *rewards of hard work!* Hence, they are combined in this section. Introducing architecture to primary or even secondary students is not easy. Elementary and high school teachers are not trained for it, and that is part of the reason why the initiative behind the program can be successful and beneficial on a variety of levels.

Significant challenges with the program start with what is arguably the most obvious: the introduction to and connection with a wholly new audience of fourth-through-eighth graders. Being in the presence of twenty or so children is intimidating for most who are not used to it; and having to keep their attention, relate to them and converse with them bring about many challenges on top of that.

Time also poses a challenge for the students who have only a semester to plan, reflect and carry-out their objectives. The course syllabus does allow for prep-time built into the early weeks of the semester, but the primary challenges for the university students are in the execution weeks as they get a taste of proposal, failure, iteration, and perseverance as they face their students week after week. This particular lesson-through-experience results in frequent assessment survey comments conveying that *this was much more difficult than I had imagined* or even *everyone should need to take this course before graduating*.

While this program exposes the university student to the profession of teaching, its aim is quite broader and more significantly relevant to the professional degree in which they are seeking. Architecture, as a profession, is about communication—both verbal and visual. In their NAAB accredited educations, students are aiming high, focusing on their portfolios, and targeting employers; but they are rarely if ever, obliged in their education, to "express" their architectural understanding and abilities to the general public. This program provides that opportunity, and in turn, helps to build confidence.

Confidence-building, in this case, is a natural result of the university students practicing and reinforcing fundamental attributes of architecture along with their ideas on communicating such knowledge. While in college, every architecture student must eventually present his/her work to an already-knowledgeable jury of professionals and professors in the discipline, the task of holding the attention of eight-to-twelve-year-old critics presents entirely new challenges. It is this task, precisely, that provides apparent benefit to the university student. As soon-to-be licensed, professional upholders of health, safety, and welfare, it is important that students begin to understand that public speaking—often engaging communities and individuals unfamiliar with any part of the undertaking or practices of the Architecture industry—is a large part of their future career.

Teaching is the vehicle in which the AIS-Independent Study program permits students the opportunity to stretch, flex, and strengthen their communication skills. They become comfortable with garnering attention in a public realm [in front of a classroom]; reacting to public situations; responding to and fielding direct questions, and assessing and addressing their effectiveness over a period of a semester.

3.3 Evaluating the program – University Student Survey and Outcomes

While there is the opportunity to assess and evaluate the learning outcomes of the primary and secondary students, that is not the objective of this paper. To determine if it is to be valuable in the realm of Higher Education, it is necessary to evaluate the fledgling AIS-Independent Study program: its registered students and its viability to continue as a three-credit course.

Evaluating the university students who take part is difficult in the quantitative sense because this program is under that of an independent study, at the pace of a fifteen-week semester, where direct supervision at all times is unlikely--and in fact contrary to the nature of autonomous learning that is encouraged in the program. Therefore survey questions were used as a means of evaluation and assessment. Below is a look at student responses to relevant questions that reveal evidence of educational learning as attested by Bloom's Taxonomy.

Reflecting Bloom's Taxonomy of Educational Objectives related to the *Affective Goals of valuing the objectives and internalizing an appreciation for the course*, the following question was posed: *Would you recommend this program to other Students? (If so, under what restrictions, i.e., only 5th years, perhaps with a GPA cut-off, interview screening process, etc.)*

Student #1 answer:

I think it is one of the best things an architecture student can do. The obvious reason is that by explaining any concept to an elementary school kid, it helps us understand better. The less obvious is that this program builds passion. When you see a class of kids getting excited about architecture and telling you they want to be an architect someday, it makes you really appreciate what you do.

Student #2 answer:

I would definitely recommend this program to other students. I think it holds you accountable to meet real-life deadlines in which all of the work has to be done and there are no shortcuts. With that being said, I believe that the course should only be allowed to 4th and 5th year architecture students with a GPA requirement. For example, [the participating school] is putting their faith in the [university] student(s) to have a well detailed lesson plan and time allotted to correspond to that plan. Every lesson was important because you had to balance the amount of lecturing versus activities to keep the students attention. Going [to the participating school] unprepared would not only reflect poorly on the student(s), but also on the [university] as a whole.

Student #3 answer:

I would definitely recommend this program to other students, I think it really challenges us as designers to be able to understand the content and then simplify it and teach younger students about it. I think it is best suited for upper level students because it requires efficient time management and a comprehensive understanding of architecture content.

Student #4 answer:

YES! I would definitely recommend the program! For sure there should be restrictions: underclassman would be okay to volunteer; 5th year students only to lead; possibly a 12 credit max including AIS (I took 15 and felt overloaded).

The latter comment from Student #4 attests to the deceptive amount of work required by the Independent Study when considering the real-world consequences of deadlines and accountability. It also demonstrates the fact that the students' values, attitudes, or interests have been affected by the course (an indicator of Bloom's most complex level of expertise under the Educational Objectives for Affected Goals).

Another question was also posed to uncover which of the three of Bloom's Taxonomy of Educational Goals remained more present from the students' perspective. The results indicate a variety of descriptions that lie within the range of measurable objectives that are, not surprising, quite personal for each participant. The question posed: *With regard to your own architecture education, what are some of the greatest benefits to this course?*

Student #1 answer:

I think a huge benefit of the course is that it gets us off campus and out of studio. It's a major change of pace, and one that is honestly very much needed. It also starts to get us involved in the community. I know from experience how important this is going into the profession.

Student #2 answer:

One of the greatest benefits of this course was understanding how to take an architectural concept and simplify it so that a middle school student can understand it. Another benefit was seeing students get excited about design and wanting to delve deeper into the subject.

Student #3 answer:

I learned how to simplify certain ideas and knowledge about architecture and comprehend and teach it to younger students. It forced me to really understand the vital and important aspects of certain lessons. I also learned a lot from the students and how they comprehended and understand what we taught them. It is interesting to see their own view and perspective of architecture and design and then have a hand in shaping them. I believe I learned just as much from them as they did from me.

Student #4 answer:

The kids' joy about architecture was inspiring. Developing lessons was a self-educating process. Simplifying concepts helped me to understand and relearn aspects of architecture again.

CONCLUSION AND FUTURE RESEARCH

In response to the conference theme, *Architectural Research for a Global Community* and the idea of Gross National Happiness (GNH), it appears that engaging university students in the practice of outreach and teaching can have significant side-effects that reflect feelings of well-being, reward, compassion, and perhaps one could surmise: happiness. It proves to be a viable, substantiated avenue in which to further educate the profession's emerging, young architecture students. In addition to meeting learning objectives set forth by Bloom's Taxonomy, the AIS-Independent Study program further reinforces one (if not all!) of this conference's core messages set forth by the King of Bhutan's four pillars of happiness: *the preservation and promotion of culture*, wherein preservation and promotion can be equated with the cyclical notion of teaching and learning.

The AIS-Independent Study program fuses empowerment and reward with leadership and hard work as the participating university students move beyond their comfort zones and initiate new opportunities for learning outside of campus walls. The young program looks to introduce increasingly comprehensive connections to maximize educational objectives at both ends of teaching and learning. Further research is to continue to relate and apply Bloom's Taxonomy objectives (and subsequent revisions) with those of the University Student and elementary and secondary students. The early success of such a program can vie for more participants that may lead to research on team-teaching and the compilation of a database of objectives, lessons, and outcomes.

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