Team Teaching the Capstone Construction Management Course: How and Why

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Construction projects are not built by individuals, but by teams. The faculty at Ball State University decided that the best construction managers were also not built – or taught – by individuals, but by teams. A team teaching methodology was selected for the capstone construction management course, where the final "proofing" of students takes place and they synthesize their learning in a realistic construction simulation. The rationale behind why the team teaching approach was selected, how it was implemented, advantages and potential pitfalls of the teaching style, and lessons learned are presented.

Keywords: team-teaching, capstone, collaboration, team-learning, teamwork

Nam non solum scire aliquid, artis est, sed quaedam ars etiam docendi.
(Not only is there an art in knowing a thing, but also a certain art in teaching it)
- Cicero

Introduction

The modern construction industry is built by and around teams. Teams meet with the owner during programming to determine the wants, needs, and overall scope. Other teams of designers, including architects and civil, mechanical, and electrical engineers, refine this information through the conceptual and schematic design phases, with the final team product being a set of construction documents. Teams of constructors, from general contractors to subcontractors and the specialized trades, then create the physical structure. No project more complex than a backyard deck is created by an individual in a vacuum; it is not an oversimplification to state that teams build the construction industry.

It is therefore unsurprising that teams are prevalent in undergraduate construction management curricula. Students commonly work as members of various teams both in and out of class; some courses are exclusively team based. Team learning activities range from small activities, such as a quantity takeoff of concrete, to larger activities, such as designing a drainage system for a university complex. In a recent survey of construction management students at Ball State University (Jones, 2006), more than 84% had participated in at least one learning activity as a member of a team, and most had been team members in multiple classes. Among construction management majors, 100% had participated in team learning activities by the time they were juniors. In other words, teams are just as common in the undergraduate learning environment as they are in the construction environment at this institution.

If teams are a given in the construction industry and in the education of its future managers, *why are they not found more commonly in the practice of teaching?* Among the 114 students taking

construction management courses at Ball State University, only 21 had taken a course that was taught by a team, with more than half of those having been in the construction management capstone class. Why would team teaching be selected as a methodology in the construction management curriculum? What are the advantages and disadvantages of the approach? This paper examines how the faculty at one institution came to use team teaching in their capstone course, as well as the lessons that they learned throughout the process.

Teaching the Capstone Course

As the construction management program is new at this institution, the faculties are afforded the opportunity to critically examine how each new course is taught. As typical at most institutions, courses are assigned to individual instructors, who then develop them with relative independence. This allows faculty with expertise and experience in specific areas to teach coursework related to them. The students benefit from this concentration, and the faculty are able to concentrate on specific areas of their discipline as well. Specialization in this manner is common, as evidenced by the multiplicity of departments at any higher learning institution.

The capstone course presented some unique challenges to this system. The capstone course was developed in order to synthesize all of the students' prior learning in a holistic and realistic construction simulation; in other words, it shows them how all of the pieces (or classes) fit together to get projects built. Site preparation, planning, scheduling, estimating, project management, safety, oral and written communication skills, and other aspects would all be used in a single project simulation.

The problem was that no single instructor at this institution could adequately integrate the others' coursework into a single class – it was simply too much for an individual. While every instructor was familiar with what the others taught in general, the specific emphases and evolving learning objectives of each course were still the purview of the individual instructors. An attempt by a single instructor to learn everything that his or her colleagues taught and then integrate it into a coherent, single course would have been unmanageable. In other words, what was called for was a team.

What it is

There is no concise definition of what team teaching is or a single "way" that it is done. Davis (1995) defined it broadly as "All arrangements that include two or more faculty in some level of collaboration in the planning and delivery of a course" (p. 8). This definition could include a mentor/mentee relationship where one faculty member does not even come into contact with the students but only assists "behind the scenes." It could also include arrangements where different faculty members teach different parts of a single course, such as one giving the lectures and another teaching the recitation or laboratory section, as may be common in a course on materials or structures. *Rotational team teaching* (Helms, Alvis, & Willis, 2005), where instructors individually teach a particular topic, section, or unit of a broader course with other faculty members also seems to fit Davis' definition. While these might technically fall under a broad definition of team teaching, there is obviously very little teamwork involved.

Another method, *participant-observer team teaching*, has all of the teachers present for every class, but only one actually teaching at any given time (Helms, Alvis, & Willis, 2005). This does offer the advantage of keeping each instructor informed of exactly what the other (or others) are covering, and could also be productively used in a mentor/mentee relationship to offer suggestions on delivery, interaction, etc. However, while there is clearly more coordination and interaction involved, it still falls short of teaching as a true team.

Buckley (2000) offers a more definitive description:

> Team teaching involves a group of instructors working purposively, regularly, and cooperatively to help a group of students learn. As a team, the teachers work together in setting goals for a course, designing a syllabus, preparing individual lesson plans, actually teaching students together, and evaluating the results. They share insights, arguing with one another and perhaps even challenging students to decide which approach is correct. The experience is exciting. Everybody wins! (p. 4)

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This integrated, participatory method was the one used by the authors for the capstone course. It was a true effort of the entire team. All instructors worked cooperatively in the preparation of the course, the delivery of the course (with all instructors present at each session), and the evaluation of the course.

Prerequisites

Like any pedagogical approach, team teaching has certain prerequisites or conditions that enhance the process and contribute to its success when present. While the authors prepared this section retrospectively, it was found that these aspects were fundamental to the success of the approach in their case and should be considered beforehand in future courses utilizing team teaching methodologies.

Voluntary participation

Since team teaching is relatively uncommon in most construction management curricula, its acceptance may be expected to vary accordingly. While participation of certain – or even all – faculty might be expected, it should not be required, as it undermines the inherent concept of teamwork. Resentment and bitterness are not solid foundations for a successful team teaching experience.

When it is approached as a voluntary endeavor, as opposed to just "work," team members can be encouraged to bring their best attributes to the course to produce a better whole. In the authors' experience with this approach, each faculty person volunteered to bring specific areas of expertise to the developmental process. The specific strengths of each faculty person included real and academic experience in construction management, architecture/planning, and general contracting. The complimentary nature of the mix of individuals was enhanced by demonstrated abilities of each individual as teachers with awareness of the contributing pedagogical issues that would surface. The team was cognizant of and discussed the need to cover the five elements of education with areas of individual and combined expertise as defined by Schwab and redefined by Novak, "learner, teacher, knowledge, context, and evaluation" (Novak, 1998, p. 10).

Leadership

A team without a leader is just a group at its best and a gaggle at its worst. While team teaching is collaborative and egalitarian in many aspects, a leader is still a necessary prerequisite. The leader is the overall project manager, administrator, and coordinator. The leader motivates the other members and helps them pull together as a team. When needed, the leader is the final arbiter of the inevitable disputes, but is also the first to celebrate its successes.
The teaching team in this case was headed in this cycle by the coordinator of the construction management program. Built into the structure of the course was an opportunity for each team member to present chosen areas of expertise as those areas related to the capstone project. Leadership remained a significant challenge keeping course content flowing and time deadlines met.

Leadership is not a monopoly held by the designated leader, however. Each faculty member must possess the leadership necessary to ensure that his or her aspects of the course are properly resourced and integrated. At times, faculty may need to champion a particular cause within the team, or even act as a student advocate. Team members must motivate each other, which includes the designated leader at times. The team teaching approach both requires and develops faculty leadership skills in a natural, collaborative environment.

Early in the course design, it was decided by the three faculty members involved in this course that the designated leader position would rotate every time the course was offered. This assuaged the department chair, who was reluctant to split a single course among faculty, particularly since it would have left one instructor without a full teaching load while the other two instructors would have been overloaded by one credit hour, with resultant pay complications in both situations. This arrangement also promised the designated course leadership opportunity to each faculty member and lessened the likelihood that egos would interfere with the team teaching process.

Flexibility

In most classes taught by a single instructor, that faculty member has a great deal of flexibility with how to teach and evaluate the material. Team teaching also offers this type of flexibility, but also requires a different type as a precursor to a successful course. Team members must recognize that it might be necessary to pare down each individual instructor's contributions in

order to allow enough time and/or other resources for other team members' contributions. Flexibility contributes to a more collaborative process.

There appeared to be a strong need for a flexible time buffer both in and out of the classroom. Student teams sought faculty input through scheduled and impromptu meetings and shared resources through e-mail and telephone conversations. The level of formal and informal meetings increased as the course developed. Much can be said for Tom Peters' practice of "management by wandering around." Teaching in a capstone class calls for informality and flexibility beyond what one would find in a classroom taught by a single instructor.

Advantages and Disadvantages of Team Teaching

Both faculty and student input must be considered when evaluating team teaching. The correct mix and expertise of faculty, and their desire for being in the class does not equate to success. Also, the intent of the faculty and the rationale for teaching the course as a team must be explained to the students. The students must also be aware that the faculty will act as a cohesive team themselves, and that the students cannot play one instructor against the other or ask each one individually until they get the answer that they want to hear. The students must hear the same thing from each faculty regardless of the personal feelings of that instructor in order for the faculty team to be effective.

From a student perspective, most classes are taught in the traditional format of one instructor, or the semester divided equally between two or more faculty, and each faculty doing their own portion of the work, having no knowledge of (or caring) what the other faculty is doing in that class. Also, most students have never experienced a team taught environment. Their specific knowledge of what is expected of them in the class will pay huge dividends to the success of the class for the faculty, and the success garnered by the student and student teams. Also, all students (and teams) do not learn the same way, nor do they relate positively or negatively to faculty in the same way. With three different faculty, each student and student team can identify with at least one faculty as an ally.

Advantages

As with any consideration for using teams in lieu of individuals, whether in industry or the classroom, there are several potential advantages. As Eisen (2000) stated, "Perhaps most obvious, teamwork became a mantra of the 1980s and 1990s as business and industry looked to teams to reduce hierarchy, improve quality, and stimulate creativity….Thus, the demand for teamwork skills has grown to the point that traditional educators have to take notice" (p. 8). Helms et al (2005) list several advantages of the team teaching approach, including offering multiple viewpoints for learning, building teamwork and communication, offering multiple styles, and creating interdisciplinary scholarship.

The offering of multiple viewpoints brings more expertise into the classroom for a single course. Thus, the knowledge base of team of three is better than two faculty members or just a single instructor. It may be thought of as a "knowledge multiplier." No single person can do the work of three or have the expertise of three different faculty. While there may certainly be a

practicable limit to how many faculty members could really be expected to be full members of the team, more expertise is generally better.

The process of team teaching also builds the program faculty into a team and fosters free communication both in the team taught course and in others. Faculty members gain a clearer view of the program's curricula at large as well as where their colleagues' strengths and interests are. For example, two of the faculty team members learned enough about each others' estimating and site preparation courses that they were able to successfully integrate portions of each others' approach on mass excavation takeoff the next semester. The students gained an added perspective, and the faculty enjoyed the collaboration.

Students also win with multiple teaching styles. As discussed by Eisen (2000) "the democratization of education following World War II spawned a population of learners with more diverse learning styles than ever before….team teaching can respond to this demand for variety by introducing diverse learning styles and expertise" (p. 8). The experience the student gets from a team taught class will be as close to the real world experience as they are going to find. Also, with two other teamed colleagues, the team members will have expert and emotional support when dealing with difficult team situations.

Finally, if it is accepted that learning is socially constructed, then the advantages of a socially taught course should also be apparent. This link has been recognized by others, including Eisen (2000), who stated that "teaching and learning are inextricably connected and that a key strength of the teaming process is that it generally serves to solidify this connection" (p. 6).

Obstacles & Disadvantages

While there are many reasons for considering a team teaching format and many advantages in doing so, it is not an approach for every course or even for every faculty member. As mentioned previously, coordination and preparation require more time and collaboration than teaching a class as an individual, particularly for the team leader. This time requirement must be carefully considered during faculty assignments, particularly in the case of the course leader and new faculty members. For the process to be effective, the course leader must provide a realistic and specific vision of what other team members will contribute and how they will all interrelate, as well as securing commitments from each instructor to meet these objectives.

Faculty must also examine the goals and objectives of a particular course when considering whether a team teaching methodology would be effective and appropriate. Courses that focus on a single subject, such as structural mechanics, may be more efficiently taught by a single instructor, while courses that are more integrative, such as the capstone course, may lend themselves more readily to this approach. Consideration also must be given to the students that will be enrolled in the course. The survey administered to students at Ball State University (Jones, 2006) indicated that few of the students taking construction management courses had been in a team taught course anywhere on campus. On campuses like this, the students' lack of familiarity might indicate that it is better suited for more mature students, such as upperclassmen. The capstone course in this case was restricted to students who were graduating that semester or the next.

Another "disadvantage" or requirement is that the faculty must really respect each other, and want to be part of a "teaching team'; if not, both the team and students will be negatively impacted, and the success of the class will be minimized. Faculty need to be respectful of their colleague's expertise, previous professional experiences, and personal feelings. While multiple and even contradictory faculty perspectives may be useful in certain discussions, this cannot be the case in every aspect of the course. In particular, the faculty team must always present a singular image of unity to the students with respect to grading, due dates, and other "non-negotiables," regardless of any internal squabbles that might occur.

If this does not occur, students who might not be used to the team taught environment may be confused and unsure how to proceed, regardless of the subject matter. For example, in a team taught psychology course, "more than one third of the respondents (39%) endorsed the statement 'I was uncertain as to which instructor it would be best to discuss the course material with (including exams)'" (Flanagan and Ralston, 1983, 116). Other potential problems may arise if students perceive that faculty have different viewpoints on grading or other issues, resulting in students playing one against the other as children do when they ask each parent, hoping to get the answer that they want from at least one.

Finally, there may be administrative issues to be overcome. While some campuses actively encourage and support team teaching through splitting and/or reduced course loads, many do not. Blythe and Sweet (2004) encourage potential team teachers to "push the envelope of administrative guidelines for compensation' (p. 1) and search for other compensatory methods, including justification for merit pay increases, writing grants to support the practice, and incentives through the Teaching and Learning Centers at their institutions. In the case of larger courses, Blythe and Sweet split the student enrollment between themselves "on paper only so that [they] each got credit for a section" (p. 5). For the capstone course described in this paper, the faculty members had previously agreed that the leadership and credit for course load would rotate among them, equalizing the load over the rotation and simultaneously satisfying the Department Chair. While administrative barriers will vary among institutions, inventive faculty can often find ways to mitigate them.

Lessons Learned

The inevitable learning by the teaching team from the first offering of the class was not limited to course structure and outline, but ran from group dynamics to all the links between faculty and students. Colleagues shared a better understanding of each other's technical knowledge and teaching skills in courses prerequisite to the capstone course. Insights to the subtleties of how students respond to different colleagues and their approaches were gained by all participants. Individual instructors observed different – and perhaps more effective – approaches to teaching technical content used by their peers. Seeing others present technical material in their own ways allowed the faculty members to reflect critically on their own teaching styles, and adopt each others' best practices.

Additionally, through frequent faculty-student interaction, faculty were able to witness students learning collaboratively as it occurred both in and out of the classroom. With the added faculty members, there were more opportunities to check and see if the students were really "getting it" and to keep an eye out for the "a-ha" look of enlightenment or the look of confusion on the students' faces during the course. As the faculty were in the classroom together, they were both learners and instructors for each other, and provided acceptance and support for each others' contributions in the capstone and foundational courses.

The responsibility for clarity and transparency must be shared by the team. Individual teachers are prepared to cover many bases when teaching alone. The team found that something as obvious as clarity, or getting student buy-in with a demonstrated understanding of tasks to accomplish, could be easily overlooked. Transparency is necessary for students to succeed. The teaching team structure is collaborative in nature. Modeling of the collaborative process by the faculty team enhances the transfer of the practice to the students. This is the same as the collaborative process that occurs on a successful construction project, with each member contributing from their professional skill sets. As Goodsell, Maher, Tinto, Smith and MacGregor (1992) note: "Collaborative learning reforms classroom learning by changing students from passive recipients of information given by an expert teacher to active agents in the construction of knowledge" (p. 4). The transfer of real responsibility from the teaching team to students assuming productive roles on student teams was realized because of the active role that the faculty team members took throughout the course. Individual team teaching members observed the need for students to respond proactively to direction shared by a colleague for student consideration. The teaching team can encourage students to take individual roles from the start of the project, much like a project management framework. "It is important to put students in official knowledge-creating roles in the classroom so they have a sense of how to create knowledge individually and collaboratively" (Eisen and Tisdell, 2000). Effective *student* teams mimic effective *teaching* teams.

Planning frequent, regularly scheduled meetings with each student group and the faculty team at intervals where specific content is involved such as scheduling, estimating, and site planning if all are appropriate is important. This assures the effectiveness of each team teaching member. Requesting early and regular professional feedback from student teams helps the teaching team. The teaching team can be made aware of student needs and preferences. Likewise, tracking and monitoring student progress for regular feedback from faculty was beneficial. Evaluation became a process rather than a single event.

A final lesson learned was that the team teaching process was indeed possible. Although others (outside the program) initially remarked at the impossibility and even futility of team teaching, remarks no doubt colored by their own failed experiences at the approach, team teaching worked in this case. Team teaching worked from the student perspective in that the students were able to see how the program's courses integrated in the management of a single, realistic construction project. Anecdotal comments by students at the end of the course as well as after they had graduated and worked in the industry for some time reinforced that this integration had happened and was invaluable.

From the faculty perspective, instructors were satisfied that they had been able to reinforce and symphonize key objectives from the other courses taught, as demonstrated by the students in their final presentations and cross examinations. Faculty also felt that the process left them all with a better understanding of the construction management program as a whole as well as how their courses reinforced and intermeshed with others. In addition, they all enjoyed the interactive process and intend to utilize it again in the next capstone offering. Team teaching was found not to be simply an idealistic pedagogical idea; it is a realistic, effective methodology that can be used in the classroom to address the needs of students and faculty alike.

Conclusion

The faculty in this case did not set out to team teach the new capstone course: it simply evolved as the preferred approach for the desired content. As the saying goes, "The proof is in the pudding" as the team teaches the capstone class for the second time in as many years. The first year's experience was perceived as a success by the faculty team. Future capstone courses and other supporting courses will be enhanced by the foundational learning taking place in the first capstone course.

As with any pedagogical approach, it has certain prerequisites for success and inherent advantages and disadvantages as a process. These should all be considered within the context of the construction management course under consideration. When planning research, the method should not be selected first and then the study designed around it. Similarly, team teaching should not be selected as something to "do" and a course be built around it, nor should teams be comprised of the unwilling and unable. It can be a very effective tool or a recipe for faculty resentment and student confusion.

Team teaching is not for all faculty, it is not for every class, and it is not for every educational program. However, if the faculty are dedicated to bettering the educational experience of the student, team teaching will be considered as an appropriate – and sometimes, even enjoyable – approach to construction management courses.

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