

Design and Delivery of an Online Graduate Course in Risk Management Using Significant Learning and Just-in-Time Teaching Approach

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Developing courses in which students have “significant learning experiences” requires professors to first design that quality into their courses and then engage in instructor-student interactions as the newly designed course is implemented. This paper tackles both these aspects, first designing the course following the *significant learning approach* philosophy proposed by Dee Fink, and then implementing it with appropriate use of pedagogical techniques and technology with an aim of finding ways to deliver the course that is engaging, and also having a meaningful influence on students long after the course is completed. Development and delivery of a graduate-level risk management course using the above mentioned approach and pedagogical technique is discussed in this paper. *Just-in-Time Teaching* (JiTT) was used and found to be an appropriate pedagogical technique to enhance student engagement and learning through the use of brief web-based questions (JiTT exercises) delivered before or during a class meeting. Students' responses to JiTT exercises were reviewed which then allowed to tailor class activities to meet students' actual learning needs.

Keywords: Risk Management, Online Graduate Course, Significant Learning, Just-in-Time Teaching (JiTT)

Introduction

Continuous improvement is needed in all aspects of today's society but it is extremely important in education and more specifically in distance education. Distance education is continually changing due to new technologies and thus instructors need to constantly learn new technologies and strategies that can be used to their advantage. The following sections describe how one of the authors involved in designing an online graduate course incorporated one of the recent learning pedagogies in delivering the newly developed course in Construction Project Risk Management.

A review of literature revealed the importance of risk-management course in construction management (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 to develop new graduate-level courses including the one in Construction Project Risk Management, which is described in depth in this paper. Based on the construction industry needs of specialized and advanced learning in the subject area, the National Housing Endowment awarded a grant to the department where one of the authors is affiliated to support the development of five subjects related to the needs of the industry and accessible to the working professional via the online delivery method. The needs were verified and approved by the department's Industry Advisory Board and several national residential construction recruiters. These course offerings were intended to attract individuals who are changing careers and undergraduate students wishing to further their knowledge in residential construction management.

The challenge of teaching a class with a diverse student population, as in this case, also came up with an incredible amount of opportunity. Student population in the graduate program has been predominantly comprising of working professionals, therefore already familiar with the construction project environment through their work experience. The other major student population making up the graduate program students are recent baccalaureate undergraduates from the department and elsewhere. Since the majority of the expected population of the students is working professionals, mostly mid-level managers, it is appropriately assumed that their main motivation stems

from the passion to learn different techniques of risk management that they can immediately apply in their profession. The same student population with their rich experiential knowledge can be tapped and shared to the relatively inexperienced pool of students. This group of students serves as a 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 pairing students from these different pools to form teams and giving projects where they work together and utilize the readily available “experience” of the veteran students and share that tacit knowledge with 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)

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. Among several instructional practices learned in the workshop, a few of which are discussed in the literature review section, this paper reports the experience of the authors in implementing a *significant learning approach* so that this very important function of Project Management remains in students’ minds even long after they graduate. The development part of the course can be found in a separate paper published by the author (Panthi & Connell, 2015). This paper, however, focuses on the implementation part of the course already developed.

Literature Review

The following section discusses some of the pertinent literatures on the instructional designs and delivery methods that were presented in the i3@UNC workshop and explains how they can encourage significant learning experiences. Overview of *Significant Learning Approach* with emphasis on the implementation aspect along with *Just-in-Time Teaching* pedagogy will be discussed in the literature review.

Significant Learning Approach

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 (2003) 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., 2008; Trudeau et al., 2014). Detailed instructions on developing a course with *Significant Learning Approach* can be found in the book “Creating Significant Learning Experiences: An Integrated Approach to Designing College Courses” by Fink (2003).

Just-in-Time Teaching (JiTT)

Just-in-Time Teaching is a pedagogical technique that was first implemented in the late 1990s in an introductory physics course to address nontraditional students’ needs. It was around this time when higher education was experiencing a paradigm shift in which instructors began questioning the effectiveness of the traditional auditorium-style class lecture and started looking for its alternative of the default pedagogical strategy. “*Just-in-Time Teaching* focuses on improving student learning through the use of brief web-based questions (JiTT exercises) delivered before a class meeting. Students’ responses to JiTT exercises are reviewed by the instructor a few hours before class and are used to develop classroom activities addressing learning gaps revealed in the JiTT responses. JiTT exercises

allow instructors to quickly gather information about student understanding of course concepts immediately prior to a class meeting and tailor activities to meet students' actual learning needs. *Just-in-Time Teaching* improves student learning and increases in-class teaching efficiency and effectiveness. JiTT does this by incorporating research-based knowledge about effective teaching and learning practices.” Simkins and Maier (2009). JiTT pedagogy has proven effective in improving classroom climate, student motivation and fostering deeper learning and ensuring good quality of teaching.

Processes involved in the *Just-in-Time Teaching* are illustrated in Figure 1. This pedagogical technique is particularly suited for an online course delivery where the class meets weekly via a web-based conference technology. The timing of presenting the questions to the students and their responses may vary slightly upon how the course is delivered. Some feedback from the students may be instantaneous whereas the others may have a time lag between the first time the question is asked and when the responses are received.

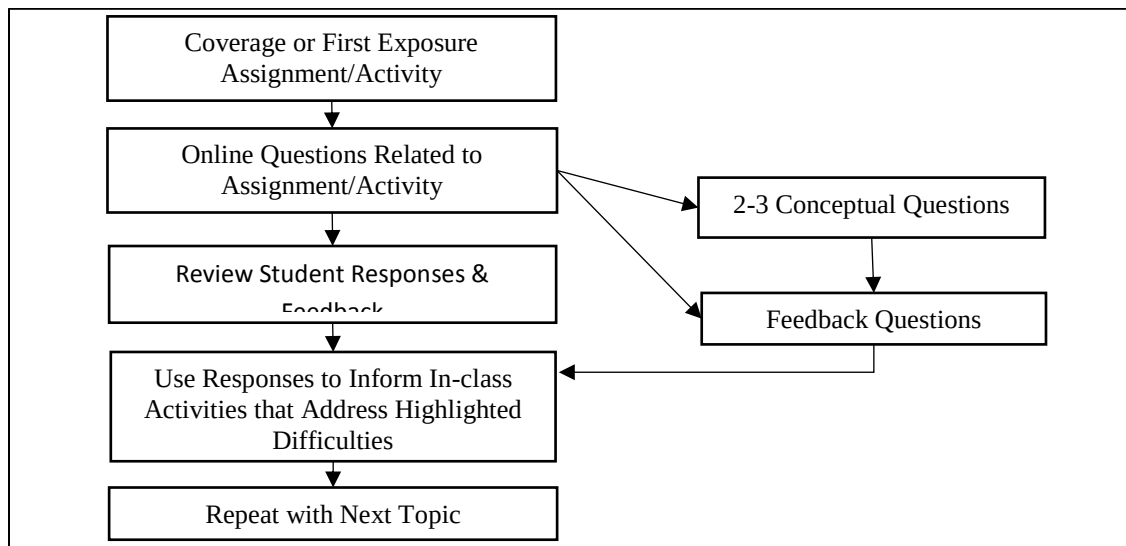


Figure 1: Just-in-Time Teaching Process (Simkins & Maier, 2009)

Methodology

This section discusses one of the several instructional practices learned in the workshop that are considered appropriate to be used for this course. Authors' experience of delivering a newly developed course in Construction Project Risk Management in the Fall of 2015 by incorporating Just-in-Time Teaching pedagogy to promote significant learning among the students is explained in the following sections. This is an entirely online course in which ten students were enrolled in the Fall of 2015. Students were a mix of mainly mid-level managers who had considerable amount of construction experience and a few fresh graduates who did not have much industrial experience. The class met once a week through the online web-conferencing tool called SabaMeeting.

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 outlined processes are very important concepts to be learned by any students of Project Risk Management, it is essential to establish one big purpose of the course as known as *Learning Imagined* as stated by Fink (2003) and shown in Figure 2.

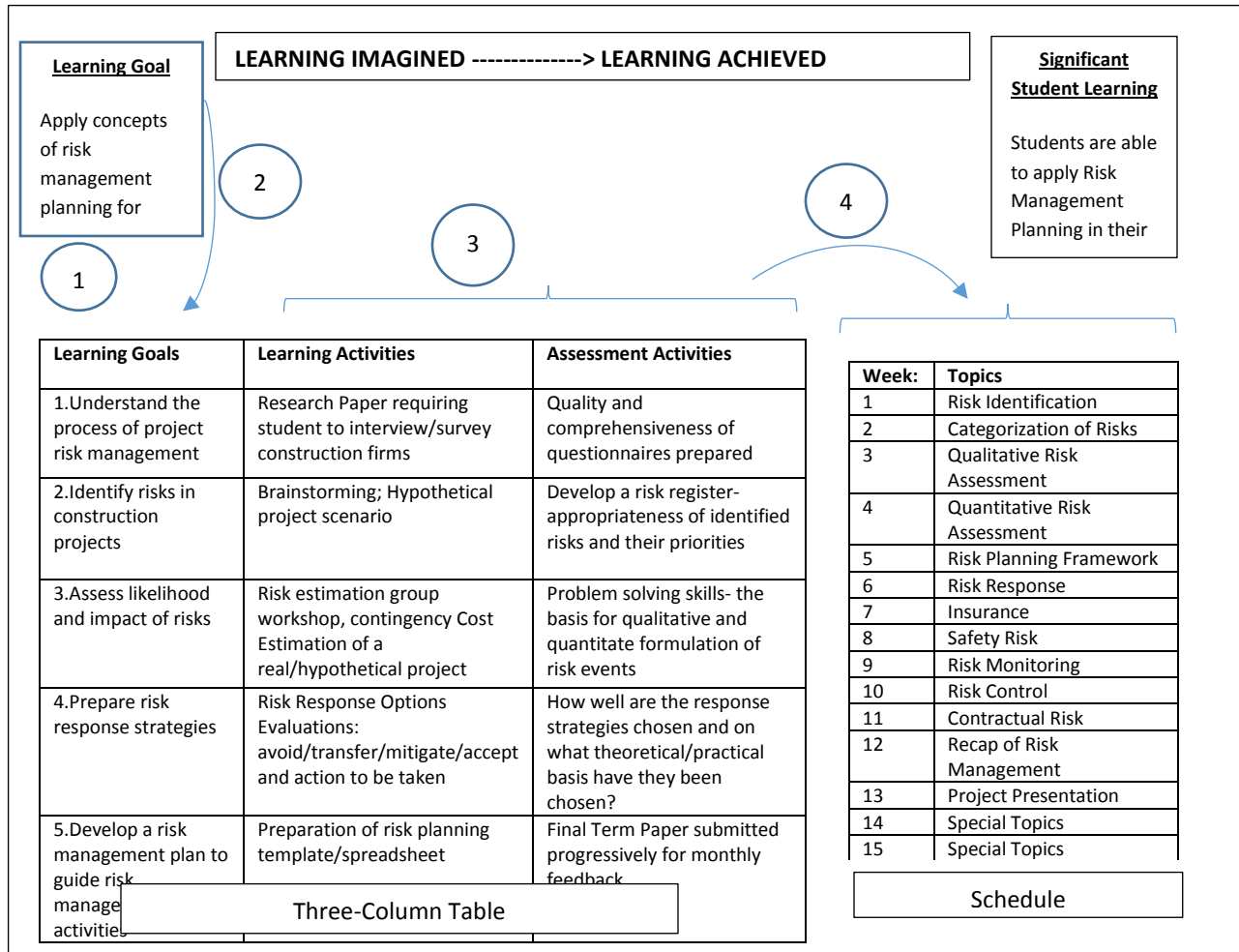


Figure 2: Sequence of Steps in Integrated Course Design (Adopted from Fink, 2003)

Restating the purpose in a simpler way, “What one thing would you want your students to remember even a long after the course is delivered?” With this overarching goal identified, the course is designed backwards listing the main topics to be covered and developing the “doing” activities that would help achieve the ultimate goal. The backward design process 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 (Wiggins & McTighe, 1998). In essence, one would start with the student’s goal as a first and foremost step and then design courses backwards linking the established goals with specific class activities and assessments. The big purpose established for this course is:

“A year (or more) after the course is over, I want and hope the students will be able to apply the concepts of risk management planning in any decision making situations they come across.”

Firstly, it was essential to have the important elements of risk management outlined above to be well understood by the students in order for them to be able to create their own risk management plan. The second step would then be to put these learning goals into the left-hand column of the three-column table as shown in Figure 2. For each of these learning goals appropriate learning activities and assessment activities for that specific kind of learning should be conducted. This is indicated in step 3. Step 4 involves taking all of these activities in the second and third columns of the three-column table and putting them into the schedule of activities for the course for the entire semester. When the course is designed and integrated in this way, it is anticipated that significant student learning is achieved. However, it is essential that learning and assessment activities are seamlessly integrated in the course design for significant learning to take place, which is the focus of this paper. In the following sections, tools and techniques that were used to enhance learning in an online class environment are discussed.

1. Understand the Process of Project Risk Management

In this learning activity, students were asked to find a local construction company and interview a project manager on how the risk management planning was performed in their projects. This assignment was given in the beginning of the semester when students had little or no knowledge of the risk management process. As part of their assignment students would have to prepare interview questions which would require them to have some knowledge of the subject matter. Students' responses and feedback would then be discussed in the following week's web-conference meeting. The responses from the students were then used to gauge the student's understanding of the subject matter while at the same time giving the instructor the opportunity to resolve any issues the students faced during this learning activity.

The importance of this activity in initiating students' interest in the subject matter cannot be underestimated. The impact of this activity to generate interest in this subject matter was tremendous. Although it is difficult to quantitatively gauge the effectiveness of this learning activity, the fact that there were a couple of students who later signed up for their capstone research project under the supervision of the author proposing to pursue research in project risk management in a similar manner as discussed in the course speaks volume for the lasting impression that such a learning activity has on the students.

2. Identify Risks in Construction Projects

In this learning activity, a hypothetical project scenario is given to students during the web-conference meeting. This activity would start the real identification stage by making all students write down what they thought the main risks were in a given project. An example of a JiTT question for this activity is:

"In an excavation for a building foundation in a downtown area, there are many risks. Identify and mention at least seven of the important construction risks that a contractor may encounter."

Students would be given approximately 15 minutes to complete this exercise. The exercise would be conducted using Google drive by sharing an already prepared excel spreadsheet template where each students had space for inputting their risks. An example of such a response submitted by the students is shown in Figure 3. When the responses are received, all of the identified risks were presented in a graphical format called Wordle. Wordle is a word cloud generator that can effectively present key words from the qualitative responses of the students (<http://www.wordle.net/>). Going through the most commonly cited risks by the students which are clearly highlighted in Wordle creates a common understanding of the importance and magnitude of each risk. If any significant risks are missed, it is at this stage that they should be discussed and included.

	B	C	D	E	F
1	Student 1	Student 2	Student 3	Student 4	Student 5
2	Traffic Management			Limited Time	
3	Limited Workspace			Safety of Workers	
4		workers safety	Liquidated Damages		
5			Delays caused by other trades		
6	Faulty Build Sequence			Structure Failure	A drastic change in material prices
7	Un-identified onsite conditions			Design Updated	
8		collapse of structure			
9		failure of super structure			
10			Protected Wetlands	Bad Weather	Destroying a natural habitat of a species.
11			Hazardous Materials uncovered	Flooding	
12		hazards			
13	Disgruntled Home Owners/Giving up Property			Traffic Failure	Political unrest.
14			Unforeseen Events	Machine/Equipment Failure	
15	Government Red Tape(NCDOT)			Permit Failure	Workforce shortage
16	Multiple Managers			Communication Failure	
17				Schedule Error	
18	Delivery Constraints			Sign Failure	
19				Traffic Jams	
20					
21	Student 6	Student 7	Student 8	Student 9	Student 10
22	long lead items	equipment availability	resource allocation	Inferior materials	long lead times on materials
23		materials	safety		subcontractor delays
24			theft		
25					
26	Design incomplete	project documents, plans		multiple changeorders	unforeseen construction delays
27	Design changing	specifications			
28					
29					
30	environmental analysis incomplete	hazardous materials	hurricane season	natural disaster	
31		weather conditions	SWPPP		
32					
33	Government's policy changing	regulations		political defunding	
34		zoning			
35	Funding			manpower mismanagement	
36	Lack of effective communication		schedule conflicts		delay in schedule
37			improper scope of work for Subs		
38				unable to acquire property	

Figure 3: An Example of Unedited Response to a JiTT Question Shared Using Google Drive

3. Assess Likelihood and Impact of Risks

As the course progressed, it was expected that the students become familiar with essential risk management concepts and techniques. Based on the experience of the author involved in teaching a similar course it was anticipated that students would find it particularly challenging task to analyze risks quantitatively. For that reason, the author decided to start discussion of this topic with a simple question using a JiTT exercise as follows:

"You are helping one of your young cousins in making the decision of going to a foreign country (Germany) to work and travel on one year working visa. There is an uncertainty about the job prospects and how much would he earn. He is also uncertain what will be his expenses in Germany. He has done single point estimation but he is not satisfied with his estimate as there is a lot of uncertainty and hence risk in the process. He has come to know that you are skilled in taking up uncertainty and risk into account while making decisions. He is also aware that you have some magic software that can realistically tell him what amount of money he would be earning over there? He contacts you about his situation and you have decided to help him by developing a probabilistic estimate of money (using @risk for Excel) he would be earning during his travel/work in Germany for one year. Make suitable assumptions about all costs and income. Use PERT distribution."

Students would input the numbers based on their perception of uncertainty in the expenses in the excel spreadsheet prepared and shared by the author which could be used to perform simulation to estimate the cost and the earnings. This simple exercise would however, be followed by relevant cost estimation problems in construction projects involving risks.

4. Prepare Risk Response Strategies

This learning activity involved identifying the risk first and then based on the risk assessed students would have to find an appropriate way of handling the risk. The JiTT question for this activity is as follows:

“Please read the two-page case study of a construction project assigned. Prepare a 10-minute (strictly enforced) presentation that provides a list of major risks identified followed by a discussion of possible risk response strategies (including the actions) based on the qualitative risk analysis to address the risks identified.”

5. *Develop a Risk Management Plan to Guide Risk Management Activities*

The goal of this learning activity was to ensure that the students were able to synthesize the individual concepts learned in risk management to create a risk management plan template for a typical project. This being the most important learning activity, it had to be more than just a weekly assignment. So it was decided to make this the final project that would require the students to synthesize the individual concepts learned during the course. A question for this was:

“Apply all the discussed techniques to solve a hypothetical risk management scenario. For the given project scenario make a ten minute presentation on developing a risk management plan which would involve all the steps of the risk management process.”

A common case study project for all the students was assigned that would allow the students to compare their work with that of their peers and see how it differed from their own plan.

Discussion

A very important dimension in *Significant Learning approach* as suggested by Dee Fink is the human dimension goals. What this entails is the opportunity provided to students during the learning process to know about themselves and how that relates to what they are learning and how that is applied to them in their personal and professional lives. 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 a very rewarding exercise for the students in knowing about their own behavior, as this is 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. *Just-in-time Teaching* offers an opportunity for students to explore themselves and thus introduces this human dimension into the teaching-learning process.

It was not the intention of the author to desperately embrace the *Just-in-Time Teaching* in all the learning and assessment activities. There might be other relevant pedagogical techniques that could be more suited to the needs of a variety of learning activities. However, in the case just discussed, JiTT technique naturally fit into the teaching-learning activity that enhanced the significant learning process. As was evident from the case, some questions required more time for the responses to be received than the others. The time required for response from the students and the assessment from the instructor can be suitably adjusted to meet the needs of the course.

Conclusion

This paper presented a significant learning approach of delivering a course at a graduate-level using *Just-in-Time Teaching* pedagogical technique. The course, Construction Risk Management, dealt with the processes involved in risk management planning that would prepare the project managers to deal with risks in their projects. It was essential that the students had a thorough knowledge of the preceding risk management processes before moving on to the next step of risk management. *Just-in-Time Teaching* technique allowed seamless transition from one concept

to the next by being able to gauge understanding of students before deciding to move on to the next step. This is especially important for online instruction environment where assessing students' understanding by means of visual cues is absent. The biggest benefit of the JiTT pedagogy is that it provided instant feedback on students' thought process regarding the risk management process prior to the coverage of the concept in the class. The same concept could be covered in a traditional and passive lecture environment but in a JiTT pedagogical technique students play a central role in knowledge creation process. As a consequence students are more involved in classroom discussions when they see their work being used in the class. This also aligns well with the central theme of the *Significant Learning Approach* which advocates for a human dimensional approach in the teaching-learning process. For the instructor teaching the course it was found that students' misconceptions on the subject matter and their gaps in learning was easily visible and could be addressed instantly. Although no apparent measurement of the student learning was performed to test the efficacy of teaching using the above teaching strategy, however, the author who taught this course felt the shift in their roles from being conveyor of knowledge to becoming facilitator of student learning. Using JiTT provided a positive feedback loop between the students and the instructor that is so essential in a learning environment.

References

- ACCE (2010). *Industry Advisory Board Best Practices*. White Paper.
<<http://www.accehq.org/images/uploads/BestPracticesWhitePaperDecember2012.pdf>> (2014, October 30)
- Boyer, E.L. (1996). *Scholarship Reconsidered: Priorities of the Professoriate*. Princeton, NJ: The Carnegie Foundation for the Advancement of Teaching.
- Fink, L. D. (2003) *Creating significant learning experiences: An integrated approach to designing college courses*. San Francisco: Jossey-Bass.
- Law, A. (2007). *Using Real-World Projects in Constructivist Learning Environments*. Forging our Own Path symposium.
- Levine L. E., Fallahi, C. R., Senft, J.M., Tessier J.T., Watson C.L., Wood, R. M. (2008). *Creating Significant Learning Experiences Across Disciplines*, College Teaching, Vol. 56, Iss. 4
- Panthi, K, and Connell, E. (2015). *Designing an Online Graduate-level Course in Construction Risk Management using the Significant Learning Approach*. ASC Proceedings of the 51st Annual Conference, Texas A&M University, College Station, TX, April 22– 25.
- PMI (2012). *A Guide to the Project Management Body of Knowledge*, 5th Ed.
- Slattery, K. and Bodapati, N. (2001). *Risk Management of Construction - A Graduate Course*. ASC Proceedings of the 37th Annual Conference, University of Denver - Denver, Colorado, April 4 - 7, pp 95 – 100.
- Sillars; D.N.(2005). *Developing a Graduate-level Course in Construction Risk*. ASC Proceedings of the 41st Annual Conference, University of Cincinnati - Cincinnati, Ohio, April 6 – 9.
- Simkins, S., and Maier, M. (eds). *Just-in-Time Teaching across the Disciplines and across the Academy*. Sterling, Va.: Stylus, 2009
- Trudeau, D. and Kruse, T.P. (2014). *Creating Significant Learning Experiences through Civic Engagement: Practical Strategies for Community- Engaged Pedagogy*. Journal of Public Scholarship in Higher Education, Volume 4.
- Wiggins, G., and McTighe, J. (1998). *Understanding by Design*. Alexandria, VA: ASCD