Methods of Instruction and Learning Outcomes: A Theoretical Analysis of Two Approaches in an Introductory Information Technology Course

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Abstract:

In introductory information technology (IT) courses, communicating technical concepts so that they can be comprehended by all students, technical and nontechnical, has been a concern. Another challenge in such courses is to teach the real-world applicability of technical concepts. In this conceptual article, we focus on a relatively unexplored issue in IT education—which instructional method is more effective in improving the learning outcomes of all students taking introductory IT courses. In doing so, we consider two instructional methods, lecture and multimedia case studies, and argue that either of these instructional methods, adopted singly, will be perceived by students as less effective in accomplishing learning outcomes than adopting a combination of the two instructional methods. Our arguments both augment existing knowledge about the differential influence of lecture and multimedia case studies on students' learning outcomes and questions the wisdom of adopting either of these methods singly in introductory IT courses. We derive insights from the literature and anecdotal evidence, presented as four propositions, which illustrate the relationship between the two instructional methods and the specific learning outcomes students perceive they affect.

Keywords: learning outcomes | lecture method | methods of instruction | multimedia case study

Article:

INTRODUCTION

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The need for qualified information technology (IT) personnel with good technical and analytical skills is well documented in job postings and academic literature (Bradley, Mbarika, Sankar, Raju, & Kaba, 2007a). Educators in the field of IT have, therefore, invested much to prepare students to be qualified managers as they enter the workforce. For example, major computing associations such as the Association of Information Systems (AIS) and the Association of Computing Machinery (ACM) have invested much effort during the last two decades to shape information systems (IS) curricula. The intent of these organizations is twofold: to help structure IS curricula to address recent developments and rapid changes in the IS industry (Gorgone et al., 2000; Nunamaker, Couger, & Davis, 1982) and to provide learning and skill development experiences that are more conducive to students born during, and native to, the digital era. Faculty provide learning and skill development experiences for the aforementioned classification of students to enhance students' performance in a real-world work environment (King, 2000). Organizations' desired skills for students include a good understanding of technical concepts and how to apply those concepts to a given line of business. While it is easy to identify desired skills, it is more difficult to teach them. Communicating highly technical concepts in a way they can be comprehended, especially in a large classroom setting such as an introductory IT course, continues to be an issue of concern for both academicians and practitioners (Lim & Benbasat, 2000).

Teaching is the primary source of student learning (Larkin-Hein & Zollman, 2000), and to prepare students to be qualified business and IT managers, it is critical to provide them an education that imparts, develops, and improves the requisite skills for such positions. Although instructors must prepare students for the workforce, they are finding it challenging partly because of the disconnect between their method of instruction and the intended learning outcomes. Given the heterogeneous group of technical and nontechnical business students typically enrolled in an introductory IT course, adopting appropriate instructional methods (i.e., methods that are conducive and congruent to the expected learning outcomes) is vital (Nadkarni, 2003).

Prior literature discusses two approaches to educating nontraditional students (e.g., adult learners) that are applicable to traditional students in the digital era—pedagogical and andragogical (Forrest & Peterson, 2006; Knowles, 1984). A pedagogical approach is characterized by instructor-driven methods that have predefined objectives, whereas an andragogical approach is characterized by more flexible, learner-driven methods (Forrest & Peterson, 2006; Nadkarni, 2003). Although there are many instructional methods that can fall into either the andragogy or pedagogy category, such as independent study, lecture, game- and role-play, discussion, case study, etc. (Sadler-Smith & Riding, 1999), the focus of this article is on the lecture and case study (i.e., multimedia case study) instructional methods. The selection of the lecture method is based on the fact it is the most widely used method of instruction (Hingorani, Sankar, & Kramer, 1998; Zdeslav, Dean, & Anjay, 2007), and has been a mainstay in educational settings for many decades (Spence, 1928; Zdeslav et al., 2007). The selection of the case study method is based on the nature and dynamics of an introductory IT course at a large university. The class size of 204 students (which is typical of a section of this type of class at a large university) and student makeup (often consisting of students from multiple disciplines within and outside the College of Business) of such a class is not conducive to game- and role-play, independent study or a strictly discussion method of instruction. Similar to the longevity of the lecture method of instruction, the case study method has been a mainstay in business

education for many decades (Merseth, 1991). Thus, the case study and lecture methods of instruction are deemed more suitable than the game- and role-play, independent study, and discussion methods of instructions for this article. The traditional lecture method is an example of a pedagogical approach, as it is instructor-driven and allows students little autonomy in facilitating the accomplishment of expected learning outcomes. On the other hand, the multimedia case study method is an example of an andragogical approach, as it is flexible and provides students with a high degree of autonomy in facilitating the accomplishment of expected learning outcomes (Nadkarni, 2003).

In this conceptual article, we focus on a relatively unexplored issue in IT education. Using anecdotal evidence from an introductory IT course at a large university, we ask and answer the question of which instructional method is more appropriate for certain learning outcomes. The objective of this article is twofold. One objective is to compare and contrast the effect of each instructional method on learning outcomes. The other objective is to explore the potential benefits of combining two instructional methods as it relates to enhancing learning outcomes.

Whereas prior studies have examined and debated the effectiveness of the lecture and multimedia case study methods independently, we argue that using both instructional methods to teach an introductory IT course in a large classroom setting can promote better student learning than using either method alone. We provide some early, anecdotal evidence in support of their argument by examining both methods in an introductory IT course at a large institution. In addition to looking at the relationship between each method of instruction and specific learning outcomes, we make a case for the complementary effect of the lecture and multimedia case study method on the accomplishment of learning outcomes.

In the next section, we develop the theoretical basis for our argument. We then present anecdotal evidence from an introductory IT course, followed by four research propositions. We conclude the article with a call for additional research.

THEORETICAL BACKGROUND

Multimedia Case Study Method

Many different definitions of multimedia exist; in this article, our definition of multimedia is adapted from Gaytan and Slate (2002/2003), who suggest that the term multimedia generally refers to the combination of several media of communication such as text, graphics, video, animation, music, and sound effects. As such, we define multimedia as the use of a computer to present and combine text, graphics, audio, and video with links and tools that allows the user to navigate, interact, create, and communicate (Gaytan & Slate, 2002/2003).

Earlier studies suggest that multimedia case studies are a major contributor to improvements in the quality of learning in technical classrooms (Bradley, Sankar, Clayton, Mbarika, & Raju, 2007b; Mbarika, Sankar, & Raju, 2003a; Mbarika, Sankar, Raju, & Raymond, 2001; Sankar & Raju, 2002). To support this conclusion, several studies have evaluated the use of multimedia instructional materials in IT undergraduate classrooms and found the students' responses to be favorable (Bradley et al., 2007b; Mbarika et al., 2003a; Sankar & Raju, 2002). Additionally,

those studies identified the following advantages and strengths of the multimedia case study approach:

- Brings theory and practice together in classrooms
- Develops higher-order cognitive skills in students
- Provides an informative and fun learning experience
- Encourages active teamwork among students
- Helps students develop personal attributes and traits
- Brings excitement of real-world problems into classrooms
- Offers insight into emerging technologies and concepts
- Makes vast amounts of information easily accessible, which enhances opportunities for analysis

In an introductory IT course, the multimedia case study method can be especially helpful in teaching the perceptual and practical aspects of technology (Nadkarni, 2003). Given the similarities between this approach and problem-based learning (PBL), this should come as no surprise (Bradley, Mbarika, Sankar, & Raju, 2005; Mbarika et al., 2003a; Mbarika, Sankar, & Raju, 2003b). PBL is a strategy that has been used extensively in medicine and law, and it has had a major impact on thinking and practice in medical and legal education (Barrows & Tamblyn, 1980; Hmelo, 1998; Mykytyn, Pearson, Paul, & Mykytyn, 2008). Although there are many variations of PBL, the paradigm involves teaching students to apply knowledge they have acquired within their disciplines to authentic, practical situations. Collaborative environments, typically computer-mediated, are used to help students explore potential solutions as they attempt to solve the problems posed in the cases. Such environments provide interactive feedback, enhancing the analysis from multiple perspectives (Koschmann, Myers, Feltovich, & Barrows, 1994).

Like PBL, the multimedia case study method requires learners to engage in the problem-solving process as they analyze and solve a number of authentic cases. The multimedia case study method also highlights the importance of learners viewing cases in an interconnected way. Instructional design theorists contend that, when cases are compared directly with one another, learners can analyze fine, yet critical, differences between situations. Enhancing the ability to discriminate cases enables students to understand the complexity of a given topic or issue. The enhanced ability to discriminate cases also aids students in constructing appropriate mental frameworks, making it more likely that they will transfer their learning from one context to another. Similar to the benefits of PBL (for more on PBL and its use to enhance MIS education, see Mykytyn et al., 2008), the benefits of the multimedia case study method are not merely in finding the solution to a problem but are also in learning to think through a problem, in considering alternatives through dialoguing with others, and in justifying decisions (Hmelo-Silver & Pfeffer, 2004; Hmelo, Holton, & Kolodner, 2000).

Lecture Method

Lectures have been found to be efficient for imparting conceptual knowledge about a new topic or field (Bonwell & Eison, 1991; Costin, 1972; Hingorani et al., 1998) as is the case in introductory IT courses. Instructors using the lecture method achieve this objective by focusing

on the relationships among facts and by examining major themes associated with them (Nadkarni, 2003; Whetten & Clark, 1996). The lecture method is also better suited for the more objective and analytical topics in introductory IT courses (Miglietti & Strange, 1998; Nadkarni, 2003).

Research in psychology has revealed that learning occurs in steps, each part building on prior learning (Henson, 1995; Smith, 1995). Thus, students in introductory IT courses may typically have limited opportunities to connect new content to old learning. The lecture method helps students in introductory courses develop a strong theoretical foundation to build on while acquiring more focused knowledge in higher-level courses (Nadkarni, 2003).

The typical lack of prior relevant knowledge in students attending introductory IT courses also hints toward the low learning maturity of students in such courses (Zoller, 1993, 2000). Students taking introductory IT courses typically have problems making connections between dispersed knowledge gained from different courses. The lecture method, by highlighting the relationships among various concepts in IT, can help students make connections (Nadkarni, 2003). The lecture method may also provide a clear structure to course learning (through well-organized lectures and clearly defined course goals), which students in introductory IT courses typically need (Nadkarni, 2003; Zoller, 1993, 2000).

Learning Outcomes

Identifying clear and measurable learning outcomes is important for a variety of reasons (Duke, 2002). A popular source for the development of learning outcomes is Bloom's Taxonomy (Bloom & Krathwohl, 1984). The taxonomy outlines six cognitive levels—recall, comprehension, application, analysis, synthesis, and evaluation—with recall being the lowest level of cognition and evaluation being the highest. It would be virtually impossible to attempt to tap into all of these levels of cognition with a single method of course content delivery. If learning outcomes are remotely related to the aforementioned cognitive levels, it only makes sense that instructors take a multipronged approach to achieve their learning objectives. In this study, we focus on five learning outcomes: two behavioral outcomes and three cognitive outcomes.

The two behavioral outcomes are *learning interest and motivation* and *values the opinions of others*. The behavioral outcome learning interest and motivation focuses on drawing and increasing students' interest during the instructional session and motivating them to continue learning after the instructional session. The behavioral outcome values the opinions of others focuses on students valuing the opinions and points of view of their peers and learning from them.

The cognitive outcomes are *evaluation*, *application*, and *comprehension*. Evaluation focuses on students' perception of their understanding of basic concepts, their ability to identify issues central to a given topic or concept, and their ability to integrate, evaluate, make decisions, and improve problem-solving skills. Application focuses on the students' perception of their ability to apply theory to real-world problems. Comprehension focuses on the students' perception of their understanding of basic IT concepts, their ability to identify and learn new IT concepts, their

ability to identify and learn management issues, and their ability to find connections between the technology and management issues. We selected these five learning outcomes because they are the desired learning outcomes for the introductory IT course at the university where the study took place. Furthermore, prior research highlights the importance of these learning outcomes in explaining the impact of both lecture and multimedia not only in improving students' ability to identify, integrate, evaluate, and interrelate technical concepts, but also in enhancing their critical thinking, decision-making, and problem-solving skills (Bradley et al., 2007b; Mbarika et al., 2003a). Also, these learning outcomes consistently appear at the top of lists of hiring criteria (Duke, 2002).

Our reasoning in favor of a combination of lecture method and multimedia case study method is based on the premise that these methods complement each other in the accomplishment of the above-mentioned learning outcomes (Miglietti & Strange, 1998). For example, learning typically occurs when people build on the content learned in the past (Henson, 1995; Smith, 1995). Thus, it is challenging for students to learn in introductory IT courses, as they have limited prior content on which to build (Nadkarni, 2003). This lack of foundational knowledge increases students' dependence on the instructor, making lectures an appropriate method to achieve learning outcomes. However, once students accumulate the required content, lectures may become redundant, and students may need multimedia case studies to connect new content to the old, thereby enhancing their learning (Bradley et al., 2007a). Additionally, lectures can help students build new knowledge structures, but have limited ability to help students apply that knowledge (Nadkarni, 2003). Multimedia case studies can be used to achieve that objective—students can utilize and enhance their new knowledge structures by using multimedia case studies to interpret new situations, to think and reason about various alternatives, and to make a justifiable decision.

Developing new knowledge structures may also require lectures as it necessitates more exclusive knowledge transfer between each student and the instructor (possibly evident by the requirements to maintain an appropriate student-teacher ratio). As prior studies have observed, during this stage, students may be "unwilling to take responsibility of learning and prefer significant guidance from the instructor (Nadkarni, 2003, p. 340)." Once initial knowledge structures are developed, students' dependence on the instructor can be reduced by exposing them to multimedia case study environment, wherein they are responsible for enhancing their learning. An additional benefit of this environment is its flexibility, and students can learn to apply their knowledge in either individual or collaborative settings, thereby gaining diverse perspectives on real-world decision making. Therefore, students enrolled in introductory IT courses require instructional methods that combine the theoretical emphasis and structure of lectures and the practical relevance and flexibility of multimedia case studies. Such a combination of instructional methods is more likely to lead to the accomplishment of the above-mentioned learning outcomes than using either the lecture or multimedia case study method alone. We do not mean to imply that the learning outcomes addressed in this article are sufficient in themselves to measure the level of student learning. Rather, they can be used to complement, and serve as proxies for, other operational learning outcomes—such as student satisfaction, perception of achievement, and retention—to comprehensively examine the extent and quality of students' learning experiences (Beder & Carrea, 1988; Graham, 1988; Nadkarni, 2003). In the subsequent section, we discuss the approach they took to combine both methods of instructions.

We also present anecdotal evidence that links the two methods of instruction to specific learning outcomes.

AUCNET USA MULTIMEDIA CASE STUDY

Being an instructor in an introductory IT class is a challenge for many reasons. First, all business majors at the school studied are required to take the class. This means that only a small percentage of students in the class are IS majors, and for most students in the class, it will be the only IS class they are required to take. As a result, the majority of the students taking the class tend to have little to no interest in the subject matter. Furthermore, the class size can easily swell to over 200 students per section. It is challenging to connect with the students and to develop an environment that facilitates class discussion with so many students. It is extremely rare for students to be willing to speak up in such classes. In an effort to change the dynamics of the class and get students more interested and engaged in the subject matter, we integrated a multimedia case study into a course that had traditionally been lecture oriented.

The case study chosen was *AUCNET USA Case Study: Telecommunications Networks for On-Line Auto Auction* (Sankar & Raju, 2000), developed by the Laboratory for Innovative Technology and Engineering Education (LITEE). The case study covers the concepts of Internet and satellite technology, e-commerce, proprietary systems, competition, new and emerging technologies, cost of technologies, marketing and customer relationship management issues, financial management, entrepreneurship, strategic planning, and cultural and global issues. The case study describes the e-commerce initiatives of a Japanese-based business-to-business (B2B) company, AUCNET Japan, which sells automobiles to dealers using a satellite network. The new CEO of the company, wishing to fulfill the vision of the former CEO, his recently deceased brother, creates a subsidiary in the United States, AUCNET USA. After a fast start in the United States, and what appears to be a promising future of stability, AUCNET USA is faced with decreasing dealer participation and the need to reexamine its business model and IT architecture. The decline in dealer participation leads to pressure from investors backing the parent company, AUCNET Japan. AUCNET USA must choose between competing network technologies—and the future of the company depends on the choice made. Because each day brings about the loss of more dealers, the company must make decisions quickly.

EXECUTION OF LECTURE AND MULTIMEDIA CASE STUDY METHODS

The decision was made to use the traditional lecture method first and the multimedia case study method second. This order was chosen based on the theorized learning strengths of the two instructional methods being used (i.e., lecture being structured and efficient for imparting knowledge about a new topic, and multimedia case studies bringing theory and practice together). In addition, because our purpose is to link each instructional method to specific learning outcomes and to understand how best to accomplish all of the learning outcomes for the introductory IT course, we concluded that the traditional lecture method would lay the foundation for the multimedia case study method.

We devoted a full week of class time to each method. There is a sole reason for the decision to devote only 1 week for each method of instruction. The reason is the design of the introductory

IT course at the university where the study took place. Due to the design of the course (which we had no control over), the instructors had 16 weeks to cover approximately 15 topics. As such, on average each topic usually gets 1 week of coverage. In light of the constraints created by the design of the course, we chose to follow the 1-week design described by (Bradley et al., 2007a). Thus to give equal time to each method, we devoted 1 week for the traditional lecture method followed by 1 week for the multimedia case study method. This approach of assessing students' perceptions over a 2-week period is similar to that taken by Litchfield, Oakland, and Anderson (2002) and Clouse and Evans (2003).

We used the traditional lecture method to introduce and present the concepts of telecommunications and networking. Two class sessions (i.e., 1 full week of approximately 3 hours of class time) were spent discussing the telecommunications and networking topics outlined in the textbook. In the third class session, the students were asked to assess the lecture method relative to the aspirant learning outcomes. The lecture assessment consisted of structured questions about the learning outcomes, measured on a five-point Likert scale (see Table 1) and on open-ended questions that asked the students to comment on the strengths and weaknesses of the lecture method. After the students submitted their assessment of the lecture, we provided them a link to the text of the multimedia case study via the course Web site. The students were given two nights to read over the case, and they were instructed to come to class ready to discuss the case. Due to the large size of the class (i.e., 204 students), it was not feasible to give the students CDs of the multimedia case study.

Table 1. Learning outcome items.

Learning Outcome	**Items**
Learning interest and motivation	LIM1: I discussed information technology and managerial topics outside of class. LIM2: I did additional reading on information technology topics. LIM3: I did additional reading on managerial topics. LIM4: I did some thinking for myself about information technology issues. LIM5: I did some thinking for myself about managerial issues.
Value the opinions of others	VO1: I learned to value my colleagues' points of view. VO2: I learned from colleagues during the session.
Evaluation	E1: I improved my ability to identify information technology issues. E2: I improved my ability to identify managerial issues. E3: I improved my ability to integrate information technology and managerial issues. E4: I improved my ability to critically evaluate information technology alternatives. E5: I improved my ability to critically evaluate managerial alternatives. E6: I became more confident in expressing my ideas. E7: My decision-making skills improved. E8: My problem-solving skills improved.
Application	A1: The method of instruction was successful at bringing real-life problems to the session. A2: The method of instruction was challenging. A3: The method of instruction was helpful in learning difficult concepts. A4: The method of instruction was helpful in transferring theory to practice.
Comprehension	C1: I improved my understanding of basic information technology concepts. C2: I learned new concepts in information technology. C3: I learned to identify central information technology issues.

Learning Outcome	Items
	C4: I learned to identify central managerial issues.
	C5: I found connections between information technology concepts and the method of instruction.
	C6: I found connections between managerial concepts and the method of instruction.
	C7: I identified various alternatives to the problem.

The next two class sessions were devoted to the multimedia case study, *AUCNET USA* (Raju & Sankar, 2004). The instructor used the CD to facilitate discussion of the issues presented in the case study. During the first session, the instructor went through the background information of the company and discussed some of the business and technology issues that plagued it. During the second session, the instructor used the multimedia elements of the case study to visually inform the students of the company's problems, the alternatives, and the outcome of AUCNET USA. An AUCNET USA executive led the students through the problems via video. Photos, animation, and videos provided background information about concepts in the case that related to e-commerce, telecommunications, and decision making. In the next class session, the students were asked to assess the multimedia case study method relative to aspirant learning outcomes. The assessment consisted of structured questions on a five-point Likert scale and open-ended questions that asked the students to comment on the strengths and weaknesses of the multimedia case study method. The students were not directly or indirectly asked to compare or contrast the lecture method with the multimedia case study method. In Table 2, we present the lesson plan for each session.

Table 2. Lesson plan.

Session 1: Lecture Method	Discuss telecommunications and networking topics from the textbook
Session 2: Lecture Method	Conclude discussion of telecommunications and networking topics from the textbook
Session 3:	Complete assessment of lecture method Assign reading of AUCNET USA case study
Session 4: Multimedia Case Study Method	Discuss telecommunications and networking topics from the perspective of the AUCNET USA case study
Session 5: Multimedia Case Study Method	Conclude discussion of telecommunications and networking topics from the perspective of the AUCNET USA case study
Session 6:	Complete assessment of multimedia case study method

ANECDOTAL EVIDENCE AND RESEARCH PROPOSITIONS

In this section, we present anecdotal evidence from the students' assessments of the lecture and multimedia case study methods. The instruments used to collect the anecdotal data regarding students' perceptions of the lecture and multimedia case study methods are in Appendix A and Appendix B, respectively. Although the class consisted of 204 students, we received useable responses from only 134 students. One author read all the student comments and coded the comments as pertaining to either the behavioral or cognitive classification of learning outcomes. The other two authors independently reviewed the coding for accuracy. Any perceived miscoding of a comment was discussed among us to ensure the most appropriate code was assigned. Based on the aforementioned anecdotal evidence, Figures 1–5 depict students' assessments of the lecture and multimedia case study methods. The items along the *x*-axis are related to the specific learning outcome assessed in each figure. The questions associated with these items were previously presented in Table 1. To facilitate easy identification of differences

between the methods of instructions relative to the learning outcomes, the *y*-axis only ranges from the lowest value reported to the highest value reported (on a five-point Likert scale) across all items.

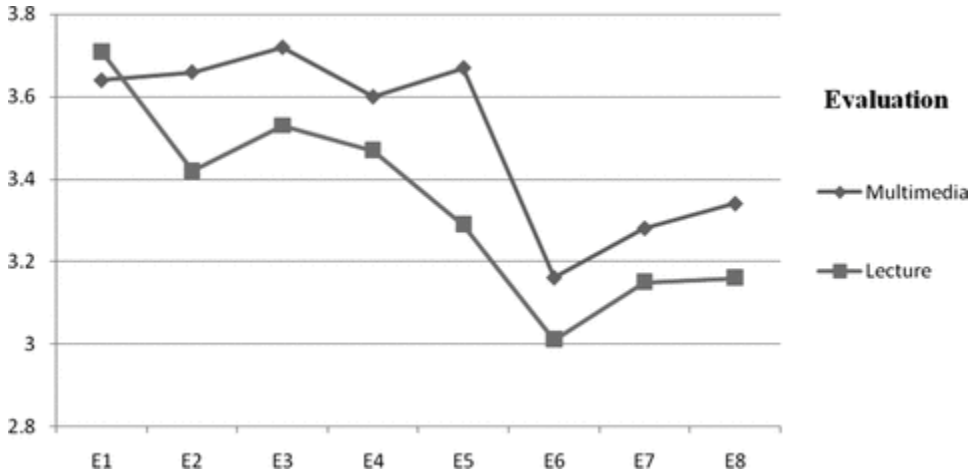

Figure 1. Evaluation.

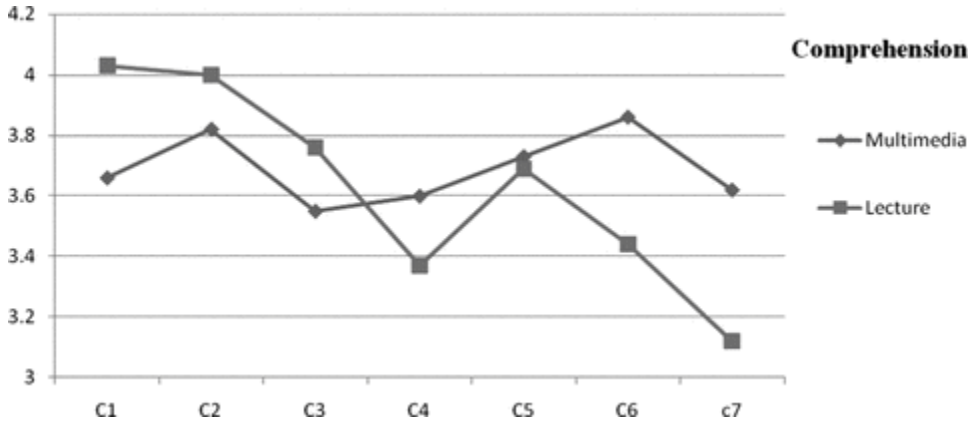

Figure 2. Comprehension.

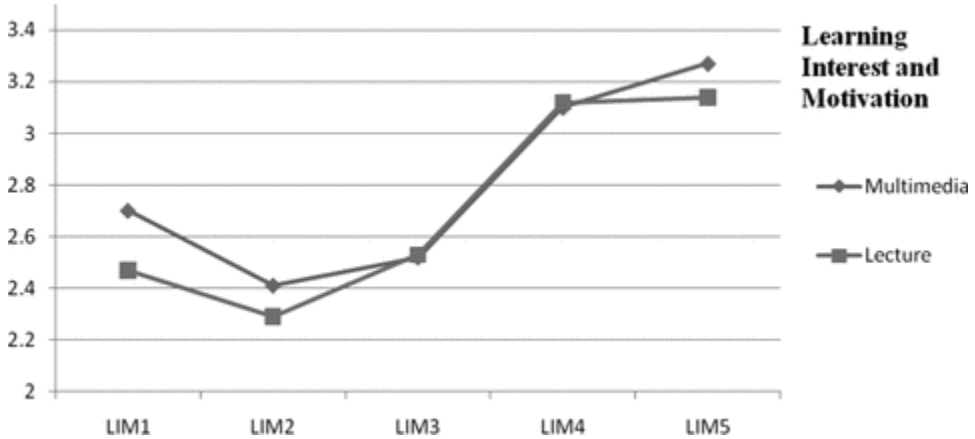

Figure 3. Learning interest and motivation.

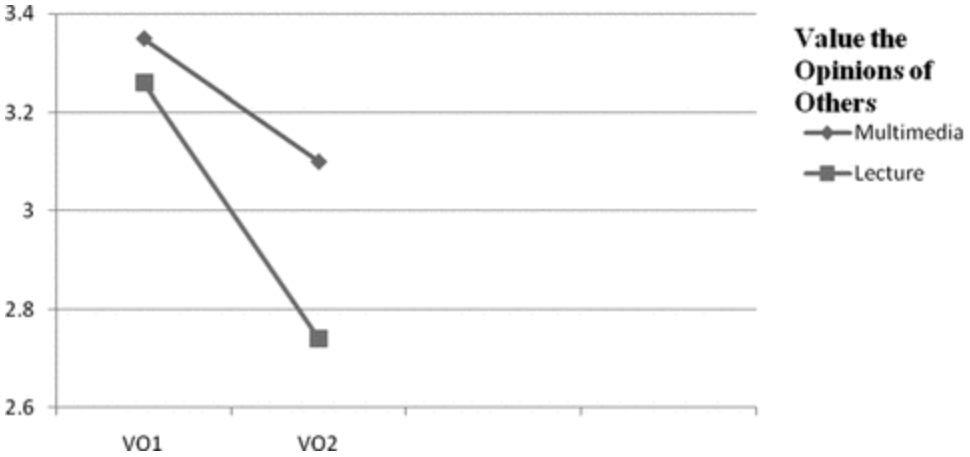

Figure 4. Values the opinions of others.

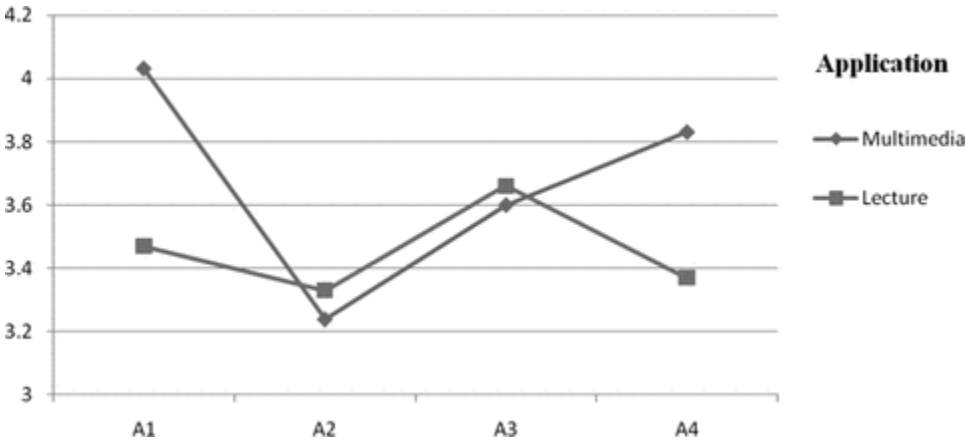

Figure 5. Application.

Lecture Method and Learning Outcomes

Based on the previously mentioned anecdotal data, Figures 1 and 2 suggest that the lecture method is better for cognitive learning outcomes that focus on basic understanding of IT concepts and terminology. Students' comments regarding the strengths and weaknesses of the lecture method relative to cognitive learning outcomes, as reported in Table 3, seem to support Figures 1 and 2. For instance, students reported that the lecture method helped them get a basic understanding of concepts and terminology and that it was good for providing detailed information about concepts. Conversely, students reported that the lecture method contributed to "information overload," was not conducive to application of the material, did not allow for interactive learning, was not interesting, was too technical and confusing, and made it difficult to identify important issues. Interestingly, students only reported weaknesses for the lecture method relative to behavioral learning outcomes (see Table 4), and all reported strengths of the lecture method are associated with lower-level cognitive learning outcomes (see Table 3). In light of students' comments and their assessments of the lecture method, we present the following research proposition:

Table 3. Summary of comments related to cognitive learning outcomes.

Lecture Strengths	Lecture Weaknesses	Multimedia Strengths	Multimedia Weakness
•Communicates the information so I could understand it •The teacher drew out a lot of examples that helped me to better understand what was being described •Use of everyday things as examples helped me understand the topics •The ability to explain concepts help me learn the material •Detailed information about the concepts helped me learn the material •Explanations helped me understand the material •Understandable dialogue even for such unfamiliar language as the IT systems network •Good at breaking down difficult concepts to help us understand them better •Going into detail helped us understand concepts easily •The examples were extremely important in understanding the concepts. They gave us the important information to understand the concepts •Terms and definitions helped me grasp the material •Explaining the information •Ability to understand terms	•Not good for applying information to everyday use •No way to apply the information •Does not incorporate much application of concepts •Lecture was too fast paced, doesn't allow students to learn at their own pace •Skipping around instead of staying in order of chapter outlined in book •Lots of information given in one lecture, doesn't allow students to learn at their own pace •Information overload •Didn't teach much application •Not good for visual learners •Too technical and confusing without the real-world examples •Information overload •A lot of unrelated information •No hands-on •Doesn't help me because I learn by doing •Too fast-paced •Doesn't provide enough hands-on application of what we are trying to learn •Doesn't include enough application topics. •Doesn't provide enough elaboration on confusing technical issues •I have trouble when the chapter outline in book isn't followed. •Couldn't easily identify the important stuff…too much information	•It really made me think about problem solving and what could have been done better •It correlated well with the concepts being covered and what I was learning in my principles of management class. •It had depth •Helped me realize how what we are learning fits into the real world •Very informative, gave me insight into a wide range of unfamiliar topics •It improved my decision-making ability •It was good at presenting a real life situation and showing how it affects others •The relational understanding of management and IT •Using the video clips versus just PowerPoint slides helped me understand how the company used IT and felt about their management decisions •Helped me understand IT concepts •It helped me in learning technology terms •It brought real life examples to what we were learning. •Learning IT information that went along with what was studied in class and notes. This case helped a lot. •It helped to show a real life situation to prove class material. •Easy to understand what they are talking about •Clearly displayed IT and management concepts •Very informative, a lot of information that I didn't know	*None Reported*

Table 4. Summary of comments related to behavioral learning outcomes.

Lecture Strengths	Lecture Weaknesses	Multimedia Strengths	Multimedia Weaknesses
None Reported	•Kind of cut and dry •Not interesting •Hard to get interested in technology topics •Not able to have open discussions •No interactive learning	•The multimedia helped to keep my attention •I enjoyed the video clips that were shown. It made the presentation a lot more interesting •It was very interesting •It was interesting and different from regular lecture •Change of pace from lectures; more involved than lectures, interesting even if you are not interested in MIS •Interesting and exciting •Gave a chance to do work outside of class	*None Reported*

Lecture Strengths	Lecture Weaknesses	Multimedia Strengths	Multimedia Weaknesses
		•Open class discussion promoted an environment that many students enjoyed being a part of it •I think this is one of the best presentations that I have seen at this university	

> ***Proposition 1:*** The lecture method is more likely to lead to lower-level cognitive learning outcomes (e.g., basic understanding of concepts and terminology), than the multimedia case study method.

Multimedia Case Study Method and Learning Outcomes

Based on the previously mentioned anecdotal data, Figures 3 and 4 suggest that the multimedia case study method is better for behavioral learning outcomes. In Figure 3, most of the items are greater for the multimedia case study method (except for the two items that are equal). In Figure 4, all items are higher for the multimedia case study method. Students' comments regarding the strengths and weaknesses of the multimedia case study method, as reported in Table 3, seem to support Figures 3 and 4. For instance, the reported strengths of the multimedia case study method pertained to behavioral learning outcomes such as learning interest and motivation and valuing the opinions of others. Students reported that the multimedia case study method was attention-capturing, exciting, provoked interest in MIS for non-MIS majors, prompted them to do some thinking about concepts outside of class, and promoted an environment in which they felt comfortable engaging in an open discussion.

Figures 1, 2, and 5 (all based on the previously mentioned anecdotal data) suggest that the multimedia case study method is better for cognitive learning outcomes that focus on the application of IT concepts and the comprehension and evaluation of managerial and/or technical issues indirectly related to those concepts. For instance, the reported strengths of the multimedia case study method centered on cognitive learning outcomes such as comprehension, application, and evaluation. Students reported that the multimedia case study method helped them make connections between IT and management concepts, recognize the relevance of the concepts to real-world situations, improve their problem-solving and decision-making skills, and improve their ability to identify alternatives. Interestingly, there were no reported weaknesses for the multimedia case study method for either behavioral or cognitive learning outcomes. In light of students' comments and their assessments of both the lecture and multimedia case study methods, we present the following research propositions:

> ***Proposition 2:*** The multimedia case study method is more likely to lead to higher-level cognitive learning outcomes, such as comprehension, application, and evaluation, than the lecture method.

> ***Proposition 3:*** The multimedia case study method is more likely to lead to behavioral learning outcomes, such as learning interest and motivation and valuing the opinions of others, than the lecture method.

The previously mentioned anecdotal data suggest students perceived the traditional lecture method as promoting the lower-level cognitive learning outcomes; whereas students perceived

the multimedia case study method as promoting the higher-level cognitive outcomes as well as the behavioral outcomes. As such, based on the anecdotal evidence, it appears students perceived neither method alone as valuable in achieving all of the learning outcomes of interest. By a process of induction, we propose that the combination of the two methods will enable the attainment of all of the learning outcomes of interest, and put forward the following proposition:

> ***Proposition 4:*** The combination of the lecture and multimedia case study methods is more likely to lead to a higher quality of learning than either method alone.

CONCLUSION AND RECOMMENDATIONS FOR FUTURE RESEARCH

In this conceptual article, we focused on a relatively unexplored issue in IT education, asking and answering the question of which instructional method is more effective in achieving the learning outcomes of students taking an introductory IT course at a large university. In doing so, we considered lecture and multimedia case studies as two instructional methods. We argued that either of these instructional methods alone would be less effective in improving students' quality of learning (as measured by the perceived achievement of course learning outcomes) than combining the two instructional methods. In addition to logical arguments based on extant literature, we presented anecdotal evidence that highlighted the potential complementary effects of the lecture and multimedia case study methods.

The anecdotal evidence we presented suggests the lecture method is better for achieving cognitive learning outcomes that focus on basic understanding of IT concepts and terminology, whereas the multimedia case study method is better for achieving behavioral learning outcomes and cognitive learning outcomes that focus on the application of IT concepts and the comprehension and evaluation of issues indirectly related to the topic of interest. In essence, the lecture method is more likely to lead the achievement of lower-order cognitive learning outcomes, whereas the multimedia case study method is more likely to lead the achievement of behavioral outcomes and higher-order cognitive learning outcomes. An interesting assessment and natural conclusion to be drawn from the anecdotal evidence is that the combination of both methods is likely to lead to the accomplishment of lower- and higher-order cognitive outcomes as well as behavioral outcomes. This finding seems to support the work of others.

Smith and Dillon (1999) note the importance of the instructor to lead students through the learning process, to keep them on track, and to supply support and motivation. Navarro and Shoemaker (2000) present learning performance as being positively correlated with learner-to-instructor and learner-to-learner interactions. Since the primary purpose of teaching is student learning (Larkin-Hein & Zollman, 2000), it is imperative that instructors guide student learning through the use of both the lecture method and the multimedia case study method. Doing so has the potential to create an environment where the quality of learning and students' expectation and enjoy can drastically increase in an introductory IT course (and perhaps by extension other core business courses).

The identified relationships between specific instructional methods and learning outcomes pose some interesting questions for future research. Are there order effects with regard to the lecture and multimedia case study methods that could be influencing students' perceptions of the

effectiveness of the instructional methods relative to achievement of certain learning outcomes? Researchers can attempt to answer the question by using one order of the methods in a section and reversing the order of the methods in another section. Another question worthy of investigation is as follows: to what degree is there a "wow" factor with the use of multimedia case studies? To attempt to answer the question researchers can employ multiple case studies of similar complexity (and possibly related to a different topics in the course) to see students' perceptions of the effectiveness of the multimedia case study method are consistent. We also encourage researchers to allocate more time to each instructional method and assess if and how students' perceptions differ over time periods. We specifically recommend trying each method for 2 weeks and 3 weeks. It may be better to attempt to assess the differences in the same semester with multiple sections. For example, one section could allocate 2 weeks to each method while another section allocates 3 weeks to each method. Care must and should be taken to ensure that topics are the same for each section. Researchers may find that there is an interaction effect between the order of the methods and the amount time allocated to the methods as it relates to achievement of certain learning outcomes. In addition to the directions for future research, it is important to develop research hypotheses from the propositions presented and to use a control group to compare and contrast findings.

The implications of the insights presented in this conceptual article and the implications of the findings of future empirical studies (guided by the previously mentioned research propositions and the above-mentioned research questions) can go a long way toward alleviating the prevalent disconnect between methods of instruction and intended learning outcomes. The value of following the directions for future research may not be limited to introductory IT courses, so it is recommended that researchers attempt to replicate the study in other cores business classes that tend to have large enrollments. Further research in these areas and in other core business courses could help educators develop more effective pedagogical and andragogical techniques, as well learn to identify the appropriate situations for employing each type. This process could aid in designing and maximizing the use of instructional methods to meet the needs of students with different abilities, skills, personality types, and learning preferences.

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APPENDIX A: LECTURE METHOD ASSESSMENT

Your completion of this rating scale will help us evaluate the lecture. There are no right or wrong answers, and your responses will in no way be used in determining your grade in the course. Please be honest in your responses. Using the scale below, indicate the extent of your agreement/disagreement with each of the following items by circling a to e.

a- - - - - - - b- - - - - - - -c- - - - - - - - -d- - - - - - - e

Strongly Disagree	**Disagree**	**Neither Agree nor Disagree**	**Agree**	**Strongly Agree**

1. The lecture was successful at bringing real-life problems to the session.	a- - -b- - -c- - -d- - -e
2. The lecture was challenging.	a- - -b- - -c- - -d- - -e
3. The lecture was helpful in learning difficult concepts.	a- - -b- - -c- - -d- - -e
4. The lecture was helpful in transferring theory to practice.	a- - -b- - -c- - -d- - -e
5. I improved my ability to identify information technology issues.	a- - -b- - -c- - -d- - -e
6. I improved my ability to identify managerial issues.	a- - -b- - -c- - -d- - -e
7. I improved my ability to integrate information technology and managerial issues.	a- - -b- - -c- - -d- - -e
8. I improved my ability to critically evaluate information technology alternatives.	a- - -b- - -c- - -d- - -e
9. I improved my ability to critically evaluate managerial alternatives.	a- - -b- - -c- - -d- - -e
10. I became more confident in expressing my ideas.	a- - -b- - -c- - -d- - -e
11. I learned to value my colleagues' points of view.	a- - -b- - -c- - -d- - -e
12. I improved my understanding of basic information technology concepts.	a- - -b- - -c- - -d- - -e
13. I learned new concepts in information technology.	a- - -b- - -c- - -d- - -e
14. I learned to identify central information technology issues.	a- - -b- - -c- - -d- - -e
15. I learned to identify central managerial issues.	a- - -b- - -c- - -d- - -e
16. I discussed information technology and managerial topics outside of class.	a- - -b- - -c- - -d- - -e
17. I did additional reading on information technology topics.	a- - -b- - -c- - -d- - -e
18. I did additional reading on managerial topics.	a- - -b- - -c- - -d- - -e
19. I did some thinking for myself about information technology issues.	a- - -b- - -c- - -d- - -e
20. I did some thinking for myself about managerial issues.	a- - -b- - -c- - -d- - -e
21. I learned from other colleagues during the session.	a- - -b- - -c- - -d- - -e
22. I found connection between information technology concepts and the lecture.	a- - -b- - -c- - -d- - -e
23. I found connection between managerial concepts and the lecture.	a- - -b- - -c- - -d- - -e
24. I identified various alternatives to the problem.	a- - -b- - -c- - -d- - -e
25. My decision-making skills improved.	a- - -b- - -c- - -d- - -e
26. My problem-solving skills improved.	a- - -b- - -c- - -d- - -e
27. What were the strengths of the lecture?	
28. What were the weaknesses of the lecture?	

APPENDIX B: CASE STUDY METHOD ASSESSMENT

Your completion of this rating scale will help us evaluate the AUCNET USA Case Study. There are no right or wrong answers, and your responses will in no way be used in determining your grade in the course. Please be honest in your responses. Using the scale below, indicate the extent of your agreement/disagreement with each of the following items by circling a to e.

a- Strongly Disagree	b- Disagree	-c- Neither Agree nor Disagree	-d- Agree	e Strongly Agree

1. The case study was successful at bringing real-life problems to the session.	a-	-b-	-c-	-d-	-e
2. The case study was challenging.	a-	-b-	-c-	-d-	-e
3. The case study was helpful in learning difficult concepts.	a-	-b-	-c-	-d-	-e
4. The case study was helpful in transferring theory to practice.	a-	-b-	-c-	-d-	-e
5. I improved my ability to identify information technology issues.	a-	-b-	-c-	-d-	-e
6. I improved my ability to identify managerial issues.	a-	-b-	-c-	-d-	-e
7. I improved my ability to integrate information technology and managerial issues.	a-	-b-	-c-	-d-	-e
8. I improved my ability to critically evaluate information technology alternatives.	a-	-b-	-c-	-d-	-e
9. I improved my ability to critically evaluate managerial alternatives.	a-	-b-	-c-	-d-	-e
10. I became more confident in expressing my ideas.	a-	-b-	-c-	-d-	-e
11. I learned to value my colleagues' points of view.	a-	-b-	-c-	-d-	-e
12. I improved my understanding of basic information technology concepts.	a-	-b-	-c-	-d-	-e
13. I learned new concepts in information technology.	a-	-b-	-c-	-d-	-e
14. I learned to identify central information technology issues.	a-	-b-	-c-	-d-	-e
15. I learned to identify central managerial issues.	a-	-b-	-c-	-d-	-e
16. I discussed information technology and managerial topics outside of class.	a-	-b-	-c-	-d-	-e
17. I did additional reading on information technology topics.	a-	-b-	-c-	-d-	-e
18. I did additional reading on managerial topics.	a-	-b-	-c-	-d-	-e
19. I did some thinking for myself about information technology issues.	a-	-b-	-c-	-d-	-e
20. I did some thinking for myself about managerial issues.	a-	-b-	-c-	-d-	-e
21. I learned from other colleagues during the session.	a-	-b-	-c-	-d-	-e
22. I found connection between information technology concepts and the case study.	a-	-b-	-c-	-d-	-e
23. I found connection between managerial concepts and the case study.	a-	-b-	-c-	-d-	-e
24. I identified various alternatives to the problem.	a-	-b-	-c-	-d-	-e
25. My decision-making skills improved.	a-	-b-	-c-	-d-	-e
26. My problem-solving skills improved.	a-	-b-	-c-	-d-	-e
27. What were the strengths of the AUCNET USA case study?					
28. What were the weaknesses of the AUCNET USA case study?					