Articulation between 2-Year and 4-Year Construction Management Programs

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In order to meet the workforce needs of the US construction industry, colleges and universities nationwide are increasingly being asked to provide better articulation between 2-year and 4-year construction management programs. Two case studies of formal articulation agreements between a 4-year and two 2-year programs are presented in this paper. The articulation agreements provide means to formalize the transfer process for coursework as well as facilitate the transition for students from one campus to the other. The final agreements provided a matrix of course equivalencies that allowed students to complete part of their coursework at either the 4-year or 2-year institution with the end goal of earning both an associates degree and a bachelor's degree. Results from the development of articulation agreements discussed in the two case studies indicated that the most important factor in the success of agreements between 2-year and 4-year programs was communication. Another key to the success of the articulation agreement was proactive advising at both of the institutions. Finally, the regular review of courses and curricula from both 2-year and 4-year programs is needed to consistently occur as part of an ongoing revision process to maintain an effective working 2+2 articulation agreement.

Key Words: Construction Management, Education, Two-Plus-Two, Articulation Agreement

Introduction

In order to meet the workforce needs of the US construction industry, there has been an increasing demand for colleges and universities within the US to provide more seamless articulation between 2-year and 4-year construction management programs. It is not unusual for the Construction Management Bachelor's degree programs to accept transfer students from other universities and community colleges. However, most of these programs do not have a formal 2+2 program in place, although many provide information about their universities' policies, procedures, and general rules and guidelines regarding transfer to prospective students. There are also several universities with accredited Construction Management Baccalaureate degree programs that offer Associate degree programs in the same or closely related field, as well as universities with formal 2+2 programs set up for students who have earned their associate degrees in construction related fields. These universities usually partner with community colleges and may have articulation agreements in place. In 1999-2000, 49% of the students graduating from baccalaureate programs in the U.S. had attended a community college prior to graduation; 22% were 2-year to 4-year transfers (McPhee, 2006). Some programs focus on enhancing the recruitment and retention of 2-year transfers into engineering and technology Bachelor's degree programs (Gupta et al, 2009). One 4-year program has collaborated with affiliated 2-year programs by offering some specialized equipment intensive labs over a web-cam interface so that students from both institutions can participate in the lab experience (Sener & Lucas, 2001).

While many benefits are generated by 2+2 programs, the creation of articulation agreements that match coursework, explain curriculum and admission requirements, and guide the smooth transfer of students between different programs across institutions, however, can be a very challenging task. This paper reviews the status of construction management articulation agreements across the US, presents two case studies, and makes recommendations for establishing or enhancing similar articulation agreements.

Status of Construction Management Articulation Agreements across the US

Web-based research to identify 2+2 Construction Management programs was performed among 62 ACCE (American Council for Construction Education) accredited Baccalaureate degree programs and 10 accredited Associate programs in Construction Management and other closely related areas. Several situations related to informal or formal 2+2 programs and transfer among Construction Management programs were noticed and are presented below.

Transfer Students from Construction Management Programs across Universities/Colleges

It is not uncommon for the Construction Management Bachelor's degree programs across universities to accept transfer students from other universities and community colleges. Most of these programs do not have a formally designed 2+2 programs in place. However, they do provide information about their universities' policies, procedures, and general rules and guidelines about transfer for prospective students. Usually, students are required to send their official transcripts to the universities' Registrar's Offices. Then the courses and earned credit hours will be evaluated and entered into the student information systems before the academic advisors from individual departments perform degree audits and decide whether these courses and credits can be accepted by the programs. To make the information clear and to better assist students in planning for effective transfer with maximum efficiency, University of Florida's Rinker School of Building Construction provides an interactive website that shows the equivalent general education, business and management, and lower-division Construction Management courses in 37 community colleges/universities across the State of Florida (Rinker School of Building Construction, 2007). This system is very helpful for prospective transfer students who have previously attended 2-year or 4-year institutions, whether or not they have earned an associate degree.

In-House Bachelor's and Associate Degrees in Construction Management

Besides accepting transfer students and students who have completed a 2-year associate degree program from an accredited community college or university, several universities with accredited Construction Management Baccalaureate degree programs also offer Associate degree programs in the same or closely related field. For example, Ferris State University offers Bachelor of Science (BS) in Construction Management and Associate of Applied Science (AAS) degree in Building Construction Technology Management. The AAS degree requires 25 credit hours of general education courses (with fewer Math and English requirements than the Bachelor's degree) and 38/39 credit hours of low-division courses within the major (Construction Technology and Management, 2008). Weber State University has both BS and AAS in Construction Management. The associate degree needs only 28 credit hours in construction management technology courses (including an internship) but requires 9 credit hours of business and management courses (Parson Construction Management Technology, 2009). At John Brown University, the Construction Management Department offers both Bachelor of Science and Associate of Science degrees in Construction Management. The associate degree program curriculum consists of 26 hours from university core curriculum, 33 hours from courses specified by the Department (including 9 hours of business and management courses), and necessary electives (Division of Engineering and Construction Management, 2009). In all the cases, the in-house 2+2 transition can be quite smooth for students who finish the Associate degree first and then choose to continue with the Baccalaureate degree.

Existing 2+2 Construction Management Programs

Based on the information published online, there are a few universities having formal 2+2 programs set up for students who have earned their associate degrees in construction related fields. They usually partner with specific community colleges and may have articulation agreements in place. For example, Minnesota State University Moorhead (MSUM) has made special transfer agreements for Construction Management students who wish to transfer to MSUM from three colleges: North Hennepin Community College, North Dakota State College of Science, and St. Cloud Technical College (MSUM, 2008). North Carolina A & T State University works with Maricopa Community College to offer 2+2 articulation programs in Construction Management and Occupational Safety and Health (NC A&T University, 2009).

Web-based searches among community colleges which offer ACCE accredited Associate degree programs in Construction Management also identified a few 2+2 programs with articulation agreements between community colleges and other universities. Cincinnati State Technical and Community College lists the institutions that have articulation agreements or a strong transfer history for their Construction Management major. These include Northern Kentucky University and University of Cincinnati (CSTCC, 2009). John A. Logan College and Southern Illinois University-Carbondale (SIUC) have created a special 2+2 program that allows students to pursue an AAS degree in Construction Management Technology at John A. Logan College while living on the campus of SIUC. It is up to the students whether they will continue at SIUC to earn a Bachelor's degree with a Construction Management emphasis (John A. Logan College, 2009). Students with an Associate of Arts degree from the Building Construction program at Santa Fe Community College (SFCC) can be transferred to the University of Florida based on competitive admission or to the University of North Florida (UNF). An articulation agreement between SFCC and UNF indicates that students can take 37, 22, and 9 or 21 credit hours of general education, business and management, and building construction courses at SFCC, respectively. Then they will take 64 or 52 hours upper-division major courses at UNF to meet the bachelor's degree 132 credit hours curriculum requirements (SFCC, 2009). Table 1 shows curriculum comparison information for these three 2+2 Construction Management programs.

Table 1 - Curriculum information for different 2+2 Construction Management programs

	North Hennepin Community College + *Minnesota State University Moorhead (credit hours)	*John A. Logan College + Southern Illinois University-Carbondale (credit hours)	*Santa Fe Community College + University of North Florida (credit hours)
Associate degree curriculum (1st & 2nd years)	63	69 (21 transferred as Univ. Core Curriculum)	68 or 80
General education	28	18	37
Business & management	4	6	22
Construction/professional	29	45	9 or 21
Additional	2		
Bachelor's degree curriculum (3rd & 4th years)	73 (including 3-hr internship)	60	64 or 52
Univ. core curriculum		12	
Major requirements	61	21	61 or 49 (6 for concentration)
Business & management	12		3
Specialization/minor		15	
Electives		12	
Total credit hours	136	129	132

* denotes schools with ACCE accredited Construction Management Associate or Baccalaureate Degree programs.

Though this research was mainly focused on a survey of ACCE accredited Construction Management programs, it should also be noted that 2+2 transfer agreements do exist in some other non-ACCE accredited Construction Management programs. One example is the University of North Carolina-Charlotte's Bachelor of Science in Construction Management, which accepts 2+2 transfers with an associate degree in civil technology, construction, architecture, or surveying from community colleges in North Carolina and nearby states (UNC Charlotte, 2009). Some construction engineering and management programs also have 2+2 options. The Bachelor's degree program in Civil Engineering (Construction Engineering and Management – General Construction Option) at North Carolina State University in Raleigh (NCSU) accepts 2+2 transfers from North Carolina State University at UNC Asheville (UNCA). These 2+2 students begin at UNCA with normal UNCA student status and no special 2+2 admission process is required. However, students must have finished at least 30 credit hours including the matriculation requirements and met a minimum grade point average of 2.5-3.0 before transferring to NCSU (UNCA, 2009).

Two Case Studies

In the following, two case studies of formal articulation agreements between a 4-year and two 2-year construction management programs are presented. Due to the space limitation, the articulation agreements related to these two

cases are not shown in this paper. However, the process, experience, and lessons learned in building the 2+2 programs and preparing articulation agreements and transfer matrices will still be beneficial to other programs or institutions which are considering such an option for their students.

The Ohio State University (4-Year Program)

The 4-year construction management bachelors program at the Ohio State University (OSU-Columbus) was founded in 1991 when the Department of Food, Agricultural, and Biological Engineering revised their Agricultural Mechanization and Systems major within the BS in Agriculture program and created two majors: Agricultural Systems Management and Construction Systems Management. The construction management program has gone through several changes since that time including a shift in emphasis from agricultural structures to residential, commercial, and heavy construction. Enrollment in the construction management major has steadily increased. Today, there are over 420 students in construction management at OSU-Columbus.

In 1999, the department established a Construction Advisory Board comprised of representatives from a variety of construction and construction-related companies and organizations. This board meets three times per year and has enthusiastically supported the program and its development. Among the advisory board are standing positions for representatives from nearby 2-year schools, specifically Columbus State Community College (CSCC) and OSU's Agricultural Technical Institute (OSU-ATI). The ensuing 2+2 articulation agreements between these institutions provided the opportunity for students to complete an associate degree in construction then transfer to the OSU Columbus campus to complete their baccalaureate degree. On an annual basis, approximately 40 to 60 students come to the 4-year program from CSCC and 5 to10 come from OSU-ATI.

Columbus State Community College (2-Year Program)

The initial articulation agreement between The Ohio State University (OSU-Columbus) and Columbus State Community College (CSCC) was created and utilized in 2005. The agreement was a culmination of efforts between both institutions to better serve their student populations. The construction management curricula of both OSU-Columbus and CSCC are close in both geographical proximity and subject matter content.

As the main campuses of both institutions are separated by only a few miles, faculty at OSU-Columbus and CSCC recognized that a number of their students were already taking courses at both institutions without a clear means for transfer of completed course hours. The affordable tuition at CSCC as well as the small class size was an incentive for many students to complete coursework there. Creation of a formal articulation agreement between OSU-Columbus and CSCC provided a means to formalize the transfer process for coursework, as well as facilitate the transition for students who had completed an Associate of Applied Science (AAS) in Construction Management at CSCC and were desirous of pursuing a Bachelor of Science at OSU-Columbus with a major in Construction Systems Management. The final agreement provided a matrix of course equivalencies that allowed students to complete part of their major coursework at either OSU-Columbus or CSCC with the end goal being an AAS at CSCC followed by a BS at OSU-Columbus.

The matrix which applied to the articulation agreement was developed through a series of meetings between representatives from both OSU-Columbus and CSCC. Syllabi from courses at each institution were compared for commonalities. Discussion between course instructors helped solidify exactly which concepts were being presented in each course. The intent was to develop as close to a 2 +2 (completion of an AAS followed by transfer and completion of a BS) transfer option for students as possible. An initial three color matrix was developed that illustrated courses at each institution which would transfer interchangeably and were listed in red type. In addition, General Education/General Curriculum Equivalency courses which were part of the majors at both OSU and CSCC but which could be completed at either institution were listed in green type. Finally, courses that had to be completed in Construction Systems Management at OSU-Columbus were listed in blue type. The initial matrix was reviewed by faculty and staff at both institutions. Once concurrence was reached, a formal articulation agreement was signed by the Department Chair at OSU-Columbus and the Dean for Career and Technical Education at CSCC.

Efforts are currently underway to create a new matrix. The new matrix will be applied to a second generation articulation agreement which will become effective once the BS in Construction Systems Management currently

awaiting final approval by the Ohio Board of Regents is approved. The new agreement addresses changes in coursework at both OSU-Columbus and CSCC and implements curriculum revisions that are a result of the transition from the current BS in Agriculture earned by Construction Systems Management majors at OSU-Columbus to the pending BS in Construction Systems Management. Efforts have also been made in this iteration of the matrix to provide more transfer credit for coursework completed in the AAS in Construction Management at CSCC to students transitioning to OSU-Columbus. The intent has been to achieve closer to an actual two years plus two years in the articulation agreement.

The goal is that the articulation agreement with its included matrix will be a "living" document that will easily be modified as changes to the major curriculum at either institution occur. The next challenge in the articulation process will be a pending change from quarters to semesters at both OSU-Columbus and CSCC in the autumn of 2012. Preliminary discussions are already underway to create a new matrix and articulation agreement that will become effective once the revised curricula for both institutions have been developed and approved.

OSU Agricultural Technical Institute (2-Year Program)

The Ohio State University Agricultural Technical Institute (OSU-ATI), in Wooster, Ohio is a department within the OSU College of Food, Agricultural, and Environmental Sciences (FAES). This department is unique in that it is located 90 miles from the main campus in Columbus, Ohio. OSU-ATI initiated an Associate of Applied Science program in Construction Management in 1990 and has been successfully offering that degree since. In 2003, discussions began between two separate departments within FAES: OSU-ATI and the Department of Food, Agricultural, and Biological Engineering (FABE). The department of FABE offered a construction management baccalaureate program, Construction Systems Management (CSM). These two departments, within the same college at the same university yet separated by 90 miles, began a discussion to create a 2+2 program where an OSU-ATI graduate would receive enough transfer credits to have junior status on entry into the Bachelor's degree program in Columbus, with only two years of coursework left to complete.

The first task of the articulation process was to evaluate the course content of the Associate of Applied Science (AAS) degree. Since other 2+2 programs already existed between OSU-ATI and other departments in FAES, some of the issues had already been resolved. The primary concern was with the general education courses that AAS students were required to complete according to the guidelines of the Ohio Board of Regents (OBR). Mainly due to the lack of transferability of the general education courses, students that completed the AAS degree at OSU-ATI still needed at least 3 years of coursework to complete the BS degree. The solution was to create a program tailored specifically for those students that intended to complete a BS in addition to the associate degree. The Associate of Science (AS) in Construction Science was developed according to OBR guidelines for AS degrees. General education courses were selected that met the OBR requirements and were the same courses taught at FAES. Based on time, frequency of offering, and prerequisite criteria, a sequence of courses was developed for the AS program which would allow students to transition smoothly into the BS curriculum as juniors.

Although the general education course requirements were simplified by offering the same courses at the two locations, developing a transfer matrix for the construction technology specific courses was a different challenge. Since students completing an AS or AAS program may never further their college education, the construction courses needed to address information covering construction fundamentals through estimating, bidding, and project management. This course sequence was already in place at OSU-ATI at the time of the articulation discussion and has not been modified since completing the agreement. Decisions needed to be made about what AS coursework would count for BS courses. This involved representatives from both programs reviewing course syllabi to generate a matrix (see Appendix) that listed how the credits would be viewed by the BS program. The end result was that classes completed for the AS program were accepted in the BS curriculum at the freshman, sophomore, and junior levels. This arrangement left some courses from the freshman and sophomore levels to be completed when the AS student entered into the BS program. In some cases, combinations of construction courses at OSU-ATI transferred for groups of classes at Columbus, while other classes transferred course for course. The final step of program development was to review the two years that a transferring student would spend in the BS program to be sure that the remaining courses to be completed were available, that the course load was manageable, and that the student could complete the program in only two years. A course sequence sheet to complete the BS degree was developed for students beginning at OSU-ATI. This allowed students to know the courses they would be taking each quarter at both campuses in order to complete the BS degree.

After the courses and the sequence that students would follow for the AS degree were agreed upon, the proposed new AS program was reviewed and approved by the OSU-ATI Agricultural and Engineering Technologies Division, the OSU-ATI Academic Affairs Committee, the OSU-ATI faculty, the FAES Associate Dean and Director of Academic Affairs, and the OSU Council on Academics Affairs. The approved program was then forwarded to the OBR. After the program had been approved at all of these levels, the AS program in Construction Science was first offered September 2005.

A general consensus reached by all the people involved in both cases is that whenever the curriculum changes in any way at either the 2 or 4 year institution, the articulation agreement and coursework matrix are revisited and necessary changes are incorporated. In the event that no major changes occur, it has been a standing policy for representatives from both the 2 and 4 year institutions to meet at least every 2 years to review the agreement and transfer matrix and determine if any updates for them need to be made.

Recommendations and Conclusions

Communication both with individual students and between institutions is critical to the success of any articulation agreement. In the two cases, some initial glitches and breakdowns in communication have been addressed with hopes of a smoother student transitional process in the future. It was important for everyone to be patient, cooperative, and to aggressively pursue the goal. It would have been easy for individuals to become occupied with other seemingly more pressing activities and place this discussion at a lower priority, resulting in little progress with the articulation agreement. Those involved with the process understood the important benefits of this articulation for students.

The review of courses and curricula from both programs has consistently occurred and will need to continue, including excellent communication, to retain a good 2+2 articulation. As classes continue to include more information and construction industry technology continues to develop, it will be of utmost importance to routinely evaluate the experience that the students are getting in both programs and to be sure that the proper preparation continues to occur in both the associate and bachelor's degree programs. Criteria (e.g., GPA or other factors) that can be used to best evaluate the performance of 2+2 transfer students need to be explored. A current challenge for both the AS and BS programs is to plan for major revisions in courses as the university shifts from quarter to semester classes. This will be an opportunity for individuals from both programs to further review/refine courses and the transfer matrix in order to provide the best student experience. The initiative to redefine the articulation agreements as they apply to the new semester curricula at each institution is currently underway.

Another key to the success of the articulation agreement has been proactive advising at both the 4-year and 2-year institutions. Students enrolled in the associate degree construction management programs who indicated an interest in transferring to OSU-Columbus were given the appropriate matrix and advised on coursework that should be taken at their school to help best prepare them to transition to Ohio State upon completion of their degree. The concise organization of the transfer matrix and color coding of coursework make the documents student "user friendly." In addition, a brochure describing the articulation process was developed at CSCC and exhibited prominently on display boards in the hallway outside of the Department offices as well as copied for inclusion in information given to newly enrolled Construction Management students. The lines of communication between advisers at both institutions have been established and maintained in an effort to make the transition for students to OSU-Columbus as seamless as possible. A concern of advisers at all of the institutions included in the case studies has been to "best serve the needs of their students." Students enrolled in the 2 year programs have the option to complete the associates degree as a terminal degree and enter or return to the workforce, or to exercise the option of continuing either immediately or in the future in the pursuit of a baccalaureate degree. Although not a viable option for all students, these articulation agreements provide a conduit through which 2-year students may move as seamlessly as possible in their journey to complete a four year degree.

It is always a difficult and challenging task to establish the articulation agreement between 2-year and 4-year programs across institutions. Future research will be focused on the development of a step by step guide that could help other construction management programs and institutions interested in creating their own articulation agreements.

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Appendix

Transfer Matrix for OSU-ATI Construction Science and OSU-Columbus Construction Systems Management Courses

Required Course in CSM Curriculum			**ATI Course(s) Approved as Substitution***		
Course	Cr Hr	Title	Course	Cr Hr	Title
CSM 241	4	Construction Materials and Methods	Eng Tech T256	5	Building Construction: Building Codes, Foundations and Framing
			Eng Tech T257	5	Building Construction: Building Codes, Exterior Coverings, and Interior Finishes
Free Elective	3	Will Transfer as CSM SPL	Eng Tech T292	3	Problem Solving: Career and Society Applications
CSM 310	4	Electrical and Lighting Systems for Buildings	Eng Tech T254	4	Residential Electrical Systems
CSM 345	4	Mechanical Systems for Buildings	Eng Tech T255	4	Residential Mechanical Systems and Energy Efficient Construction
CSM 440	5	Construction Site Development	Eng Tech T253	3	Sitework Planning and Construction
			Eng Tech T259	3	Construction Management
CSM 441 &	5	Construction Drawings and Estimating	Eng Tech T256	5	Building Construction: Building Codes, Foundations and Framing
CSM 241	4	Construction Materials and Methods	Eng Tech T257	5	Building Construction: Building Codes, Exterior Coverings, and Interior Finishes
			Eng Tech T258	3	Estimating and Bidding
CSM 489	3	Internship in CSM	Eng Tech T290	6	Internship
En Graph 121	3	Graphic Presentation I	Eng Tech T209	2	Introduction to Computer Aided Design
			Eng Tech T210	2	Advanced Computer Aided Design
Physics 111	5	General Physics: Mechanics and Heat	Tech Physics T101**	4	Technical Physics I
			Tech Physics T102 **	4	Technical Physics II

* All courses listed in each category must transfer to meet the CSM requirement in that category.

**Combination of both courses will substitute for Physics 111.