

Designing an Online Graduate Level Course in Construction Risk Management using the Significant Learning Approach

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Creating courses in which students have “significant learning experiences” requires professor to first design that quality into their courses and then finally engage in teacher-student interactions as the newly designed course is implemented. This paper focuses on the first part, which is designing the course, by summarizing the effort of this author in developing a new course in Construction Risk Management at the graduate level. This paper is an outcome of an intensive ten days incubation workshop organized by UNC Instructional Innovation Incubator (i3@UNC) in which the author was a recipient fellow. By following “A Self-directed Guide to Designing Courses for Significant Learning” framework proposed by Dee Fink, the authors develop a Graduate level Risk Management course outline in this paper. It has been found that such a framework provides a very convenient and systematic methodology for anyone designing a new curriculum that is geared towards providing a significant learning approach to students.

Keywords: Risk Management, Online Graduate Course, Significant Learning, i3@UNC

Introduction

While the six major levels of Bloom's taxonomy of the cognitive domain have been the backbone of major course design for over more than half a century, evolvement of modes of course delivery in the recent years has necessitated a modified approach of course design. There has been a widespread acceptance of a *significant learning experience* approach of designing and delivering a course, the primary reason being that retaining and applying the knowledge meaningfully in the long run is viewed more important than simply gathering information. Fink (2003a) has been a strong proponent of the significant learning experience approach and has come up with *A Self-directed Guide to Designing Courses for Significant Learning* which has been widely adopted by professors and instructional designers for developing new courses (Levine et al., 2007; Trudeau et al, 2014). The following paragraph explains how such an approach of designing and delivering a course was found to be the most appropriate one when there were newer courses to be introduced at the graduate level program where the authors teach.

Numerous literatures even within the realm of ASC proceedings archive have stated the importance of a risk management course in construction (Sillars, 2005; Slattery & Bodapati, 2001). With the current graduate curriculum in the department where the authors teach, lacking a dedicated course on risk management, this study was highly significant in its importance. The authors were tasked by the authors' affiliated departmental graduate curriculum committee with developing new graduate level courses including the one in Construction Risk Management, which is described in this paper in depth. Risk Management is a very important component of project management. The Project Management Body of Knowledge (PMBOK) describes the six processes in Risk Management as having the following essential steps (PMI, 2012):

- Risk management planning— how to approach and plan risk management activities to reduce effect of negative outcomes and enhance opportunities and positive outcomes
- Risk identification—determining which risks might affect the project
- Qualitative risk analysis—Use of subjective techniques to assess impact of identified risks

- Quantitative risk analysis— Use of mathematical and statistical methods in measuring the probability and consequences of risks and their effects on project outcomes
- Risk response planning— developing specific response plans for each risk to enhance opportunities and reduce impact to project objectives and outcomes
- Risk monitoring and control— monitoring and tracking risks, determining effectiveness of risk responses and fallback and contingency plans

While the above steps are more generic and can be applied in any fields of risk management (such as IT risk management, construction risk management, etc.) it has been found that students often find it difficult to relate the theoretical aspects of risk management described above to real situations or projects (Xia, 2012). It is this problem situation that has prompted the authors to think of other options of designing and delivering the course so that the theoretical knowledge of risk management is assimilated well by the students and integrated in real situations for their benefit. In essence, authors were looking for opportunities to introduce new instructional designs in their curriculum that would make a significant learning impact on their students.

Literature Review

This section discusses some of the pertinent literatures on the instructional designs that were presented in the i3@UNC workshop and explains how they can encourage significant learning experiences. *Overview of Backward Design Process, Research on How People Learn, and Pedagogies of Engagement* are some of the important concept discussed in this section in order to make a case for the support of the chosen design approach.

Backward design process (Wiggins and McTighe, 1998) proposes that a course be designed starting with the identification of desired results followed by determining acceptable evidence and only then planning learning experiences and instruction. In essence, one would start with the student goals in advance and then design courses backwards illustrating how such goals would be achieved and what needs to be covered in the course and how should it be delivered to achieve those student goals.

Designing learning environments based on HPL (How People Learn) suggests that we ask about the degree to which learning environments are (Bransford, Vye and Bateman, 2002):

1. Knowledge centered (in the sense of being based on a careful analysis of what we want people to know and be able to do when they finish with our materials or course and providing them with the foundational knowledge, skills, and attitudes needed for successful transfer);
2. Learner centered (in the sense of connecting to the strengths, interests, and preconceptions of learners and helping them learn about themselves as learners);
3. Community centered (in the sense of providing an environment—both within and outside the classroom— where students feel safe to ask questions, learn to use technology to access resources and work collaboratively, and are helped to develop lifelong learning skills);
4. Assessment centered (in the sense of providing multiple opportunities to make students' thinking visible so they can receive feedback and be given chances to revise).

“Pedagogies of engagement” introduced by Edgerton (2001) in his 2001 *Education White Paper* has two central themes: Cooperative learning and Problem-Based Learning. Cooperative Learning is instruction that involves people working in teams to accomplish a common goal, under conditions that involve both positive interdependence (all members must cooperate to complete the task) and individual and group accountability (each member is accountable for the complete final outcome). Problem-based learning (PBL) “is the learning that results from the process of working toward the understanding or resolution of a problem. The problem is encountered first in the learning process.”

In the following paragraph Dee Fink's *Significant Learning Experience* (Fink, 2003a) is discussed. This approach, though novel, is based on the same components found in most models of instructional design, but it assembles these components into a relational, integrated model rather than a linear one. This approach gives as much an emphasis on course design as it gives to delivering the course content. This approach describes the course design first, where gathering information and making a number of decisions about the way the course will be taught is outlined. Second, teacher-student interactions are dealt based on the designed course. In order to teach well, one must be competent in both course design and teacher-student interactions. However, of these two activities, ability of the instructor to design courses well is usually the most limiting factor. For most instructors, as with the authors of this paper, they have had little or no training in how to design courses. Moreover, during the last two decades, research on college teaching and learning have led to some new ideas about course design that have, in essence, "raised the bar" in terms of what is possible. These include ideas such as active learning, significant learning, and educative assessment. The Self-Directed Guide prepared by Fink (2003b) is along these lines of active learning, significant learning and educative assessment, and is intended to introduce a useful and systematic process for designing courses. Among other benefits, this model provides clear criteria for determining when a course design is a good design. This Guide consists of introductory comments, worksheets, and action questions in each of the three major phases of Integrated Course Design outlined below.

Initial Design Phase: Build Strong Primary Components

- Step 1. Identify important **situational factors**
- Step 2. Identify important **learning goals**
- Step 3. Formulate appropriate **feedback and assessment procedures**
- Step 4. Select effective **teaching/learning activities**
- Step 5. Make sure the primary components are **integrated**

Intermediate Design Phase: Assemble the Components into a Coherent Whole

- Step 6. Create a thematic **structure for the course**
- Step 7. Select or create an **instructional strategy**
- Step 8. Integrate the course structure and the instructional strategy to create an **overall scheme of learning activities**

Final Design Phase: Finish Important Remaining Tasks

- Step 9. Develop the **grading system**
- Step 10. De-Bug **possible problems**
- Step 11. Write the course **syllabus**
- Step 12. Plan an **evaluation** of the course and of your teaching

In order to understand what constitutes significant learning, Fink (2003) has proposed a taxonomy of significant learning. It consists of six major types of significant learning, with a number of sub-categories as shown in Figure 1. This is very useful in identifying significant kinds of learning that one may want to incorporate in learning goals for their course.

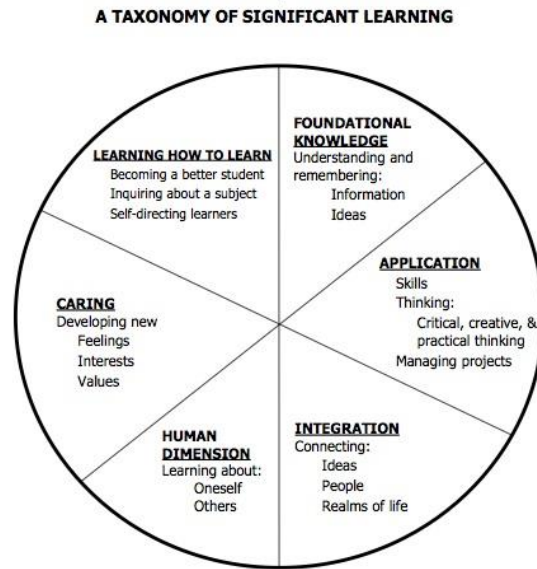


Figure 1: Taxonomy of Significant Learning (Fink, 2003b)

Methodology-A Case Study of Developing a Graduate Course in Construction Risk Management

This section first outlines the general steps followed by detailed information pertinent to the course under study. However, a preamble on how the process of developing a course on Construction Risk Management started would be relevant here. One of the authors was selected for a summer fellowship along with twenty other fellows from the University of North Carolina systems for a ten-day intensive incubation pilot workshop to help faculty create courses that meet the learning needs of diverse student populations in an online teaching environment. The workshop, UNC Instructional Innovation Incubator (i3@UNC), provided formative assessments to personalize online instruction; employ social media for student engagement and discussion; tailor online instruction to different disciplines; and offered choices of using specialized technological tools in online teaching and learning. Through discussions with national and state leaders in online education, collaborations with peers, one to one support from specialists in video production, instructional design, and user experience, participants of the workshop were given the opportunity to rethink their instructional practice to help their students learn more effectively. Among several instructional practices learned in the workshop, a few of which were already discussed in the literature review section, this paper reports the effort of the authors in developing a Risk Management course through the *significant learning approach* so that this very important function of Project Management remains in the mind of the students even long after they graduate. This paper includes only the *Initial Design Phase* of the Self-Directed Guide prepared by Fink (2003b) and describes how a new course is developed using the first five steps by illustrating with an example of a new Risk Management course.

Initial Design Phase (Steps 1-5) of Designing courses that promote significant learning

If professors want to create courses in which students have “significant learning experiences,” they need to design that quality into their courses. How can they do that? By following the five basic steps of the instructional design process, as laid out below:

Step 1. Give careful consideration to a variety of situational factor

Construction Risk Management is a new course to be introduced at a graduate level designed as a graduate level course. This course is to be first offered in an online environment both synchronously and asynchronously that would meet once in a week in the evening through a university supported web-conferencing tool called SabaMeeting. Anticipated size of the class is about 10-15 consisting of diverse student population. By taking this course graduates of the program are expected to learn about the planning and managing risk in construction projects. Risk Management is an integral part of project management and regardless of which dimension of the profession they practice, they are expected to contribute in managing risk in one form or the other. The course developed will be theoretical to some extent but has numerous practical applications that will generate interest from the students. Student population in the graduate program is predominantly comprised of working professionals, therefore already familiar with the construction project environment through their work experience. The other major student sector making up the graduate program students are recent baccalaureate undergraduate from construction management. Since the majority of the expected population of the students is working professionals, mostly mid-level managers, it is appropriately assumed that they are motivated to learn different techniques of risk management and also transfer their experiential knowledge to a pool of fresh graduates. This group serves as good mentor for the less experienced students and they are primed for a greater expectation of their education providing flexibility, complexity and relevance that is found in the professional workplace and should be reflected in the learning environment (Boyer, 1996). A study conducted in the year 2006 revealed that a “constructivist learning environment which involves students in real-world projects can motivate students in learning (Law, 2007). So, it would be reasonable to assume that students with less or no experience in project management would gain from the experiences of their peer. In an online teaching environment this can be achieved by asking students to form online teams and giving projects where they work together and utilize the readily available “experience” of the working students and share that tacit knowledge with the less experienced students. Among other resources, if a department is willing to utilize their industry advisory board they can contribute in different roles; as a repository for teaching materials, professional mentoring, and or role playing from professional experiences (ACCE, 2010). As experts on risk management lectures are easily accommodated with the online accessibility feature of SabaMeeting permitting professionals to contribute with minimal interruption of their time, they can be, interviewed by the students, on the varied dimensions of the risk management aspects of construction practices. These situational factors foster a robust and significant learning approach by designing the proposed course and as well as delivery of the course.

Step 2. Learning Goals: What do you want students to learn by the end of the course that will resonate with them several years later?

A year (or more) after the course is over, the authors want and hope that the students will be able to apply the concepts of risk management planning in any decision making they are involved with. That would mean students would be able to break down project risk to smaller manageable pieces and be able to identify, assess, respond and ultimately develop a risk management plan for proper execution. Fundamental to any risk management program is understanding the key concept that risk has two components, probability and impact. Probability is how likely is the risk event and if it occurs, what is its impact. The impact of the event is more commonly expressed in terms of monetary loss. Essentially, students are expected to qualitatively and quantitatively determine the probability of a risk event occurring and their impact (dollar amount) should the risk event occur.

The overarching principle of decision making process always involves risk analysis and everyone on a daily basis has to make some decisions. It could be a decision of making choices between buying a used vs. new car or it could be as mundane as choosing which road to drive to work if there are several options. With this course, students will be able to articulate risk events and their possible outcomes methodically, preparing them to become a better decision maker. Students will be able to relate to the risk management process to important situations or on a daily basis if they are able to use the concept in their decision making process. Taking again the example of buying a new car vs. old car, students will be able draw from their experiences to predict the chances of repair needed for an old car when compared with the new one and the impact of those repairs in dollar values over the useful life of the car.

Another dimension in significant learning approach as suggested by Dee Fink is the *human dimension goals*. What could students learn about themselves? What could or should students learn about understanding others and /or interacting with them? Students comprehend the subject matter better if they can relate the idea to their own experience or behavior. For example, in the case of risk taking behavior, a simple exercise in determining how much of a risk taker one is and how this behavior affects his/her decision making process can be very much rewarding exercise for the students in knowing about their own behavior that was probably unexplored by them. Most of the time we make decisions at the spur of the moment which may not always result in a favorable situation. When we start articulating our decision making process we become better risk planners, which minimizes the chances of unfavorable outcomes. Students compare their risk taking behavior with other students. When students see the value of planning at the personal level, they will certainly appreciate the value of risk management planning for their construction projects. By doing this, we are introducing significant learning approach in the course curriculum.

In significant learning approach, teachers help students become self-directed learners of the subject. This can easily be achieved for this course by asking the students to apply the concept in their every-day decision making process that they were involved in the past, or are involved in the present, and may get involved in the future. With this exercise, student will be able to create/develop a risk management plan for a project.

Step 3. Feedback & assessment procedures: What will the students have to do, to demonstrate that they have achieved the learning goals (as identified in Step 2 above)?

Procedure for *educative assessment* as proposed by Dee Fink is to include *Forward Looking Assessment*. What this means is that the course should identify a situation in which students are likely to use what they have learned, and try to replicate that situation with a question, problem or issue. For example, a typical situation for construction graduates would be to start by giving them a hypothetical situation, not so complex, where the students are involved in the bidding of a simple residential building. Students are then asked as to what risks may occur during the construction of such a simple residential building. Of course, this simple hypothetical project in the beginning is later added with more complex situations fraught with plenty of risks as the course progresses. The main learning goal for students would be to understand the complex situations of the project in terms of risk that could occur in the project and be able to approximate the likelihood of such risk events happening and their impact should they occur. A good rubric for grading would be to establish two or three levels of standards for each of the criteria for assessing the work. A good work would be the one that includes a comprehensive list of risk with all the major risk being covered. A poor work would be the one that has identified only few risks and misses major ones. All the other works would fall in between these two extremes. Self-assessment gives an opportunity for students to contemplate their strengths and weaknesses. Asking students to critique on each other works gives this opportunity. Mobius SLIP (<http://www.mobiuslip.com>), for example, can be utilized to foster creative collaborative community where students critique each other's work. This web-based Learning Management System (LMS) facilitates complex assignments and social learning interaction among students, encourages creativity, critical thinking, communication and collaboration by giving students an audience for their creations and challenges them to critique their peers' solutions.

Step 4. Teaching/learning activities: What would have to happen during the course for students to do well on the feedback & assessment activities?

There are a numerous ways of involving students that will support more expansive learning goals. Identification of some learning activities to add to one's course that will give students a "doing", or "observing" experience is essential. Gaming and simulations are identified to be pertinent activities that would enhance the learning experience of the students when there are no opportunities for students to get directly involved in a real project. There are plenty of risk management games (off-the-shelf) that can be used for this exercise. As the game progresses, gamers are given feedback on their performance that allows them to review their strengths and weaknesses. A pertinent example of a game in construction risk management is *Simsoft Risk* (Xia, 2012).

Another exercise that is deemed to provide an excellent learning opportunity is to ask the students to interview risk managers or project managers of local construction companies on the different aspect of risk management (risk identification, risk assessment, risk response, and risk planning) and get a better first hand understanding of the risk management process.

There are several ways of infusing reflective dialogue into one's course (Schön, 1990). In this particular course, students are introduced a simple decision making scenario at the beginning of the course, even before they are taught the fundamentals of risk management planning. In the later part of the semester, ask the students to go back and revisit their previous responses or decisions and ask them how they would have answered that question differently had they been introduced the concepts after the fact. What value do the students perceive in being knowledgeable about the subject matter? Lectures, often being one-way mode of communication, should not be the only option of providing information. Case studies, Journal papers, websites, software/programs are other modes to provide initial exposure to subject matter and ideas preferably outside of the classroom environment.

Step 5. Make sure that the key components are all integrated

Check to ensure that the key components (Steps 1-4) are all consistent with, and support each other. The last step of the initial design phase integrates the ideas generated (mostly through questioning) in the previous steps. A skeleton of the worksheet for designing a course is available to help the instructional designers in integrating those ideas such as the one shown in Table 1.

Table 1

Worksheet for designing a course

Learning Goals for Course/Session/Module:	Ways of Assessing This Kind of Learning:	Actual Teaching-Learning Activities:	Helpful Resources: (e.g., people, things)
1. Understand the process of project risk management	Quality and comprehensiveness of questionnaires prepared	Research Paper requiring student to interview/survey local construction firms	Guest Speaker from Local Construction Company, PMBOK

2. Identify typical risks in construction projects	Develop a risk register- appropriateness of risks identified and their priorities	Brainstorming; Hypothetical project scenario	Local construction firms in the Industry Advisory Board, Case studies
3. Assess likelihood and impact of risks	Problem solving skills- the basis for qualitative and quantitative formulation of risk events	Risk estimation group workshop, contingency Cost Estimation of a real/hypothetical project	Excel-Add in; @Risk software, PERT, Monte Carlo Simulation
4. Prepare risk response strategies	How well are the response strategies chosen and on what theoretical/practical basis have they been chosen?	Risk Response Options Evaluations: (strategy: avoid/transfer/mitigate/accept) and (action to be taken)	AIA contract documents, Insurance and Premiums
5. Apply the project risk management knowledge and skills in the scenario provided.	Individual/Team problem based learning- how well an individual/team proposes a solution	Problem-based learning activities, Case Studies, Risk Simulation Games	SimSoft Risk Management Games
6. Develop a risk management plan to guide risk management activities	Final Term Paper submitted progressively for monthly feedback	Preparation of risk planning template/Spreadsheet	WSDOT Project Risk Management Plan Spreadsheet (WSDOT)

Conclusions

This paper presents a significant learning approach of designing a course at a graduate level. The challenges of teaching a course online are many, yet because of the advancement in ICTs there are a multitude of opportunities as well. By following through the steps presented in *A Self-directed Guide to Designing Courses for Significant Learning* the authors have drafted a framework for a course in Construction Risk Management at the graduate level.

It has been found to be a very insightful and rewarding exercise as the question posed in every step of the design phase forces the instructional designer to think beyond the traditional course delivery style and to look for ideas that promote life-long learning experiences or simply put as significant learning experiences. Therefore, any new faculty member with a little or no prior experience in course design can use this approach to develop a syllabus that stimulates significant learning experience from students. It is the opinion of the authors that after following the widely used technique presented here, delivering online courses provide numerous opportunities that otherwise would not have been possible by simply adopting the traditional course design approaches.

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