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Global Learning and Collaborations in Engineering and Architecture

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Abstract

In 2010, the city of Pecs, Hungary, EU was one of the designated Cultural Capitals of Europe. In preparation for the associated events, a large number of Hungarian government-sponsored refurbishment projects were ongoing in the city. These projects provided a unique opportunity for Metropolitan State University of Denver (MSU Denver) and University of Pecs (UP) to jointly organize a Refurbishment of Structures course that constituted the start of an academic collaboration between the two institutions. Although initially the partnership was between the engineering colleges, by now it has expanded university wide. As the partnership grows, more academic areas, from Political Science, to Africana Studies, to Management have started collaborations, which consist mainly of faculty and student exchanges and joint conferences and program development. One of the main purposes of the engineering collaboration was to expand students' exposure to global perspectives in their higher education experience. Building upon the expertise of UP architecture faculty, an architecture minor was jointly developed. This paper describes the development of the architecture minor (ARCH) for MSU Denver. The progression of the number of students taking ARCH classes and declaring the architecture minor since the launch of the new minor in Fall 2014 are highlighted. In addition, the partnership's successes and challenges are discussed along with the growth of Civil Engineering Technology students in the areas of creative thinking and project-based applications with a global perspective of the architecture profession. Subsequently, a transferability agreement was also developed between UP and MSU Denver. The completion path for the Master of Science degree in Architecture at UP for an MSU Denver Civil Engineering Technology graduate with a minor in architecture is outlined.

Keywords: global learning, academic collaboration, curriculum development, engineering education, architecture

1. Background

On one hand, in the last decade the Civil Engineering profession is facing a major revision in the educational preparedness of its graduates [1]. The American Society of Civil Engineers (ASCE) took the lead in this major initiative in the early 2000. Its Committee on Academic Prerequisites for Professional Practice (CAP3) produced the Body of Knowledge for the 21st Century (BOK2) document [2], which could serve as a guideline for the civil engineering undergraduate curriculum development in the United States. It addresses the allocation of educational responsibilities between the academic programs and the professional community. Three major outcomes are grouped into three categories: Foundational, Technical, and Professional, assisting readers in understanding the current needs of civil engineering education on the undergraduate level in preparing graduates for graduate school and/or professional fields. One of the outcomes of the BOK2, in the Professional category is the Globalization initiative.

On the other hand, at the Metropolitan State University of Denver (MSU Denver) in the past decade, the Civil Engineering Technology program Industry Advisory Board (IAB) supported and students expressed interest in having architecture course offerings in order to provide them an architectural engineering background.

2. Introduction

In 2010, the city of Pecs, Hungary, EU was one of the designated Cultural Capitals of Europe. In preparation for the associated events, numerous Hungarian government-sponsored refurbishment projects were ongoing in the city. These projects provided a unique opportunity for MSU Denver and UP to jointly organize a Refurbishment of Structures course that constituted the start of an academic collaboration between the two institutions. A Memorandum of Understanding (MOU) between Faculty of Engineering and Information Technology (UP-FEIT) and MSU Denver College of Professional Studies (CPS) was signed in Spring 2010. The purpose of this initial agreement was to promote and expand international understanding, institutional goals, and friendship by stimulating and supporting academic, professional, and intercultural activities among students, professors, and staff of the two cooperating units. One goal for the parties was to jointly develop appropriate educational programs for faculty and students of the two institutions within the framework provided by this agreement. More broadly, the cooperative activities covered by this agreement include, but are not limited to, faculty and student exchanges, collaborative research, cultural exchanges, grant writing, and the joint development and offering of courses, programs, seminars, workshops, and/or service programs that promote academic advancement and cultural understanding. The partnership is based on multi-faceted cooperation between the two universities including but not limited to faculty exchanges, joint research projects, joint organization and sponsorship of courses, seminars, study tours, and conferences. Examples are the 2nd Humanitarian Technologies International Conference in 2017 at University of Pecs [3], the participation in the University of Pecs 650th Jubilee event in 2017 [4], or the 5th Pécs African Studies Conference [5]. In addition to cooperation on the architecture minor, joint research activities in the area of sustainable timber-concrete composite structural systems are performed. Aspects of energy performance [6], social architecture, as well as structural behavior [7] are investigated. Mini-conferences are organized regularly by the parties, such as the “Trends in European Structures and Architecture”, or the annual “Miklós Iványi International PhD & DLA Symposium” [8].

With an increased interest in the partnership between the two universities from multiple academic units, such as Departments of Art, Political Science & International Relations, Africana Studies, Business, and other areas, the expansion of the partnership from college level to university wide level was approved in March 2014. Today, both universities consider this collaboration one of the most successful international partnership they developed.

This paper is related mainly to the undergraduate level preparedness and is presenting the planning, development, and implementation of an architecture minor program within the framework of an international partnership between two universities, in the United States and in the European Union, as an instrument for including the globalization aspect in the undergraduate civil engineering education at the university. This is to expand the horizon of the MSU Denver engineering students beyond their academic curriculum and to gain international exposure in

order to be able to function in a global context in the engineering profession after graduation. Such an experience allows graduates to develop their horizontal thinking [2] beyond their comfort zones. The main objective of the project was to create a minor program in architecture that addresses the IAB recommendation as well as the ASCE BOK2 Globalization initiative.

3. Conducting of the Project

Enhancement of the Civil Engineering Technology curriculum by offering a minor in Architecture was initiated during a two-month English immersion program on the MSU Denver campus for a group of architecture professors from the University of Pecs. University of Pecs offers architecture degrees in English at undergraduate and graduate levels including Masters of Science (MSc) and Doctorate in Liberal Arts (DLA), along with PhD in architectural engineering [9]. Within a professional development program, a group of 16 architecture professors from UP attended an English immersion program specifically tailored to their professional needs in the Summer of 2013. The professors represented a full academic program and their expertise covered most areas of architecture. They were also interested in learning about the structure and operation of a higher education institution in the US, in particular, at MSU Denver. Therefore, it was straightforward to develop the architecture minor program for MSU Denver jointly.

The UP professors and their MSU Denver civil engineering professor colleagues formed a committee to work on the project lead by the CET Program Coordinator. Working in subgroups by subject areas, each subgroup provided recommendations in their specific field of expertise on the content and structure of the corresponding planned course. Ultimately, six courses were developed for 18 credits of the minor. Combining the development of architecture courses with the international expertise available at the European partner institution helped the courses align well with the ASCE initiative regarding the globalization aspect of the Civil Engineering undergraduate education. The minor is housed in the Engineering and Engineering Technology (EAET) department. The architecture minor proposal was submitted for approval in Fall 2013. As part of the curriculum approval process, the proposal had to be reviewed by the departmental, college, and university curriculum committees, as well as the department chair, college dean, and Faculty Senate president prior to submission for approval to the Associate Vice President of Academic and Student Affairs. In April of 2014, the architecture minor proposal was approved by the MSU Denver Board of Trustees. Offering the Architecture minor starting in Fall 2014 was a big step toward the globalization of the Civil Engineering curriculum at MSU Denver.

4. Project Results

The architecture (ARCH) minor program was launched as a new minor option university wide for all undergraduate students, regardless of their major, thus expanding the choice of minor options for all students. The courses in the minor are Introduction to Architecture (3cr), Architectural Design-Studio 1 (3cr), Building Structures (3cr), Architectural Interior Design (3cr), Architectural Design-Studio 2 (3cr), and Digital Presentations in Architecture (3cr).

Presently, out of the 27 total number of declared architecture minor students, 48% are CET majors and 52% are from other areas such as Industrial Design, Individualized Degree Program, Mechanical Engineering Technology, Criminal Justice and Criminology, History, Psychology,

Biology, and Construction Project Management. Industrial Design and Art were the programs of majors most related professionally to the field of architecture, and it was expected that students from these majors would take the minor. Nevertheless, it was found that no Art majors took the minor.

In the last couple of years, it became clear that students from different backgrounds and majors were open to a minor with an international perspective. Several students taking Architecture classes are not registered as ARCH minor students. Although CET students are not required to take a minor program due to their extended major degree, 100% of those enrolled in the non-required architecture courses declared the ARCH minor. The number of students with declared Architecture (ARCH) minor increased from 9 in Spring 2015 to 27 in Spring 2018 as shown on Figure 1.

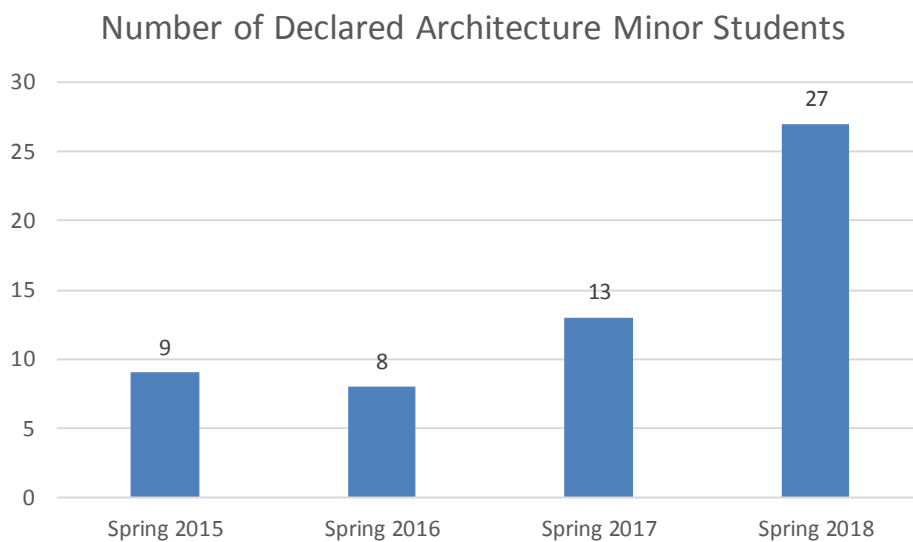


Figure 1: Declared Architecture Minor students

A particularity of the implementation of the architecture minor at MSU Denver is that it was not only jointly developed with University of Pecs, but it is also operated jointly. As a result, UP faculty regularly teach the minor courses. As a result, students are experiencing an interaction with world-class international architecture faculty who are in many cases also practicing architects, without the challenges of leaving their campus, workplace, or home that a study abroad course would require. The feedback received through the Student Ratings of Instruction (SRI) for the ARCH classes taught by visiting international scholars was in line or exceeded the departmental average values. This is an indication how well students received these new architecture courses and faculty.

Table 1 shows the growth in Full time equivalent (FTE) by semesters along with the enrolled student numbers.

Table 1: 2014-2018 Full Time Equivalent (FTE) and Student Number Summary

Semester (number of class, number of faculty)	Academic Year	FTE/Semester	Student Number/Semester (FTE x 15)/3
Fall 2014 (3 classes, 1 faculty)	2014-2015	9.6	48
Spring 2015 (5 classes, 2 faculty)		7.8	39
Fall 2015 (6 classes, 2 faculty)	2015-2016	8.4	42
Spring 2016 (6 classes, 2 faculty)		7.4	37
Fall 2016 (6 classes, 2 faculty)	2016-2017	9.2	46
Spring 2017 (6 classes, 2 faculty)		13	65
Fall 2017 (6 classes, 2 faculty)	2017-2018	11	55
Spring 2018 (6 classes, 2 faculty)		11.2	56

In the hiring process of visiting international scholars, appointment offers are usually for one semester. After one semester, based on the student, program coordinator, and department chair feedback, the renewal option is considered. In these circumstances, we encourage the visiting professors to have the one-year period of teaching at MSU Denver. The two architecture faculty who started in Fall 2015 continued to teach for two academic years. In Figure 2, the FTE changes are graphically presented. One impact on the FTE is the continuation of the same visiting faculty members throughout multiple semesters. Figure 2 shows an AY increase in FTE, from 15.8 in 2015-2016 to 22.2 in 2016-2017; corresponding to a 40.5% increase. In Figure 3, the student enrollment is presented based on the number of courses in the Architecture minor that students enrolled in between Fall 2014 and Spring 2018.

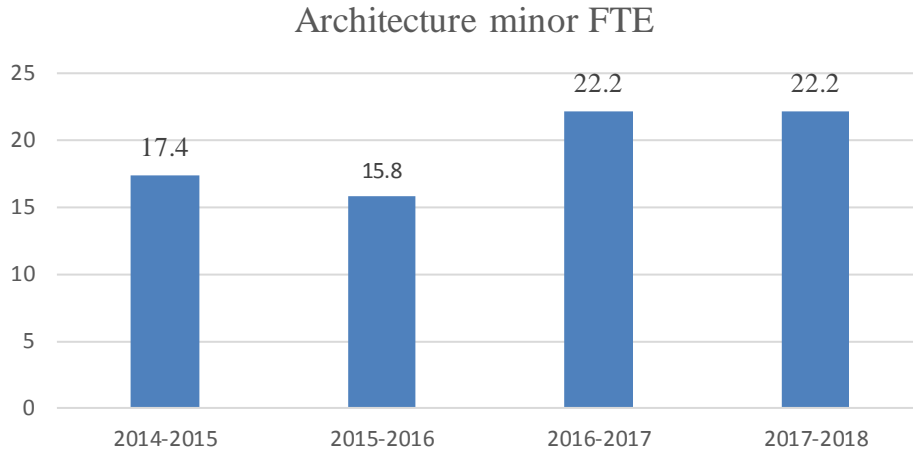


Figure 2: Architecture minor FTE by academic year since start of the program

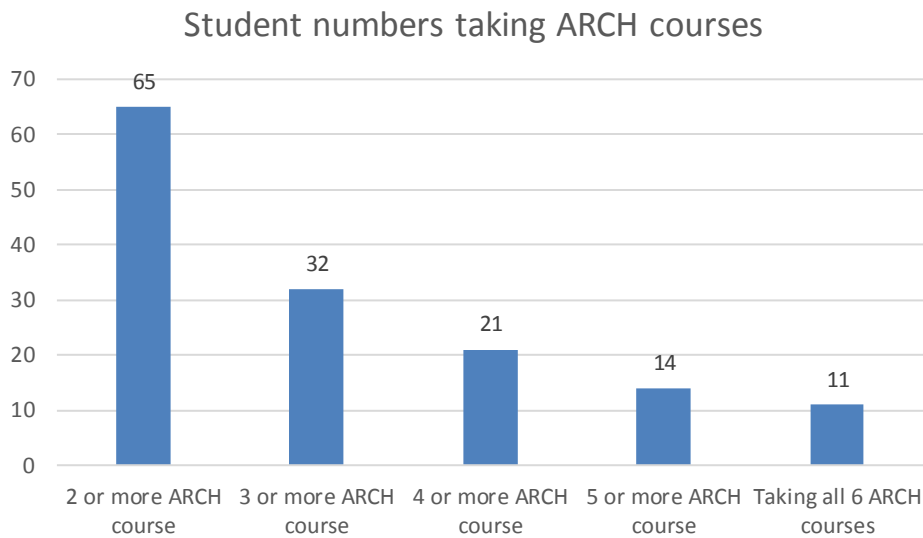


Figure 3: Student enrollment by number of Architecture courses taken

It is also to be noted the benefits of the cooperation at the partner institution. Some of the participating faculty from UP were able to use their teaching experience at MSU Denver towards their application for promotion to full professor in their home country. Based on the joint architecture minor development and operating experience, University of Pecs redesigned their English language architecture program's curriculum using the same format they worked with at MSU Denver. In addition, learning from EAET faculty and the EAET chair about the benefits of an Accreditation Board for Engineering and Technology (ABET) accreditation, the senior leadership of the UP-FEIT is considering pursuing an international accreditation of their English language engineering programs in the future.

A transfer agreement on the equivalency of the courses offered at MSU Denver within the civil major and architecture minor and those offered by UP was instated. This creates an opportunity for the graduates to seamlessly continue pursuing a graduate degree in architecture at UP. With the first graduates in the civil major and architecture minor starting to emerge, it is expected that some of the students will take the opportunity offered by the transfer agreement.

5. Conclusions and Recommendations

The partnership between University of Pecs and Metropolitan State University of Denver advanced the global learning in the civil engineering and architecture areas, along with other academic fields at MSU Denver. The uniqueness of the collaboration in civil engineering and architecture between the academic institutions is due to the structure of how the architecture minor is operated, with a truly international focus, by having international experts teaching in the program.

Working towards having international visiting scholars teaching the architecture courses for more than one semester term is recommended, as it appears to be beneficial to the program. Expanding the cooperation with possible new academic program developments such as a dual degree [8] between the Environmental Engineering and Architecture Engineering is planned and recommended.

In order to seek student feedback, the design of a survey tool to be distributed to all students, declared or non-declared architecture minors, has been initiated. The short survey will reflect on the six ARCH courses offered and will provide the basis for recommendations for future refinements of the minor program.

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