SECTION F

Application of Case Analysis to the Blended Modality in Graduate Coursework

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ABSTRACT

Embry-Riddle Aeronautical University's Worldwide campus provides multi-modal curriculum delivery: Classroom, Online, Eagle Vision, Eagle Vision Home, and Blended. This manuscript describes a longitudinal research study on the implementation of inquiry-based learning using case-based teaching. The population of the study is students enrolled in a core course in the Master of Aeronautical Science program. Case-based teaching is used as the online portion of the Blended delivery modality. The goal of this paper is to provide a discussion on the implementation of inquiry-based learning in a multimodal delivery system and to gather students' perspectives thereof. This manuscript describes the (1) fundamentals of inquiry-based learning, (2) fundamentals of case-based teaching, and (3) strategies for integration of case-based teaching into the Blended delivery modality.

Introduction

      Inquiry-based learning. Inductive based teaching is the overarching methodology of student-centered learning under which inquiry-based learning (IBL); discovery learning; problem-based learning; project-based learning; hybrid (problem/project-based) methods; and case-based teaching reside. It "is an instructional (and curricular) learner-centered approach that empowers learners to conduct research, integrate theory and practice, and apply knowledge and skills to develop a viable solution to a defined problem" (Savery, 2006, p. 9). *The emphasis is placed on constructivist education; whereby questions, data collection, and learning are student centric. Instructors guide and facilitate the learning process. Experimental and analytical skills are assessed rather than quantity of knowledge accumulated.* Inductive based teaching, as opposed to the more traditional and widely used deductive based teaching, places the means of discovery on the student. The instructor becomes a facilitator of the learning process, guiding students in their quest for knowledge rather than an Oracle of indisputable truths.

      Inquiry-based learning; a derivation of inductive based teaching, is based upon the philosophy of John Dewey "IBL is a student-centered, active learning approach focused on questioning, critical thinking, and problem solving" (Savery, 2006, p. 16). *Inquiry based learning is an instructional method and form of active learning developed during the discovery learning movement of the 1960s ("Community Center," 2013, para. 1).* Any learning activity that: (a) begins with a question; is followed by investigative solutions; (b) creates knowledge through data gathering and analysis; (c) elicits discussion on discoveries and experiences; and (d) reflects on new-found knowledge is IBL (Savery, 2006, p. 16).

      Case-based teaching. Instruction beginning with a challenge, when the required knowledge has not been previously provided, is inquiry-based learning. The scope of inquiry

may vary from a portion of a single lecture to a major term project. "In case-based teaching, students study historical or hypothetical cases involving scenarios likely to be encountered in professional practice" (Prince & Felder, 2007, p. 16). One way to motivate students is to provide them with a case analysis based upon a contemporary, real-world, and subject-matter-related problem to solve. Permeating a case analysis with the tenets of IBL presents students with a challenge in which they are responsible for readings as assigned; identifying, isolating, and defining a relevant problem or issue; establishing significance of the problem, and creating a well-developed and substantiated solution to the problem.

The case analysis methodology that is the centerpiece of this research has undergone modification, adaptation, and continuous revision since it was first applied by one of the researchers in 1996. At that time the case analysis process was brought into the classroom to augment a textbook that was more than 10 years old. The initial case analysis process was loosely structured and casual. Although the case analysis methodology did have merit; a more structured format to conduct the analysis was needed.

Significance of the study. "I read – I forget; I see – I remember; I do – I understand" this Chinese proverb sets the stage for IBL as applied by the researchers of this study. As we move farther and faster into the 21st century our means and methods of instruction must advance to properly prepare future generations of aviation and aerospace leaders. Embry-Riddle Aeronautical University (ERAU) Worldwide campus delivers undergraduate and graduate course work in a number of modalities that are designed to serve a widely diverse and dispersed student population. This accredited multimodal delivery system has proven to be successful and it has been sustained with an intense continuous improvement process. Instructors must be qualified

and re-qualified; courses are continuously reviewed, added, or deleted based upon needs; and the delivery technology is continuously updated.

"It has been widely recommended that the learning approach should be changed from teacher-centered to student-centered with a balance of knowledge, skills, and attitudes" (Ketpichainarong, Panijpan, & Ruenwongsa, 2010, p. 169). Distance learning and online modalities are particularly open to the implementation of student-centered learning. In either distributed learning mode, interfacing with instructors is at a moderate level at best. Students are, for the most part, on their own path of discovery. In the purely online courses there is even less opportunity for instructor to student and student to student face time as compared to the traditional classroom. Regardless of the modality, the inductive teaching method has merit.

> A better way to motivate students is *inductive teaching*, in which the instructor begins by presenting students with a specific challenge, such as experimental data to interpret, a case study to analyze, or a complex real-world problem to solve. Students grappling with these challenges quickly recognize the need for facts, skills, and conceptual understanding, at which point the teacher provides instruction or helps students learn on their own. (Prince & Felder, 2007, p. 14)

The researchers of this study have implemented the case analysis methodology as the Blended component when teaching a core course in the Master of Aeronautical Science (MAS) program. This was done for the first time in the August term of 2010. Initial results were encouraging. In-class discussion increased, student to instructor discussion increased, student to student interaction increased, and students became more cognizant and conversant on specific components of the assigned readings. Research skills, writing, critical thinking, and problem solving improved as well. This research study originated when the second researcher adopted the

case analysis methodology in the Air Transportation Systems course and experienced many of the same results. It then became apparent that this phenomenon warranted further research.

Literature Review

Inquiry-based learning. "Inquiry based learning is a learning environment focused on a process in which asking questions, thinking critically, and solving problems are encouraged" (Friedman et al., 2010, p. 766). Not all course work lends itself to the time and effort required of IBL. "If instructional objectives are at a low cognitive level, requiring almost exclusively rote memorization of facts or mechanical substitution into formulas, there is no reason to use an inductive method" (Prince & Felder, 2007, p. 18). However, for coursework that requires higher levels of cognition IBL is an ideal, albeit time and labor intensive methodology. It would appear that IBL would be an ideal method for non-traditional students, those with "day jobs," taking courses in an environment outside of the traditional classroom environment.

> In inquiry based lessons, students develop, carry out, and reflect on their own multiple solution strategies to arrive at a correct answer that makes sense to them, rather than following the teacher's prescribed series of steps to arrive at the correct answer. (Inoue & Buczynski, 2011, p. 10)

However, each of the delivery modalities at ERAU-Worldwide is highly structured. They have to be in consideration of the numbers of different faculty that teach a wide range of courses, with thousands of registrations, and coursework delivered in all modalities. Consistency is understandably a required quality, and yet, research has shown the need for more inductive versus deductive teaching. "While studies supporting the different inductive methods vary in both quantity and persuasiveness, the collective evidence favoring inductive teaching over traditional deductive pedagogy is unequivocal. Induction is supported by widely accepted

educational theories, cognitive science, and empirical research" (Prince & Felder, 2007, p. 18). Striking a balance among quality and consistency, and the traditional deductive approach and the progress inductive approach is challenging.

As indicative of IBL's flexibility and adaptability, consider that IBL lessons may be "guided" with more direction from the instructor and somewhat less independence on the part of the student. Students are provided with a problem and the resources to solve it and they are expected to devise their own procedure to solve the problem ("Just Science," 2013). Open inquiry on the other hand places sole responsibility for the learning process upon the student (Inoue & Buczynski, 2011, p. 10). Students identify and isolate a problem and develop their own solutions (Inoue & Buczynski, 2011, p. 10). The IBL teaching process does not ignore the need for structure. Using structured inquiry provides students with basics of investigating as well as techniques for using various equipment and procedures. Structured inquiry provides common learning experiences that can be used in guided or open inquiry.

Case analysis. According to Towl (as cited in Lutte & Bowen, 1995), case analysis can be documented as early as 1915 at Harvard. Case analysis has continued to find application in a wide variety of subjects and delivery modalities over the years. Definitions for case analysis range from the basic by Taylor "a description of an organization or organizational situation" (as cited in Lutte, 1996); the more complex by Jain, Gooch, & Grantham as an opportunity to generate knowledge (as cited in Lutte, 1996), and the pragmatic as useful in keeping students attention and applying previously learned skills to real world situations (Lutte & Bowen, 1995). Other research parallels and supports Lutte & Bowen findings. For example, well-constructed case analysis enables the learner to grasp significant facets of the problem/situation. Conducting case analyses develops critical thinking skills and to identifying logic flaws or false assumptions.

Using the case analysis methodology as a group project enables students to develop improved communication and collaboration skills (Savery, 2006, p. 15). The key to case-based instruction is having cases that are clear and realistic and encompass all of the teaching points the instructor wishes to convey (Prince & Felder, 2007, p. 17).

Case analysis has been identified as a school-based teaching/learning strategy that assists students in understanding the relevance of learning. Lundeberg and Yadav (2006) carried out a meta-analysis and concluded that cases have a positive impact on faculty and student attitudes, class attendance, and faculty perceptions of learning outcomes. Case analysis can enable the learning environment by providing the link between knowing and doing and thereby capture and maintain the attention of the student (Finch, Frantz, Mooney, & Aneke, 1997). Compared to typical problems used in problem-based learning, case analyses tend to be relatively well structured and rich in contextual details, with students applying material that is already somewhat familiar (Lohman, 2002).

The impact case analysis has on communication cannot be overlooked. Conducting a case analysis can help students develop all aspects of communication that is required in the workplace: reading, writing, speaking, and listening. Case analysis significantly improves the quality of education, provides a variety of workplace scenarios, and exposes students to all facets of workplace communication (Graves, 1999). The degree to which a student masters the skills of communication will directly and proportionately determine their probability of thriving in the real world.

Student's perspective. So far responses to Case Analysis as a tool for IBL have come from the perspective of the practitioner. Initial reaction from instructors has been positive with the overall process. However, the literature indicates that some students do not express the same

broad acceptance as do instructors. It appears that some students are more dependent or expectant of the traditional deductive learning process. According to Madden (2010), student comments varied from "interpretative questions are useless in the readings without something to guide you through them (p. 235);'' IBL "did not effectively provide what the economist was thinking. It made really ha[r]d readings even harder (p. 235);'' "felt more confused coming out of class than ... when I came in (p. 236);'' and lastly from a student with underdeveloped reading skills:

> I am not a strong reader and my reading comprehension lacks as well, so when I have to read difficult material and analyse [sic] it I lose motivation and tend to get confused. I don't feel I learned anything on my own using this technique. (add   en, 2010, p. 236)

Expect the unexpected. Inquiry based learning poses a challenge to instructors who may not be prepared for the answers, or questions, that result from their IBL lesson plan. This challenge originates from the inability to anticipate diverse responses to an open ended question and/or an unanticipated follow up question to the initial open ended question. Inoue and Buczynski (2011, p. 20), found that "failure to anticipate students' diverse responses" was one of the reasons that an inquiry lesson was ineffective and deviated from the initially planned instructional goal.

Methodology

The researchers determined that a common course would be best for the study, this led to the selection of a core-course in the MAS program. Selection of a core-course would ensure the greatest number of student participants. The course chosen is a core course that both researchers teach on a regular basis. The Air Transportation System is the core course in the MAS program that meets these criterion.

Course-work delivery at ERAU-Worldwide are delivered in any one, or combination of modalities: traditional classroom; EagleVision classroom, EagleVision home, Online, and Blended.

Classroom. The classroom modality is representative of the tradition means of course delivery. The distinction for ERAU-Worldwide classroom delivery is that the classrooms are not located on campus. The vast majority of courses are taught in the evening or on weekends.

EagleVision. EagleVision is ERAU-Worldwide's version of synchronous distance learning. There are two versions of EagleVision delivery.

EagleVision classroom. Instructor and students are located together in a classroom connected in real time with up to three additional classrooms at remote locations, and combine into a single classroom environment.

EagleVision home. Instructor and students are not collocated. The instructor and students are at different locations; either one may be at home, at an office, or deployed to any number of locations worldwide.

Online. Online programs support and connect students in an asynchronous virtual learning community through Web-based support groups, e-mail discussions, and other online forums.

Blended. A blend of classroom (generally 70%) and online (generally 30%) course delivery. The majority of the instruction occurs in the classroom, a portion of the course takes place online through activities such as guided discussion, group projects, and online assignments.

For the purposes of this study, the researchers chose a core course in the MAS program using the Blended modality. This course, ASCI 602 The Air Transportation System is taught by

both researchers. The online component of the Blended modality is facilitated with case analysis methodology.

Case Analysis Methodology

At the outset of the course students are introduced to the case analysis methodology that will be used throughout the course. A thorough description of the process is provided, this includes exemplars, and workflow expectations.

The case analysis (CA) is comprised of summary, problem statement, significance of the problem, alternatives, and recommendation and it is required to be directly related to course material; learning outcomes, assigned readings, etc. Initially, the CA horizontal and vertical structure is relatively rigid. However, as students demonstrate ability, the structure becomes less rigid allowing students to take a much broader approach to the requirements. The analysis is limited to four pages: title page, analysis (two pages maximum), and references. Adherence to the guidelines and application of the applicable components of the most current edition of the Publication Manual of the American Psychological Association (APA) is emphasized.

Summary. The purpose here is to provide a brief and comprehensive summary of the analysis. Students are encouraged to establish the nature or the background from which the issue/problem/situation emerged. The summary must be accurate, non-evaluative, coherent and readable, and concise (APA, 2010b, p. 24).

Problem. This section begins with a clear problem statement "The problem is…." Students are required to elaborate on what caused the problem. Nothing but the problem statement and its contributing factors should appear in this section. The problem statement must include only one problem. The problem should be specific and action oriented. The problem statement should reflect a situation that must be addressed. Students are cautioned not to confuse

symptoms or results of the problem with the problem itself. This is the centerpiece of the analysis. From this point forward the problem statement must establish a thread of commonality that is woven throughout the remainder of the analysis; everything that follows must be linked back to the problem statement.

Significance of the problem. What is important about this problem? Students are required to identify what is significant about the problem they have identified. At this point the analysis is not concerned with what caused the problem; that should have been illustrated in the previous section. Students are encouraged to consider what will happen if the problem is not corrected. Will there be a decline in one segment of the industry, a weak financial report/reduced revenue, or an impact on safety? The significance of the problem may be multi-faceted, however students are cautioned to not lose their focus on the problem that was identified previously.

Another aspect of significance of the problem is to validate the problem and help to determine what priority should be assigned to its resolution. The significance of the problem and the priority assigned to it is determined by what will happen if the problem is not resolved.

The significance of the problem is a pivotal point in the analysis. When it is done correctly one of two things should happen (a) the problem is validated and the student moves onto to the next step having identified and isolated one problem or (b) the problem is not valid, it does not justify the expenditure of time and effort to resolve it. Although disappointing, this is an essential component of the analysis. If the problem is valid the student moves on to alternative actions. If not, a new problem statement must be developed.

Development of alternative actions. Alternatives (two each) provide a feasible, realistic approach to resolving the problem. Students must justify their alternative actions with rationale: why is the alternative an appropriate approach to resolving the problem at hand? Students must

then state what they believe the advantages and the disadvantages of each alternative action are. There must be two advantages and two disadvantages for alternative action. Advantages and disadvantages may not be duplicated. Once again it is essential that each alternative action be directly related to resolving the problem at hand.

Alternatives must be derived directly from the source of the issue/problem/situation and/or the assigned chapter(s)/learning outcome(s). Students are directed to focus on the problem at hand and to consider the significance of the problem as well. They are required to use the information they have: current and related trade magazine or research journal and the assigned chapter(s) from the textbook or assigned reading material to resolve the situation.

Students are given the option to complete this section in one of two formats. The first of which is to write it out in paragraph form; being sure to address each required component: two alternatives, with rationale, and with two advantages and two disadvantages. The second approach is the "matrix" format.

In the matrix format students use a table formatted in accordance with APA (2010a) requirements (see Table 1). Consistency takes precedence over typical punctuation and grammar.

Recommendation. This part of the analysis requires students to provide a recommendation that is separate and distinctly different that either alternative action. Rationale for the recommendation is required and one advantage and one disadvantage are required. Students are encouraged to get outside of what was identified in the source document and/or the assigned chapter(s) or reading material to solve the problem they have discovered. Students are encouraged to (a) explain why their recommendation is superior and why the advantage outweighs the disadvantage; (b) discuss how the disadvantage might be overcome or minimized;

(c) discuss what is involved in implementing their recommendation, how long it will take, how much it will cost, and anticipated results.

This is an opportunity for students to take a chance and risk putting forth an idea or thought of their own device; it is a simulation of sorts. Creativity and innovation are highly desirable. And, once more, theoretical resolution of the original problem must be evident.

Table 1

Alternative Actions

Alternative	Rationale	Advantages	Disadvantages
1. Clearly state what the alternative action[a]	Provide the reason for this action	a. [b]first advantage b. second advantage	a. first disadvantage b. second disadvantage
2. Clearly state what the alternative action	Provide the reason for this action	a. first advantage b. second advantage	a. first disadvantage b. second disadvantage

Note. Use the appropriate table note to indicate any special instruction/comment and to properly cite sourced material. [a]punctuation is not required, consistency is. [b]capitalization is not required, consistency is.

Results

At this point in the study results are preliminary and subjective at best. However, both researchers have seen positive results overall. Student comments (post-course) also suggest high levels of learning occurred and students confirming applicability to their professional lives. As previously discussed, in-class discussion has improved, not only in quantity but quality as well. Students are more engaged and animated in expressing what they have discovered. Student to student interaction through the online component has been an interesting development. Comments on one another student's discussion board posts frequently goes beyond the tertiary levels. It appears, initially, that students are less inhibited to make comments in the online environment than they are in the traditional face to face classroom environment. In regard to threats to the process, some students have a tendency toward confirmation bias. Both researchers

have noted that some students find, identify, and isolate a problem and then they cannot substantiate it. Rather than revising to find another problem they attempt to "make it fit" their analysis. Another interesting finding is that students are initially resistant to IBL; frequently asking for specific examples and resist taking action on their own initiative. At times, students have misinterpreted the connection to the subject matter of a specific week's assignment and stray away from the requisite area of research.

Discussion

The case analysis process was in progress with the researchers collaboratively since 2010. As the University progressed through the Southern Association of Colleges and Schools (SACS) accreditation process, it became more evident as the university's Quality Enhancement Program (QEP) was developed and with the initiation of *Ignite*, that there was a significant connection between the case analysis process and the tenets of *Ignite*. Inquiry-based learning approaches are trending upward for the Worldwide campus, and the case analysis process is complimentary to that movement. An unintended benefit is that the researchers case analysis process is symbiotic with both *Ignite* goals and several of the operational strategies, specifically:

Ignite goals.

- Faculty and staff will engage students in scholarly activities and facilitate research through curricular or co-curricular opportunities.

- Students will obtain the skills to investigate hypotheses, solve problems, and/or advance knowledge utilizing methods valued in the various disciplines.

Ignite operational strategies.

- Enhanced curriculum
- Enhanced faculty development program

o Enrichment for creation of co-curricular learning opportunities in academic

support

Faculty mentorship. This is another area that the researchers have experienced similar

findings. Although specific numbers cannot be substantiated at this time it is hoped the results of

the study will provide some quantitative data for analysis. Faculty and student collaboration in

the development of a case analysis has resulted in significant improvement of a student's ability

to conduct a meaningful case analysis and/or significant research, analysis, and findings have

resulted in a heightened awareness of the subject matter of the course. This "faculty mentoring,"

was found to be similar to that experienced in each researcher's respective graduate post-

graduate academic careers.

Flexibility. The flexibility of the case analysis methodology is another benefit to IBL as

discussed. The researchers are keen to explore the influence, viability, applicability, and

performance of case analysis during the longitudinal study. Their analysis may provide

exceptional results to the theory that case analysis is an exceptional method to impart IBL.

Student responses, from those who have already experienced this technique, are supportive of the

theory. One student expressed in class that this process was applied frequently to his mid-level

management job in manufacturing at Bell Helicopter in Fort Worth, TX. The case analysis and

IBL clearly support the first statement in the Ignite executive summary, "Our mission is to teach

the science, practice and business of aviation and aerospace, preparing students for productive

careers and leadership roles in service around the world."

Conclusions

There is a documented justification for a transition from purely deductive teaching

methodologies to inductive based methodologies. Bringing the case analysis methodology, as

described in this research, into the Blended delivery modality is a natural application inductive based teaching. The case analysis methodology is a means by which students are challenged to identify and isolate a problem and then develop substantiated solutions for the problem discovered.

Recommendations

The researchers believe that the application of case analysis as a means to integrate IBL into graduate level courses delivered in the Blended modality warrants an intensive, longitudinal study to determine student perceptions of IBL. It is believed that this study will provide quantitative data that supports this hypothesis. If so, this study could be continued and expanded to include other courses, both graduate and undergraduate, as well as other modalities.

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