

Concrete Industry Management in Higher Education

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This Paper Focuses on the concrete industry and programs that prepare college students for their future in it and to try and implement some sort of concrete program at Cal Poly. The idea to make Concrete Industry Management first came along at Middle Tennessee State University in 1996, but only a few other programs have started at other schools since then. These programs focus on skills for graduates to enter the concrete industry in production, project management, sales, and marketing. They are structured similar to the way Construction Management programs are structured and have similar courses like estimating, sustainability, and project management as well. Data on program curriculum, industry support, and entry level jobs after graduation was collected from the four schools around the country that have Concrete Industry Management programs. A survey was given to Cal Poly Students in Construction Management. Their responses helped conclude the research that was needed to lay out the structure of a concrete program that could be implemented for Cal Poly students.

KEYWORDS: Concrete, Industry, Construction Management, Concrete Management

Introduction

Concrete is one of the most important materials in the construction industry. It is used on nearly every project and has been a core material in building throughout history. The only problem is that Concrete Industry Management is not a popular focus of study in colleges around the country. It is forgotten about because most people don't see the concrete industry as a major study program. Anyone who has worked with concrete in any way would agree that it's not meant for everyone. Many things go in to concrete such as formwork, strength, workability, finishing, curing, and recycling material. These are just a few things that go into a concrete pour on a site. We forget that there is a whole business and science side of the concrete industry that is not talked about very often. That is where the study of Concrete Industry Management comes in.

Concrete Industry Management is a major program first implemented at Middle Tennessee State University. In 1996 the concrete industry was beginning to worry about what the future would hold for the industry. They worried that civil engineering programs were not going into enough detail when it came to the study of concrete. They decided that they wanted to try starting a new program for the study of concrete, but they did not want it to be overshadowed by a big civil engineering program. That is how Middle Tennessee was chosen for the opening of Concrete Industry Management. The program started and has been a success. Since then other schools have taken in the program and have been improving since then.

CSU Chico has a concrete program worth taking note of as well as New Jersey Institute of Technology, and Texas State University. All of these schools were researched and provided similar data collection. Students that graduate from these schools with a degree in Concrete Industry Management have a 100% job offer rate (Florida, R.). Prior to graduation students are encouraged to work in internships and co-ops in order to get hands on experience and get their foot in the door with companies that interest them. They are able to figure out what kind of industry jobs interest them by participating in the internships and co-ops.

The concrete industry shows no signs of slowing down any time soon. Different forms of concrete have been used for many centuries and different mix designs and uses are still in the works today. There is always room to improve the industry. Billions of tons of concrete is used every year worldwide and is still rising each year.

Below is a graphic showing the demand for concrete around the world. See Figure 1

WORLD CEMENT DEMAND (million metric tons)					
Item	2009	2014	2019	% Annual Growth	
				2009-2014	2014-2019
Cement Demand	3009.0	4160.0	5190.0	6.7	4.5
North America	115.0	136.0	168.0	3.4	4.3
Western Europe	163.0	126.0	142.0	-5.0	2.4
Asia/Pacific	2149.0	3158.0	3940.0	8.0	4.5
Central & South America	119.0	153.0	190.0	5.2	4.4
Eastern Europe	105.0	120.0	139.0	2.7	3.0
Africa/Mideast	358.0	467.0	611.0	5.5	5.5

Figure 1 (Green,J.)

Data was collected through a student survey at Cal Poly San Luis Obispo in the Construction Management Program. 45 students participated which is enough to provide the information needed to conclude this study. The data shows that there is much to learn and have a thirst for knowledge in the concrete category. Overall students are interested in the study of concrete and want more opportunities to take classes involving it.

Literature Review

The research for this paper entailed looking into other schools who have implemented the Concrete Industry Management Program. Middle Tennessee State University was the first to implement the major in 1996 and has grown and established itself since then. California State University Chico has established Concrete Industry Management in the curriculum and is only getting better. New Jersey Institute of Technology, and Texas State University have Concrete Industry Management programs as well. All of these schools have a very similar curriculum and are all supported by the same industry members. When teaching students about the concrete industry they are preparing them to enter jobs in the industry that revolve around production, project management, sales, and marketing. The concrete industry helps out with funding and establishing the curriculum that is needed for the students to get their degree. Through scholarships and funding of programs, the industry pushes to get students the right education and gives them the tools to be fully prepared when they begin their career in the concrete industry.

Middle Tennessee State University

Middle Tennessee State University has led the way for Concrete Industry Management. Since the start in 1996 over 825 students have graduated with a bachelors degree in the program, and as of 2012 students can pursue a masters degree in it. The school prides itself on the hands on learning that the students go through at the school. While at the school students are connected with industry representatives and recruiters to help them with landing internships and full time careers after graduation. The curriculum helps prepare the students for what is to come in their future in the concrete industry.

The CIM program at MTSU includes classes ranging from plan reading to computer applications in concrete and everything in between. In these classes students will learn how to work out problems on a jobsite, how to plan for construction, making the jobsite safe, different methods for construction, and the list goes on. The curriculum prepares the students for full time work after graduation. They will go on to work in a variety of jobs in the office, and in the field depending on what they want out of their career.

This is a list of the careers that students go in to when looking for internships and full time jobs:

- Building cost estimator
- Building/construction inspector
- Building manager
- Concrete specialist
- Construction worker
- Field engineer
- General contractor
- Home builder
- Manufacturer's field representative
- Marketing representative (for concrete industry)
- Planner
- Production manager
- Purchasing manager
- Quality control technician
- Technical sales representative

They will be employed by a variety of companies involved in heavy civil construction, commercial construction, and material suppliers. students in Concrete Industry Management rank in the top 3 highest paid graduates every year since the programs inception at the college. With more than 360 students enrolled in the program now, the industry does not have to worry about the future of concrete management.

California State University, Chico

CSU, Chico has the only Concrete Industry Management program in the Western United States. They pride themselves in producing top concrete professionals who go on to work for a variety of companies around the country. Much like Middle Tennessee, they work with industry officials to be sure that they are providing what the industry wants out of their future concrete managers.

Here is a list of the goals Chico State aims to accomplish with their Concrete Industry Management program.

1. Be knowledgeable concrete technologists
2. Be able to successfully manage concrete projects, concrete production, and concrete quality
3. Be effective communicators, both in oral and written forms, and team players in multidisciplinary settings
4. Expand their knowledge and adapt to the immerging technologies and practices in the concrete industry through lifelong learning practices.

Chico States curriculum is similar to Middle Tennessee's. They focus on classes like construction management would, but there is much more emphasis on the concrete side. Upon graduation they are prepared to enter the industry with knowledge in concrete technology, management, safety, and business administration.

Here is a list of the major courses taken in Concrete Industry Management at CSU, Chico.

- Concrete Project Estimating and Bidding
- Concrete Repair and Restoration
- Sustainability and the Built Environment
- Concrete Industry Internship
- Concrete Facilities Management
- Concrete Capstone Project
- Legal Aspects of Construction
- Project Management
- Operations Management

- Decorative Concrete Fixtures and Surfaces
- Principles of Soil Mechanics and Foundations

Their jobs they enter into once they are graduated will be in production, project management, sales, and marketing. Students with more technical skills typically choose to go to jobs in quality control. Students take the skills they have learned from school and enter into the concrete industry. The industry works with the schools to make sure they are providing the industry with high level professionals once they graduate. With help from the industry more schools should be pushing to get programs similar to this started. Not only does it benefit the industry, it benefits the school and its reputation.

NJIT & Texas State University

New Jersey Institute of Technology and Texas State University have similar programs to Middle Tennessee and Chico. They are hands on programs and pride themselves in their very successful students once they join the full time work force. The concrete industry supports all of these programs and is driven to keep producing successful concrete managers. All seniors have multiple job offers upon graduation and have a chance to get right into the industry. The concrete industry has created the foundation for concrete programs to thrive and produce high quality managers.

Methodology (survey)

A student survey based on the study of Concrete Industry Management was made available to Cal Poly Construction Management students. The Survey got 45 respondents who showed interest in the study of concrete for the most part. Cal Poly requires construction management students to take a course called Construction Materials and Assemblies which includes a lab section. In this course students learn about materials used in construction and the different projects that they are used on. The lab section entails testing materials used in the construction industry. A majority of the lab section is making different concrete mix designs and testing them through slump, strength tests. Students showed interest in taking more courses that were related to concrete.

Results

When asked how important concrete is in the construction industry on a scale of 0 to 10 (10 being the most important), students on average ranked it at 8.7. Only 6 students ranked concrete at 7 or lower for importance in the industry, while 39 students ranked it at 8 or higher. 19 students actually ranked concrete as a 10 for importance in construction. With a material as important as concrete is, construction professionals need to be able to access as much information possible to be prepared for the industry.

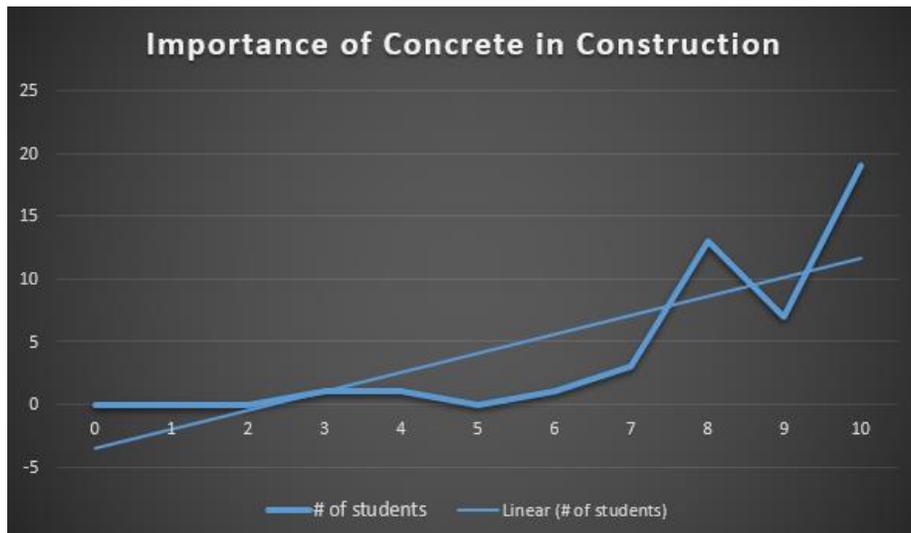


Figure 2

Although 55% of Cal Poly Construction Management students feel that the CM department thoroughly covers the topic of concrete in the construction industry, 89% of the students would be interested in enrolling in tech electives for concrete solutions if they were offered. Only 5 students were not sold on the idea of adding technical electives that fell into the Concrete Industry Management Category.

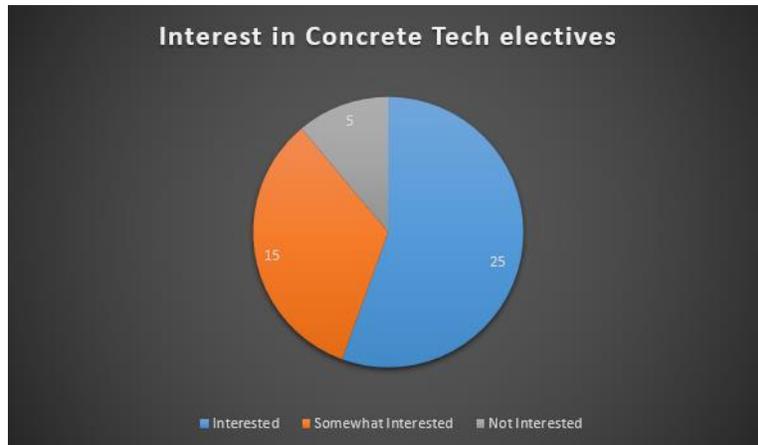


Figure 3

Construction Management students are required to take at least 3 technical electives at Cal Poly. They are not always offered every quarter and most of the time it is difficult to find one that you are interested in taking. The students in the survey were given choices for electives they would be interested in taking. 22 students showed interest in alternatives to using concrete. 26 responded to sustainable solutions and the recycling of concrete. Only 16 were enthused about the study of admixtures. The biggest turn out was for the study of high strength concrete and large scale building, and concrete mix design and specific uses with 28 and 31 selections. There was also a comment section for the surveyed students to freely respond with suggestions. Some suggestions worth taking note of were reading and creating shop drawings for concrete, rebar use and design, and the study of formwork production. These classes will help Construction Managers in their field of work when it comes to the time on the project when concrete forms are being built, reinforcing bars are getting set in place, the specified mix design is being ordered, and everything is starting to come together for the concrete pour. These are just a few of the things that go into concrete on the job site, but we don't get the opportunity to learn this through classes in the construction management program. If the CM curriculum included some of these classes, graduates would be prepared for it when the time comes in the real world.

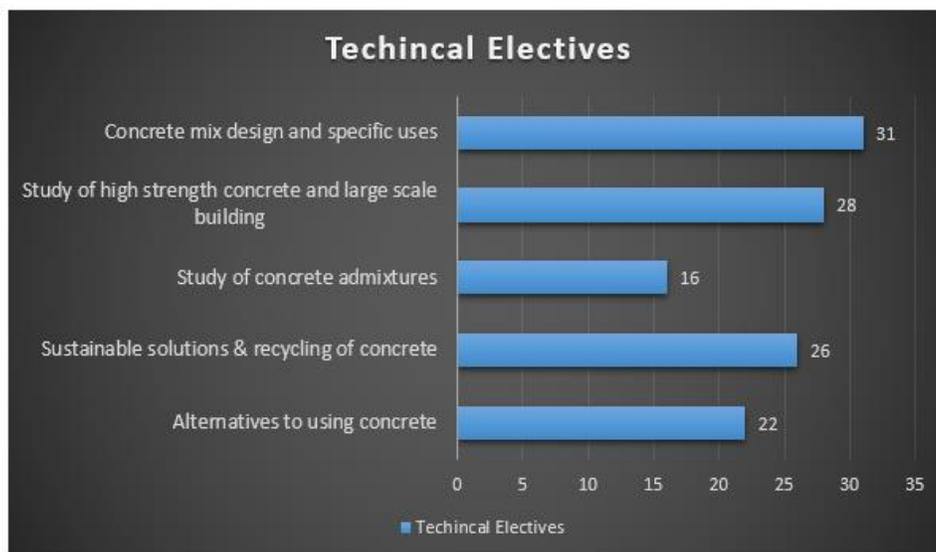


Figure 4

Some students choose to minor in a subject in addition to majoring in Construction Management. When the surveyed students were asked if they would be open to the idea of minoring in Concrete Industry Management, 37 students showed interest in the idea. If students were able to minor or have a concentration within the construction degree they would be able to focus their studies in the categories that they are enthusiastic about. When students are passionate about their learning they will achieve so much more than the average student. Students would be able to have a concentration in any topic they want, not just concrete. This would enable them to specialize in areas that interest them, and in turn would create better construction managers in their area of study.

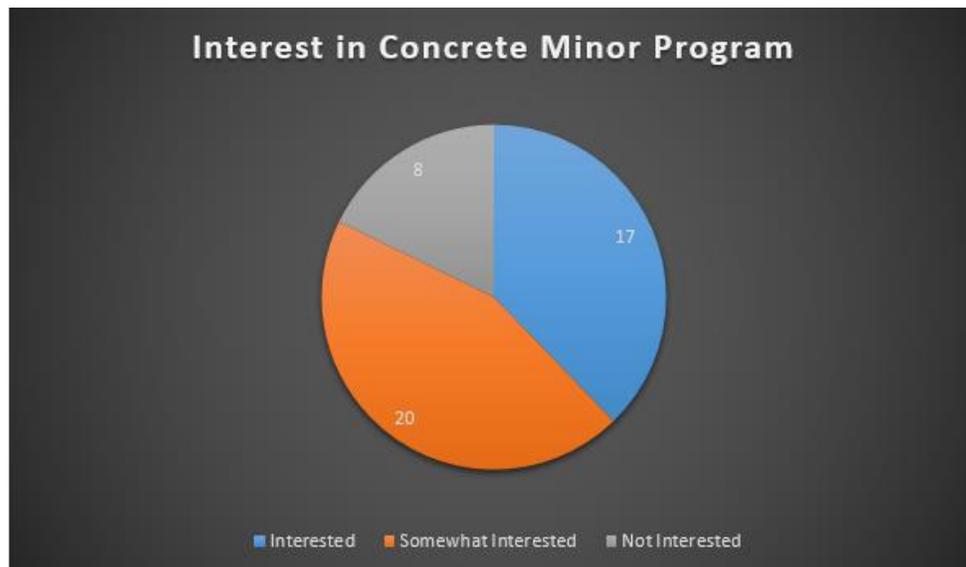


Figure 5

Some members from the industry value the knowledge offered in the study of concrete solutions and promote the idea of adding it to the curriculum. Adding classes to the curriculum at Cal Poly will help students in construction in estimating, formwork production, reading plans, and understanding the general process of construction with concrete. Once we are in the industry working as a full time managers, we will need knowledge in concrete solutions in order to fully understand the projects we are on and staying within the budget and on schedule.

Summary

Concrete is a 200 billion dollar industry. It employs 500,000 people in a wide variety of careers. Without this material roads, buildings, bridges, dams, and other infrastructure would not be able to stand. The construction industry heavily relies on concrete for the majority of projects in some way.

The data collected shows that students are interested in concrete and want more classes to further understand the material and its uses. The concrete industry makes sure to support Concrete Industry Management programs by offering scholarships every year as well as having professionals work with administration to ensure that students are getting the most out of the program to make them better off in the industry once they are in the work force.

If Cal Poly Construction Management adopted some of the curriculum in Concrete Industry Management, the students would be more valuable once they graduate. They would not have to learn later on since they have been educated while at school. If courses were available for students, the concrete industry would be willing to help with administration, and course goals in order to benefit the industry as well.

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