Active Learning Strategies for Computer Information Systems Education in Online Courses

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ABSTRACT

Active learning strategies have been established as effective methods to increase student interaction and knowledge retention in the traditional classroom environment. Recently, growth has been seen in the popularity of online learning due to the independence and convenience associated with the medium. We chose to investigate methods for integrating active learning methods into Computer Information Systems (CIS) online classes, and identify methods that apply to the technical nature of CIS, and can be extended to other technical areas such as accounting and digital media. The goal of this paper is to create a model of disciplinary active learning best practices that can be used to increase effectiveness in online CIS (technical area) classrooms. Active learning strategies in traditional classrooms will be compared to similar strategies in online classrooms. Also, criteria will be established for measuring the success of active learning in this environment.

Introduction

This research investigates methods for integrating active learning strategies into Computer Information Systems (CIS) online classes. Methods are identified that are specifically well-suited for the technical focus of CIS as a discipline. These methods can be extended to other technical business disciplines such as accounting and digital media, although it should be noted that each discipline may attract students with distinct learning styles (Jones, Reichard, & Mokhtari, 2003).

Best practices in active learning for online CIS courses are identified, and methods for measurement of success of these methods are also discussed, based on a review of effective measurement research. Online learning and course delivery have grown substantially in the past five years, changing at an accelerated pace (Allen & Needham, 2007). A substantial amount of research has shown that there are no significant differences between the success of learning delivery in traditional and online classrooms (Twigg, 2003). The active learning strategies that may be applied in a traditional classroom environment may also be applied to the online classroom, as long as consideration is provided for the multiple learning styles of participants in both environments (Phillips, 2005).

Traditional Active Learning Methods

Current methods in higher education are evolving away from static lecture based classrooms to a learning environment where students actively engage in the learning process (Strage, 2008). In the future, the position of the classroom as the defacto center of learning may change; with online education becoming a larger percentage of the total student population, lecture based instruction is not always the best solution. In a study that surveyed college students, 32.7% of respondents stated that the ideal professor employs a wide variety of active learning strategies (Strage).

Active learning is typically defined as an instructional technique that requires that students be actively engaged in the learning process (Prince, 2004). Several strategies exist for creating an active learning classroom including: in class writing assignments, case studies, clickers, debates or discussions, individual or group projects, visual instruction and podcasting (Austin & Mescia, 2001). Cost, individual learning styles, instructor skill sets and technology support are critical to deciding which strategies to implement (Phillips, 2005).

One minute papers are an example of quick in class writing assignments that require active participation from the students (Stead, 2005). Giving students one minute to respond to a review questions dealing with the days ma-

terial shows instructors how well students grasped the material. A one minute paper asking students to list questions still existing actively engages the student, in addition to empowering the student to take a more active role in their education (Stead).

Case studies typically are written with a brief overview of a specific situation, set in a context for a problematic situation and list major decisions that need to be made (Kreber, 2001). There are several advantages to using case studies: role playing, emotional content capturing student attention, and cost effectiveness (Bonwell & Eison, 1991). Through role playing students can experience a wide variety of situations they may face in the future allowing them to put theory into practical application. Inherent in most case studies are emotional based right and wrong decisions needing resolution. The emotional content captures student attention far better than a static lecture (Kreber). Cost is also a factor as large groups can disperse the initial expense of purchasing case studies.

Debates and discussions between learners create higher level thinking as students are encouraged to defend their answers, use good oral skills and control emotions. Debates can be used to encourage students to face their biases or remove instructor biases, force students to do research, promote logical thinking and better oral presentation skills (Schroeder & Ebert).

Cooperative learning is creating project teams which simulate the business world, where employees from all aspects of the company form to complete a project. The active learning benefits are increased student social skills, decision making, conflict resolution and better oral and electronic communication (Bonwell & Eison, 1991). Students are forced to work together to establish time lines, leaders and responsibilities, cooperative goals and to establish social norms for the group.

Technical strategies for active learning include using clickers, podcasts and visual presentation methods to increase student participation (Austin & Mescia, 2001). Clickers are small hand held devices that allow students to respond to a multiple choice question anonymously. By allowing an anonymous answer students are more likely to feel free to voice their thoughts, answer without fear of criticism and allow an instructor to poll students without getting a group answer (Wood, 2004). Podcasts are recorded voice files which allow learners to play the recording on their personal computers, iPods or other mobile devices. Usages include chapter summaries, review of student work and reminders of upcoming important events (Gribbins, 2007). Video presentations include slide shows, overhead examples and video recording. Video recording is a good choice when reviewing student presentations, by recording the presentation students can evaluate themselves.

Active Learning Methods for Online Teaching

"Providing learners with a variety of active learning strategies will address their many learning needs based on their learning styles and placement in their learning process" (Phillips, 2005, p. 81). Online learning creates distinct challenges for both the learner and the instructor. Not all active learning strategies can be used. Instructors need to think about the three types of learning styles of online learners: visual, auditory and action oriented (Vincent & Ross, 2001). Instructors must be prepared to use active learning strategies to help each style of learner.

Visual learners in an online class have very specific needs. This type of learner does best with video presentations (Vincent & Ross, 2001). Pictures also present a better way for visual learners to grasp material (Vincent & Ross). Video recordings also give visual learners a style of learning best suited for them. To these types of learners, an action oriented and hands on style is not a good fit (Vincent & Ross). Learners will get frustrated with a lack of visual instruction and lose interest or become very impatient (Phillips, 2005). Video clips, taped lectures and even short movies are all effective when used within an online course (Austin & Mescia, 2001).

The auditory learner gains information and knowledge by listening to directions, hearing step by step instructions or even through music (Vincent & Ross, 2001). Podcasts used to provide directions to problems, keys to the material or review of work are all excellent aids to audio learners (Austin & Mescia, 2001). Podcasts also allow the online learner to take the instruction with them on their personal mobile computing devices such as an iPod or personal digital assistant (PDA).

Action oriented learners benefit from assignments that cause them to perform an action, to create something and see a tangible result from their efforts (Vincent & Ross, 2001). Discussions/debates, group projects, and quizzes are great tools for an online action-oriented student (Vincent & Ross). Keeping these students busy and engaged in the learning process is critical. Reading or listening to directions will cause these students to lose focus, become disinterested and frustrated with the online course (Dewar & Whittington, 2000).

Best Practices in Online Learning

Regardless of the medium in which they are presented, components of good active learning activities remain the same. These activities should contain the following components: a defined start and end, a focused objective, easy to read and complete directions, a means of feedback, and also an explanation of the technology being used in support of the exercise (Austin & Mescia, 2001).

Several active learning strategies can be used in the online classroom as successfully as they can be in the traditional classroom. Although the medium of delivery may be different, the strategies remain similar to traditional active learning methods (Austin & Mescia, 2001). The "no significant difference" phenomenon has encouraged comparative research studies to demonstrate that most technology-based courses produce learning outcomes that are equivalent to traditional courses (Twigg, 2003). Active learning techniques can be applied in online learning environments as follows:

- Discussions- the use of virtual chat sessions and bulletin boards provides online learners with an opportunity to carefully formulate thoughts before formally sharing them with classmates, facilitating higher-order thinking (Meyer, 2003).

- Assessments- exams and quizzes in online courses can be used to provide immediate feedback to the learner (Austin & Mescia, 2001).

- Projects- projects can be completed individually or in groups, simulating virtual teams much like those used in global enterprises (Anne, Gabriele, & Blake, 2004).

- Visual instruction- streaming videos and multimedia may be used to make an online learning experience more interactive, especially in situations where hands-on methods would have been preferred in a traditional environment (Dongsong, Zhao, Lina, & Jay F. Nunamaker, 2004).

- Podcasting- The use of audio files to deliver content to learners allows students to hear the instructors voice, to pick up on the subtle verbal cues that an instructor may provide, and to engage in a portable and interactive course segment (Stephen, 2005).

When creating an online course environment, it is important for the course developer to consider fundamental design practices, including: understanding the context and learning environment, developing strategies to support learning such as directions and sources of information, learner assessment, and designing with active learner participation in mind (Austin & Mescia, 2001). These design principles must be fit to the topic and content of the course, beginning with the basic instructional design and continuing with good teaching practices (Austin & Mescia). As the framework of the course begins to take shape, it is important to consider supplemental tools to reinforce difficult concepts and opportunities for learning reinforcement. Tools such as podcasts and videos can be used to facilitate comprehension and retention of these concepts (Stephen, 2005).

Active learning in an online environment must be planned and encouraged by the instructor to take place effectively (Salmon, 2002). With careful planning, learner engagement will develop through the course and metacognitive learning evidence will be provided by the participants. By encouraging and supporting learner reflection of concepts in the course, group learning tools such as threaded discussions and collaboration sessions will display this metacognitive learning evidence to the instructor (Salmon, 2004).

Measuring Success in the Online Environment

A number of metrics may be used to determine success in the online learning environment. Often, the measurement of success in online learning is dependent upon the unit of analysis (Preece, 2001). For example, message boards and chat discussions in online learning communities may be measured by measurements such as the number of participants, number of messages in a given time frame, number of messages related to the topic, and satisfaction of the learners (Preece). Many of these metrics are similar to those used in the traditional classroom, as noted by Neuhauser's (2002) side-by-side comparison of online and traditional course delivery. It is important to note that Neuhauser's study found no significant differences between learning preferences, styles, or grades between traditional and online courses being delivered simultaneously by the same instructor using the same instructional materials.

The technology acceptance model (TAM) states that users' attitudes toward technology are influenced by their belief that the technology is useful and easy to use, ultimately impacting their decision to adopt the technology (Saade & Bahli, 2005). Recent work by Gribbins (2007) used the TAM to demonstrate that learners perceive podcasting to be a useful tool for learning, even though learners show doubt about potential effectiveness of podcasting to improve their individual performance. Measurements to establish the effectiveness of podcasting and attitude toward podcasting were established via a survey based on the TAM. TAM has also been used to evaluate streaming video and video media effectiveness (Lee, Cheung, & Chen, 2005).

The measurement of success in the use of projects, both individual and group, in the online environment must use a linkage between course objectives and project assignment content (Picciano, 2002). By using content analysis techniques, identifying concepts and phrases that determine learner comprehension and mastery of subject matter, it is possible to evaluate success (Picciano). This approach considers that in Computer Information Systems, Information Technology, and Information Systems courses, projects are used that involve the design of complex systems. In such cases there may be more than one "right answer", and it is important to provide a measurement framework that can be consistent across all possible solutions.

Assessments may be used in the form of quizzes and exams to measure student learning and comprehension. Typically, quizzes and exams are facilitated using the online course management system and can provide immediate feedback to students upon completion (Austin & Mescia, 2001). Active learning success may be measured by using overall scores, just as in the traditional environment (Picciano, 2002).

Conclusion

Just as active learning strategies facilitate increased interaction in the traditional classroom, these strategies make the online classroom more engaging for learners (Phillips, 2005). Growth and interest in online learning has resulted in an expansion of the use of online courses in universities globally (Allen & Needham, 2007). A variety of best practices in online active learning have been discussed, with special application to the technical nature of CIS courses. Success measurement methods provided may be used to gauge success. These best practices may also be applied to the other technical disciplines within business education, but learning styles must be considered (Jones et al., 2003).

References

Allen, I. E., & Needham, M. A. (2007). *Online Nation: Five Years of Growth in Online Learning*. Needham, MA: Sloan Consortium.

Anne, P., Gabriele, P., & Blake, I. (2004). Virtual teams: a review of current literature and directions for future research. *SIGMIS Database, 35*(1), 6-36.

Austin, D., & Mescia, M. D. (2001). Strategies to Incorporate Active Learning into Online Teaching. *2001 International Conference on Technology and Education*.

Bonwell, C., & Eison, J. (1991). *Active Learning: Creating Excitement in the Classroom*. Washington, D.C.: The George Washington University, School of Education and Human Development.

Dewar, T., & Whittington, D. (2000). Online Learners and Their Learning Strategies. *Journal of Educational Computing Research, 23*(4), 385-403.

Dongsong, Z., Zhao, J. L., Lina, Z., & Jay F. Nunamaker, Jr. (2004). Can e-learning replace classroom learning? *Commun. ACM, 47*(5), 75-79.

Gribbins, M. (2007). *The Perceived Usefulness of Podcasting in Higher Education: A Survey of Students' Attitudes and Intention to Use*. Paper presented at the Second Midwest United States Association for Information Systems, Springfield, IL, May 18-19, 2007.

Jones, C., Reichard, C., & Mokhtari, K. (2003). Are Students' Learning Styles Discipline Specific? *Community College Journal of Research and Practice, 27*(5), 363-375.

Kreber, C. (2001). Learning Experientially Through Case Studies? A Conceptual Analysis. *Teaching in Higher Education, 6*(2), 217-228.

Lee, M. K., Cheung, C. M., & Chen, Z. (2005). Acceptance of Internet-Based Learning Medium: The Role of Extrinsic and Intrinsic Motivation. *Information & Management, 42*(8), 1095-1104.

Meyer, K. A. (2003). Face-to-Face Versus Threaded Discussions: The Role of Time and Higher-Order Thinking. *Journal of Asynchronous Learning Networks, 7*(3), 55-65.

Neuhauser, C. (2002). Learning Style and Effectiveness of Online and Face-to-Face Instruction. *The American Journal of Distance Education, 16*(2), 99-113.

Phillips, J. (2005). Strategies for Active Learning in Online Continuing Education. *The Journal of Continuing Education in Nursing, 36*(2), 77-83.

Picciano, A. G. (2002). Beyond Student Perceptions: Issues of Interaction, Presence, and Performance in an Online Course. *Journal of Asynchronous Learning Networks, 6*(1), 21-40.

Preece, J. (2001). Sociability and Usability in Online Communities: Determining and Measuring Success. *Behaviour & Information Technology, 20*(5), 347-356.

Prince, M. (2004). Does Active Learning Work? A Review of the Research. *Journal of Engineering Education*.

Saade, R., & Bahli, B. (2005). The Impact of Cognitive Absorption on Perceived Usefulness and Perceived Ease of Use in Online Learning: An Extension of the Technology Acceptance Model. *Information & Management, 42*(2), 317-327.

Salmon, G. (2002). *E-tivities: The Key to Active Online Learning*: Routeledge.

Salmon, G. (2004). *E-Moderating: The Key to Teaching and Learning Online*: Routeledge.

Schroeder, H., & Ebert, D. (1983). Debates as a Business and Society Teaching Technique. *Journal of Business Education, 58*, 266-269.

Stead, D. R. (2005). A Review of the One-Minute Paper. *Active Learning in Higher Education, 6*(2), 118-131.

Stephen, D. (2005). E-learning 2.0. *eLearn, 2005*(10), 1.

Strage, A. (2008). Traditional and Non-Traditional College Students' Descriptions of the "Ideal" Professor and the "Ideal" Course and Perceived Strengths and Limitations. *College Student Journal, 42*(1), 225-231.

Twigg, C. A. (2003). Improving Learning and Reducing Costs: New Models for Online Learning. *EDUCAUSE Review*(September/October 2003), 28-38.

Vincent, A., & Ross, D. (2001). Personalize Training: Determine Learning Styles, Personality Types and Multiple Intelligences Online. *The Learning Organization, 8*(1), 36-43.

Wood, W. (2004). Clickers: A Teaching Gimmick that Works. *Developmental Cell, 7*(6), 796-798.

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