

## An Academic Consortium Approach to Construction Education

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### Abstract

Construction education has gained a firm place in academic institutions over the last 50 years and is now maturing to the point of recognition of key sub sectors. Construction academic programs predominantly focus on general construction with some split along the lines of commercial, residential, industrial and civil. There has been a growing demand from industry over the last five years for programs recognizing specialty sectors, such as Electrical, Mechanical, Sheet Metal and Roofing. Major impediments to establishing specialty construction programs have been finding faculty qualified to develop and teach curriculum and finding room in existing curriculum for new programs.

A unique solution was developed through the Academic Consortium Project of the Specialty Construction Institute. The vision was to bring together a consortium of established construction programs with shared interest in developing the specialty area to design, develop, and deliver a shared curriculum. This would allow working in established programs rather than building "from scratch". It also would allow faculty without broad expertise in specialty areas to develop a new, focused expertise with help from the industry. Finally, it would incorporate emerging technology and a new academic interest on collaboration, not only among academic institutions, but with industry, as well, to develop the new academic programs.

This paper introduces the shared curriculum concept and summarizes the academic consortium project. It then introduces the second-generation shared curriculum project, summarizing lessons learned and recognizing a renewed vision. For a detailed study of the shared curriculum project, see Normand<sup>1</sup>.

### The Problem

Construction education has evolved over the last 50 years to become an accepted academic discipline found on most campuses throughout the United States. It has great diversity in its academic home, being found in Colleges of Engineering, Education, Architecture, Business, and even occasionally in Agriculture. There is some diversity in curriculum focus recognizing major industry sectors such as Commercial, Residential, Industrial and Civil. This focus reflects the structure of the industry entities responsible for the creation of the programs and providing faculty in the early years. Those sponsors were typically general contractors often working through their associations like the National Home Builders Association and the Associated General Contractors of America.

Today's construction industry is significantly different from that which spawned most construction academic programs. The industry dominance of general contractors with support from subcontractors in small specialty areas has given way to an industry built upon construction

managers (often wearing the hat of general contractor) and a diverse, sophisticated specialty construction industry. Today, graduates of construction programs are nearly as much in demand from specialty contractors as they are from general contractors. Hence, there is great interest, both in construction academic programs and in the industry, to create curriculum focusing specifically on the needs of the specialty contractor.

Today's academic environment is also significantly different from that existing in the early years of construction education. In the past, universities were willing to accept highly experienced practitioners who could teach in the new discipline since there was no traditional academic sector from which to draw fully qualified professors. Over, the years, academic requirements have been strengthened in the construction discipline to bring it into line with the rest of the university so faculty must have a terminal degree and be engaged in research, as well as teach. There are enough academic programs providing terminal degrees related to construction to more-or-less meet this demand. However, these people generally come from Civil Engineering or Construction Management programs with the traditional focus upon general construction. It is a rarity to find a person qualified academically who has a background in one of the specialty trades.

As a result of these evolutionary trends in the construction industry and in the academy, two impediments face the specialty construction industry as it pushes to create academic programs that meet its needs: Finding academically qualified faculty, professionally qualified in a specialty construction sector, and creating a place for new specialty construction curricula in universities whose orientation is toward consolidation rather than expansion.

### The Solution: A Shared Curriculum

The above-mentioned trends in the academy and in the construction industry are not moving in isolation. Other trends are creating unique opportunity to remove the impediments in ways that are redefining education in the early 21<sup>st</sup> century.

In industry, the growth in market share and sophistication of the specialty sectors has lead to a realization by specialty contractors that they have a strong need for academically prepared managers. The increasing complexity of the industry in terms of both the product and the means to realize the product has lead to a realization among specialty contractors that research is of vital importance to the future of their companies, the construction industry and the growth and health of the country as a whole. The most forward looking specialty construction associations have developed foundations to generate financial support for research in support of their sector. This funding can also be used to support the creation and maintenance of new academic programs.

In the academic sector, media technologies for education and training are advancing rapidly allowing effective asynchronous delivery of curriculum. Courses can be delivered anywhere, at any time, and with quality on a par with traditional delivery. The availability of delivery technology together with tight financial resources in most universities is creating not just opportunities, but a strong pressure within institutions for collaboration across institutional boundaries that can build strength through alliances and cut costs through shared resources.

Focusing these positive trends on the impediments facing the creation of new specialty construction academic programs yields a unique solution. Forward-looking specialty contractors and academics are working together to develop new curriculum in existing academic programs. Industry research funds are attracting younger academically qualified faculty with general construction background to refocus upon a specialty sector. Media technology and an orientation toward institutional collaboration are prompting curriculum sharing among faculty from different universities. The result is efficient development of new curriculum with industry support and placement of the curriculum within the existing academic structure. This new approach to curriculum building is the focus of the Shared Curriculum Project of the Specialty Construction Institute.

### The Shared Curriculum Project, Version 1

In the shared curriculum concept, each academic member in the group develops a single course to contribute to a pool. All draw from the pool to enable creation of a sector specific curriculum within each academic program. The investment from an institution is a single course and faculty commitment to building the infrastructure to support the new curriculum. What is gained is a multi-course specialty construction area of emphasis embedded in the existing construction academic program. The benefits of the project include broader opportunity for students, research opportunities for faculty, realization of collaboration and technology goals for the institution and a presence in construction programs for the specialty sectors. Contractors invest real dollars into the programs either directly or through their foundations. The payback is rich, allowing them to recruit more successfully, to get better prepared students to enter their companies and to have a place to carry out the research they see as vital to their companies and industry.

The initial shared curriculum project brought representatives of 5 specialty construction sectors together with representatives of 6 academic institutions to develop the concept of a shared curriculum with focus on specialty construction. The specialty sectors were represented by an association staff member and a contractor. The academic institutions were represented by one specific faculty member from each. The project was housed at Virginia Tech which provided significant initial funding to enable establishment of the Specialty Construction Institute. The other academic partners were Georgia Tech, Penn State, The University of Kansas, the University of Washington and the University of California at Berkeley. The initial sectors represented were Electrical, Mechanical, Sheet Metal, Roofing, and Glazing. The associations representing these sectors were the National Electrical Contractors Association, the Mechanical Contractors Association of America, the Sheet Metal and Air Conditioning Contractors National Association, the National Roofing Contractors Association and the Glass Association of North America.

Over a period of several years, the institutional and industry representatives met to discuss the concept of a shared curriculum and the mechanism to realize it. Funding was committed by four of the associations to initiate a 3-year project. Milestones were:

- By the end of the first year, each of the 6 academic programs would have developed a single course and shared it with one of the other institutions.
- By the end of the second year, the sharing would be 3-way.

- By the end of the final year, all 6 universities would have a recognizable specialty construction option in place.

The project envisioned support from the industrial partners not only financially, but also in kind, through assistance in developing the course materials. The academic programs agreed to develop the infrastructure including such things as student associations, academic and career advising, and internship and summer job programs. The national associations provided both direct support and local contacts with chapters and contractors.

A major challenge was built into the project by the desire for broad diversity. The academic programs were quite diverse, including two Departments of Building Construction housed in Colleges of Architecture, two construction management programs housed within Architectural Engineering, and two programs housed within Civil Engineering. Geographic diversity spread the programs from coast to coast, representing Eastern, Central and Pacific time zones. Industry representation was dominated by the systems area (Electrical, Mechanical, and Sheet Metal) with building envelope representation, as well (Roofing and Glazing). Fairly early on, the glazing representatives bowed out, leaving only the roofing sector to represent the non-systems area. As a result primary focus was on the systems area. Diversity was also found in individual participants. At least three distinct professional types were represented: academics, association staff and contractors.

With such great diversity, efforts were made initially at team building and finding common ground. In retrospect, the project would have been more feasible with less diversity and more team building. Meetings brought together all members with the focus on integrating all the players into a single team. Though the meetings were rich in learning for all participants, it would have been more effective to meet in sub-groups of academics, contractors and associations allowing each group to build their own synergy, then to meet as a whole to bring the three together.

The project was under funded. In spite of the generosity of the four associations who provided support for the project, when the pool of money was divided 6 ways, with an additional apportionment for overall project administration, the individual support provided each school was simply not enough to support the goals of the project.

The complexity of the project was not well recognized up front. It was considered more a development project, to develop new courses rather than a research project that involved course development, but also encompassed a number of new areas, including

- Inter-institutional sharing of curriculum
- Distance delivery of curriculum
- Building a coalition among discrete industry sectors
- Developing a fundamentally new curriculum based upon an integrated theory of construction.
- Creating a new student infrastructure within existing traditional academic programs.

Common project goals and objectives were never achieved. Many industry representatives focused upon gaining visibility in the university programs and access to students and saw a new

curriculum as a means to achieve this. Some academic representatives focused on building a new area of emphasis within their program, while others saw this project as an opportunity to make fundamental changes to how we understand and teach construction. No common vision ever emerged.

One other problem that was not anticipated was the natural turnover both in industry and in the academic group. One association dropped out early in the process. One of the associations changed personnel and the new representative had a fundamentally different concept of the project. One of the initial academic representatives moved to another school early in the initial funding year and his program was not able to continue in the project. In what would have been the second funding year, a second faculty member moved to another of the consortium schools and a third faculty member left the university go into industry. The project was designed around specific individuals selected for their creativity and interest in developing a new educational concept. The loss of individuals mattered a great deal.

On the other hand, a great deal was accomplished in the first year. Two academic members did share courses and probed the opportunities and challenges in live interactive course sharing among institutions. The conclusion was that, though live interactive delivery of courses in several locations can be effective, equipment incompatibilities in different institutions, course scheduling across time zones, and anticipation of sharing up to 6 ways within the project and significantly more beyond the project lead to the conclusion that in the long run, live interactive course sharing would not be effective or efficient for this project. Two very diverse academic members (a Civil Engineering graduate program and an undergraduate department of construction, one on semesters and one on quarters) probed the challenges of curriculum sharing in a diverse academic environment. The conclusion was that to effectively share curriculum in a diverse academic environment, development needs to be at a modular level (3-week modules) and delivered on line. Another program developed and offered several new sector-specific courses appropriate for sharing and has made them available to the other partners, but that program's first year partner dropped out so no sharing tool place.

Considering the complexity of the project, a great deal was achieved in the initial year, however, specific year 1 objectives were not met. As a result of lack of progress and lack of team building, several industry partners elected not to continue the project beyond the initial year.

### The Shared Curriculum Project, Version 2

Fortunately, one industry member, the National Electrical Contractor's Association has a clear vision of the fundamental importance of the project and has agreed to continue funding at a significantly higher level. The 6 diverse academic members have been reduced to three much more closely aligned programs: Virginia Tech, Penn State and University of Kansas. After a year of rebuilding, the project restarted in January of 2001 with a two-year objective of three-way sharing among the three members by the end of 2002. Much of the groundwork was laid in the initial project and there is a high expectation that the new project will achieve its objective. The new project is called the Electrical Construction Academic Alliance (ECAA).

In addition to the objective of a three-way sharing among the academic partners, the other objective is to have the student infrastructure in the form of a student association, academic and professional advising, and work experience opportunities in place to support the new curriculum. Project members plan to meet several times each year to coordinate the project and do a lot of coordination on line.

There has been significant interest among other schools in the shared curriculum concept. The anticipation is that upon completion of the initial project, other schools with an interest in participating will be allowed to join the ECAA with the investment of a new course and a plan to develop a new academic area of emphasis, together with its support infrastructure. The curriculum will belong jointly to the Alliance members, so expansion will be up to those members.

### Summary and Conclusions

A second generation shared curriculum project, the Electrical Construction Academic Alliance has been undertaken to work within existing construction programs with the objective of establishing an area of emphasis in electrical construction shared among the member programs. This new alliance builds upon the Specialty Construction Institute shared curriculum project that has provided a foundation and significant new understanding of the complexity of building an academic program to be shared across several institutions.

Lessons learned from the initial project include:

- Limit academic diversity
- Limit sector diversity
- Develop clear shared goals and objectives early in the project
- Allow for faculty migrations
- For broader access, design should be based upon small modules or units shared on line rather than entire courses delivered in a live interactive mode.

The three-way shared curriculum, together with support infrastructure should be on line in the three Alliance programs by the end of 2002. It is anticipated that the model can be expanded to include other programs once the initial curriculum is up and running.

For developing sector specific curriculum, industry participation is vital, both from the standpoint of funding and from the standpoint of assistance with developing the sector specific materials. To include industry in the process, particular care is needed in developing common goals and objectives mutually accepted by both the industry and academic representatives.

### Bibliography

1. Normand, William J., An Integrated, Holistic and Systemic Learning Model in Education for the Construction Industry. MS Project and Report, Department of Building Construction, Virginia Tech, Blacksburg, VA 24061, 2001.

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