

A Hybrid Curriculum for Improving Faculty Productivity and Learner-Centered Effectiveness

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Enrollment in university level construction management programs through the United States and abroad is expanding rapidly. There are a finite number of faculty candidates in the pool and the construction industry and construction educators have failed to build a faculty pipeline. Demands to do more with less are increasing. There is a need to provide tools for current faculty members to improve productivity and effectiveness in teaching. This paper presents the case for development of a hybrid curriculum in construction using face-to-face, live classroom and web mediated content and assessment delivery.

Keywords: Online education, “hybrid” delivery, construction curriculum, faculty productivity

Introduction

The tradition of higher education thinking is that high quality instruction means low student faculty ratio. New models are emerging that show that is possible to improve learning while simultaneously reducing the cost of instruction. (Twigg 1999)

In the 20th century, almost all post-secondary learning was characterized as in-person lecture format. In the 21st century, learning formats will combine integrative in-person discussion learning with 60-80 percent learning delivered on line. (Draves, 2000)

Learner-centered education places the responsibilities for learning on the student, facilitated by faculty who provide individualistic, flexible; competency based educational opportunities of varied methodology, not always constrained in time and place (ABOR, 2006).

During the 2006 Associated Schools of Construction Conference a paper was presented on multiple levels of online course applications (Koch & Sener, 2006). Although a variety of papers about on-line delivery platforms and individual courses (Orth & Jenkins, 2003), (Orth & Long, 2005), (Carr, 2005), (Guggemos, et.al 2006) (Koch & Sener 2006) among others, have been presented, little has been written about a complete core curriculum for undergraduate construction management education using what Koch and Sener called “multi-modal” delivery.

Koch and Sener presented a high level discussion about possible online tools in courses within the curriculum. Koch and Sener offered the term “multi-modal” for on-line tool use. EDUCAUSE, the leading nonprofit association whose mission is to advance higher education by promoting the intelligent use of information technology, has been employing the term “hybrid” to define the combination of electronically mediated and live classrooms since sometime before 2002. (Fritz & Shrewbridge 2002) We will use the term “hybrid” to refer to learning

environments that combine live lecture, and hands-on laboratories with asynchronous or synchronous web (on-line) mediated curriculum content and learning assessment.

The virtual on-line learning environment requires students to obtain skills other than the skills required for traditional classrooms. Without the live interaction in a classroom, distance learners must be able to process written materials and texts at least as efficiently as they process lecture and discussion. Further, they must be able to make “connections between new and existing knowledge” in their own. (Lindsay 2004)

In “hybrid” learning environments faculty may choose to put some or all of the content and readings on line, some or all of the assessments on-line, some or all of the discussions, chats and correspondence on line, and some or all of assignments on-line.

According to Bransford (1999), the term “learner-centered” is used to “refer to environments that pay careful attention to the knowledge, skills, attitudes and beliefs the learners bring to the educational setting”.

One of the key elements of “learner-centered” teaching is placing the responsibility for learning on the student, facilitated by faculty in flexible, competency based educational opportunities of various methodologies, unconstrained by space and time (Chickering, 1991).

Good learner-centered teaching practice:

- Encourages student-faculty contact
- Encourages cooperation among students
- Encourages active learning
- Gives prompt feedback
- Emphasizes time on task
- Communicates high expectations
- Respects diverse talents and ways of learning (ABOR 2006)

Case Study Background

Typical, construction management students are visual and graphical problems solvers, they are critical thinkers rather than analytical thinkers, they are information technology (IT) sophisticated, and adapt well to the use of new technologies. Construction management students “tend to be very practical individuals” (Cairns, 2005).

Successful construction managers are team/group, action-oriented and construction management instruction fosters enhancement of these characteristic in our students through classroom, laboratory, public service, internships and extra curricular activities.

The construction management program at Northern Arizona University evolved from an industrial supervision and vocational education programs of the 1970’s. The vocational education method, of that time, was to engage students in active learning with classroom lectures

tied immediately, in time and space, to laboratory practice. Many of the vocational education teaching and learning techniques survived the transition to the professional construction management program.

In addition to the university core curriculum, construction management students take courses in business, management, mathematics and science. The required major curriculum consists of nineteen individual courses. (Eight of these courses include laboratory experiences).

The construction management program at Northern Arizona University is ACCE accredited and currently serves approximately 200 active majors. As part of the strategic plan growth to 275-300 active majors (without any additional faculty) is expected by the year 2009. Currently, seven full time undergraduate teaching faculty members and one part time laboratory manager/instructor provide the core construction management instruction at Northern Arizona University. The undergraduate construction management faculty members are among the most productive student credit hour producers at Northern Arizona University.

In addition to an on-campus undergraduate construction management program, the department serves approximately 85 on-line distance-only graduate students in construction engineering management, and project management. Distance graduate enrollment is expected to grow to 200 within the next three to five years. The number of part time graduate faculty changes to meet demand.

During the academic year of 2004, the construction management faculty committed to build a web mediated component for each of the nineteen courses in the construction management core. Two of the major core courses had previously been converted to a “hybrid” model.

Why “Hybridize”?

At a time when industry demands more construction management graduates, the pool of potential construction educators is being stressed. University construction management programs must find ways to increase faculty productivity and effectiveness without over stretching the potential of our existing educational work force. Highly successful and productive on-line graduate programs have demonstrated the viability of increasing productivity and effectiveness through on-line teaching. However, undergraduate faculty are unanimously concerned about the “outside the classroom” teaching and learning that is a significant part of undergraduate professional construction management degree programs.

Faculty needed to reach consensus on an approach that blends the best of live teaching, hands-on experiences and e-learning. Faculty commitment to curriculum “hybridization” was expected to result in the following outcomes:

- Increased productivity through reducing non-teaching and administrative work of faculty.
- Improved student learning through enhanced communication and rich content delivery for students.
- Increase student-faculty contact time for quality teaching and learning opportunities both

inside and outside the classroom, by freeing up faculty time from menial and administrative tasks.

- Enrich and deepen course content thereby enhancing individual student's university learning experiences.

“Hybridization” of the Curriculum

During the academic years 2004 and 2005 more than 50% of the construction curriculum was “hybridized” to some extent, with one core required course completely web-mediated with no live in-class component. Starting with the academic year 2006, all Northern Arizona University courses were brought into a “hybridized” environment in the WebCT Vista platform. (In 2006 Blackboard acquired WebCT).

Each Northern Arizona University course is assigned a WebCT Vista shell. Upon registering for a class, every student is directed to the shell through a variety of electronic media. Once in the shell, students are provided with on line tutoring in the use of WebCT Vista and provided with other on-line learning resources.

In order to stimulate interest in creating e-content, faculty members are offered a stipend for attending WebCT Vista training sessions, that are taught in a “live” classroom setting. On-line training and workshops for the WebCT Vista platform were also available. All university teaching faculty are allowed to “exempt” themselves from the web “hybrid” environment, but they are strongly encouraged at a minimum, to post the course syllabus on-line. Administrators believe that student demand for more on-line activities and opportunities will drive the university-wide “hybridization” process (e-learning, 2006).

Construction management faculty have voluntarily elected to provide e-content and use tools beyond Northern Arizona University minimum expectations and “hybridization” curriculum at a variety of levels. For posting to the class shell, the consensus expectations for construction management faculty are:

- Syllabus
- Assignment schedules
- Grade book
- Internal class email.

Many of the construction management on-line shells now include:

- Asynchronous discussion boards
- Frequently asked question postings
 - Answer banks
- Course content
 - Cognitive learning opportunities
 - Power points
 - Graphic presentation

- Post and pre lecture note posting
- On-line readings (html and pdf's)
- Outside web site directs
- Commercial sites: Click Safety, Crane Safety Bureau
- Asynchronous lectures
- Learning assessments
- Quizzes and Exams
- Assignments
- Student work peer-to-peer review
- Course log books
 - Electronic or handwritten

A full review of potential on-line e-content and tools includes, but is not limited to the following:

- Asynchronous discussion boards
- Live chat rooms
 - Teleconferencing,
 - Elluminate
- Frequently asked question postings
 - Answer banks
- Course content
 - Cognitive learning opportunities
 - Power points
 - Visualization programs
 - Graphic presentation
- Simulations, gaming
- Post and pre lecture note posting
- On-line readings (html and pdf's)
- Electronic Library reserved readings (E-reserves)
- Outside web site directs
- Commercial sites: Click Safety, Crane Safety Bureau
- Audio lectures
- Podcasting
- Video streaming
- Live lectures
- Asynchronous lecture
- Non-lecture video
- White boards
- Learning assessments
- Non-graded testing
- Quizzes and Exams
 - Individualized examinations
- Assignments
 - Individualized assignments

- Student work peer-to-peer review
- Course log books
 - Electronic or handwritten

Although the construction management faculty members are not required to engage in the “hybridization” process, they have voluntarily made increased efforts, each semester, to add web content and/or improve delivery of “hybrid” content. Not every faculty member will require, nor will every course requires, or justify, a full complement of on-line “hybrid” teaching and learning activities.

According to Lindsay (2004), “face-to-face contact will continue in a ‘hybrid’ course, it important to design and monitor the online communications to ensure that they are effective and productive”.

How does “hybridization” lead to faculty productivity improvement and learner-centered teaching effectiveness?

Research in learner-centered teaching tells us we should:

- Encourage student-faculty contact.
- Encourage cooperation among students.
- Encourage active learning.
- Gives prompt feedback.
- Emphasize time on task.
- Communicate high expectations.
- Respect diverse talents and ways of learning. (ABOR, 2006)

“Hybrid” course delivery can be used to encourage student-faculty contact in a variety of useful and productive ways. With work-shifting and “anytime-anywhere” access, faculty can provide “virtual” extended office hours for question and answers. While students often expect instant message responses, they can be encouraged to respect faculty time while still having rapid response to learning questions. Productive teaching time can be increased by reducing administrative actions. Students can be expected to use on-line student grade books to reduce or eliminate drop-ins or emails. Using Frequently Asked Questions (FAQ’s) can avoid repetitive interruptions for simple recurrent problems. By reducing or eliminating recurrent tasks or questions, faculty can free up time for more quality student interactions. Online virtual space may serve as information centers or repositories. Students who loose paper copies always access to course materials. In a fully “hybridized” environment it is possible to forgo paper copies for students and use the electronic content versions of text as the course backbone. An added benefit of “hybridization” is that by allowing students to ask questions or enter discussions outside of the live class environment; thoughtful, shy, or unprepared students are encouraged to actively engaged at a time and place of their desire, not the teacher’s desire.

“Hybrid” course delivery can be used to encourage co-operation among students. Using student, or peer led, discussion boards can increase the opportunities for collaborative learning while

reducing or reassigning faculty time on discussion leading during live lectures. Collaborative learning is an instruction method in which students work in groups toward a common academic goal. Although more difficult to accomplish in a web environment than in a live classroom setting it is possible to engage students in collaborative learning in spatially disperse and asynchronous environments.

We expected to observe no significant difference in increasing the professional knowledge and competence, and in evaluation of collaborative experience, among students who participated in small group collaborative learning, whether the groups met face-to-face or online...Online students, however, appeared to be more efficient in working together. (Francescato, 2006)

“Hybrid” course delivery provides a variety of effective ways to encourage active learning among students. They must read, write, discuss, or be engaged in solving problems. Most important, to be actively involved, students must engage in such higher-order thinking tasks as analysis, synthesis, and evaluation. Within this context, it is proposed that strategies promoting active learning be defined as instructional activities involving students in doing things and thinking about what they are doing. (Bonwell, 1991)

Visual-based instruction encourages interactive techniques. Other active role learning methodologies such as simulation, gaming, (Mead, 2005) and role playing can be used. A literature search on alternatives to traditional classroom lectures will provide a wide variety of suggestions on active learning that can be delivered on-line.

“Hybrid” course delivery provides an effective method for prompt feedback. With on-line quiz software proliferating (A Google search of on-line quiz software will net in excess of five million hits) it is possible, even suggested, that test and quiz writing can be customized for the individual learner. Immediate or contemporaneous feedback in on-line quizzes and test are possible. A variety of methods can be employed to reduce the inevitable temptation to cheat. The simplest of “hybrid” tools, on-line grade books, allows students to receive feedback as soon as the teacher has completed grading. Often days in advance of the next live class or live student-faculty interface.

“Hybrid” courses can be built to emphasize time on task. Many of the web course mediation platforms include sophisticated student tracking systems, allowing faculty to monitor time on task of individuals and of the entire class. By focusing on areas where time on task seems out of the expected norm, faculty can add or subtract live lecture/classroom work to supplement student learning. Cognition is defined as the process or faculty of knowing. I see, I connect what I see to what I know, and I learn. On-line mediation of cognitive learning is the most easily demonstrated and the most easily tracked. For example, if an instructor wanted each student to be able to identify a series of different types of architectural columns, these columns would be shown on-line in a variety of graphic or visual presentations, with captions (audio or written). The student would stay on task till they had “learned” to differentiate and identify those columns in similar but different graphic or visual representations. The web course mediation platform would then measure the students learning through on-line testing. As expected, the amount of time it takes to for an individual to acquire some desired cognitive knowledge will vary, and is recorded by the mediation platform for faculty review. In a live class this same activity is

targeted to the teacher's expectation of an average student's cognition capacity and a fifty-minute class. Both of which are artificial constructs. Testing and feedback on learning are not likely to be immediate. In live class environment the time on task is defined by the teacher, not by the learners.

"Hybrid" teaching can communicate high expectations through high quality platforms and content. In western culture, long accustomed to splitting and dividing all things as a means of control, it is sometimes a bit of a shock to be reminded that, in operational and practical fact, the medium is the message.

This is merely to say that the personal and social consequences of any medium - that is, of any extension of ourselves - result from the new scale that is introduced into our affairs by each extension of ourselves, or by any new technology. (McLuhan, 1964, p. 7)

In the way that one expects esteem purchases to be highly priced, "hybrid" delivery must establish an esteem value in the learner's perception. It is not only necessary to say we have high expectations, we must show that we have high expectations, and high expectations require a high price. For students this high price is often deemed to be time on task and learning outcome. "I have worked hard and I have learned a lot". In this regard "hybridization" of the learning environment has an added cost element; however this cost can be overcome by establishing esteem-value of the product.

"Hybrid" course delivery must respect diverse talents and ways of learning of the students. Given the time and opportunity, most traditional lecture-style teachers would like to actively engage all of their students. However, students do learn in different ways, and at different time. Teachers do not always connect with all students. By applying good learner-centered teaching practice and providing multiple learning paths for students, faculty using "hybrid" delivery can demonstrate respect of the diversity of student talents. On an anecdotal basis, we have noticed in our graduate level on-line classes that Native Americans are much more likely to enter discussions and challenge the teacher than they are in the corresponding live-lecture classes.

How are we doing with Hybridization?

The jury is still out.

Faculty members have exhibited a mixed bag in hybrid deployment. Some faculty are delivering fully on-line content with minimal class meetings while others are using the minimal approach of syllabus, schedules and grade book. Other faculty are somewhere in the middle with additional on-line content and testing. Of the nineteen courses in our core construction management curriculum, one course is fully on-line, six courses (one with lab) have been highly "hybrid" integrated, eight courses have been taken beyond the minimal requirements to varying degrees, and four courses are using the minimal approach. Of our permanent core faculty two have full embraced "hybridization", one has returned from a full year sabbatical and is making progress and one reluctantly acknowledges that the minimal approach does reduce his tedious administrative tasks and reduces printing costs.

Because two faculty members are new to us this year, one is a novice and one new to full-time teaching, and a third faculty member is retiring this year, we were unable to bring a full effort to the hybridization process. We will be making three new hires this academic year and expect that “technology literacy” and “openness to new ideas” will be significant factors in our hiring process.

Initial evaluation of student surveys indicates that once students understand the faculty’s motivation and strategy they seem to embrace the use of “hybrid” copurse delivery. These initial studies are supported by other research. Studies have shown that students believe the “hybrid” approach improves communication and interaction, both between students and between the students and instructors. For example, one study showed 66% of the students saw a marked improvement in interaction while 27% felt that communication was the same. Another survey showed that 90% of students in a “hybrid” course felt they learned as much or more than in a traditional course. A high school even introduced “hybrid” courses and found it helped lower their drop-out rates (Lindsay 2004). Anecdotally, students appear to accept on-line, asynchronous work as part of their natural lives. On-line discussions boards have spilled over into live discussion in and outside of class. Students have reported that taking routine quizzes and submitting assignments on-line fits their busy life style and also allows for more active learning in the classroom with out non-learning busy work.

Full acceptance of a “hybrid” curriculum by the construction management faculty at Northern Arizona University has been less than universal. Even with consensus, and agreed to guidelines, individual faculty have had difficulty finding time to evaluate and implement the full suite of on-line teaching and learning tools. However as each new tool is adopted, faculty are able to assign more time to focus on e-content enrichment and in direct student contact. Reluctant faculty are observing and adapting on an individual basis and the process is moving forward. The construction management faculty report that using web mediated tools does encourage student-faculty contact, for significant teaching and learning opportunities rather than for routine administrative duties. Students now come to office hours mainly for learning and career counseling rather than checking on the status of assignments, and grades.

Construction management students report that on-line asynchronous and real time chat rooms encourage cooperation among students. Students feel comfortable with IT as media for communication, and active communication encourages cooperation among students.

Construction management students and faculty report that on-line simulations and role playing encourages active learning. By providing interactive as well as self-directed learning opportunities active learning may occur when and where students focus. Rather than passively listening to a live lecture, students are able to speed up, slow down, or detour the activity to maximize their individual learning.

A twenty-four hour, world-wide feedback mechanism is available in most on-line learning environments. Faculty and students report that on-line learning assessments such as quizzes and skill review with immediate feedback are important, and that availability to grades and assignment when and where they desire it is provides the prompt feedback necessary for a

learner centered environment.

The construction management faculty report that, “hybrid” delivery emphasizes time on task rather than time at task such as passively sitting in a class. The WebCT Vista platform provides measurement tools for individual students and groups of students in on-task activity. Variations in students and student groups can be viewed and curriculum adaptations rapidly made. For example if the time on task for a specific learning module far exceeds the plan, faculty are alerted to review the specifics of the problem, or if the time on task to skill mastery is rapid, the faculty can add content to the class curriculum. Students focus until they learn, analyze or synthesize the subject matter, and then move on. Student time is freed up to other related learning or more in depth learning.

The construction management faculty can communicate high expectations, through first class e-content and actively supervised discussion boards. High quality e-content requires a significant up-front investment from faculty. However, once the content is on-line, it needs no more nor less upkeep than a well delivered live lecture class.

When used properly, students report that “hybrid” courses respect diverse talents and ways of learning of students. This is an area where the construction management faculty at Northern Arizona University lack adequate knowledge and skills, and it has been identified as an area of investigation for faculty. Many college students juggle family, school and work and find the freedom of time shifting work to meet their desires very helpful. A well developed hybrid curriculum also provides similar content and context in a variety of ways, again respecting the fact that students learn in individual ways, often quite differently than the teacher desires.

Conclusions and Recommendations

University construction education is at a cross roads, faculty members are aging, industry demand for front line managers and leaders is increasing, wages for construction professionals are rising rapidly, while academic salaries and resources for university instruction have stagnated or declined. Hybridization of curriculum is here and it is real. “Hybridization” offers an opportunity for increased productivity and increased effectiveness at a time when teaching resources are under great stress. If construction educators fail to react to increasing demand for graduates by increasing productivity and effectiveness, the free marketplace will adapt. At least one national “technical/trade” college is planning a nationally delivered “construction management” curriculum.

“Adaptation is an organism’s or an organization’s ability to alter its internal rules of operation in response to external stimuli.” (Highsmith, 1999)

“Hybridization” of curriculum provides us with the opportunity to combine what works best in live classroom interactions, with what works best in on-line cognitive learning and assessment. By adopting those tools that work well with their individual teaching styles, construction educators can become more efficient and effective.

Although the following statement may be a creation of how we teach, rather than to whom we teach: as a group, construction management students have been observed to show certain learning type characteristics. The authors recommend more study of how and why construction management students learn. The authors believe this knowledge will help construction educators determine which “hybrid” tools have the greatest potential. While EDUCAUSE is involved in general e-learning investigation, the authors believe specific studies of why and how construction management students learn is an area ripe for directed investigation.

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