Students Use of Laptops in Large Lecture Classes: Distraction, Partial Attention or Productive Use?

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Abstract: An increasing number of students are bringing personal laptops to their classes and are using laptops during lectures. This increasing use of personal mobile devices has been described as a shift from e-learning (electronic learning) to m-learning (mobile learning). However, a large debate on the appropriateness of the use of laptops in class has emerged. Many teachers describe that students use laptops for surfing the net, emailing, downloading software and using chat forums during class rather than paying attention to the lecture. This paper reports on the use of laptops in a large lecture class of 650+ students and describes a pilot project that introduced an innovative system that was designed to both focus the attention of students during the class and engage them with the course material outside of class. Educational implications and next steps will be discussed.

Introduction

Challenges in maintaining students' attention in large lecture classes is well documented in the literature and is an ongoing problem in universities (Biggs and Tang 2007; Bligh, 2000; Chickering & Gamson, 1987; Geske, 1992; Hartley & Davies, 1978; McKeachy, 1999; Bonwell & Eison, 1991). This problem is not likely to decrease as class sizes continue to increase. Many institutions have explored in-class laptop use as a way to motivate students in class to engage in task-based activities during the lecture and to focus the students' attention on the topic at hand. According to Brown, 250 institutions internationally had or have embarked on technology programs using laptops and notebook computers (Brown, 2009) and it is forecast that the number of universities using laptop initiatives will continue to grow.

According to the European commission, digital competencies play an increasing role in learning, with Information and Communication Technology (ICT) comprising an important facet of learning that should be considered in developing students' creativity and innovation (European Commission, 2008). In an age where technology use is increasing in the workplace and in personal usage it seems that effective ways to use technology in education should continue to be explored and channeled in pedagogically sound directions.

Early discussions on technology usage, prior to the prevalence of mobile technology initiatives, generally focused on content. This manifested in numerous ways including the development of content specific 'learning-objects' and/or on the effective (and non-effective) usage of learning management systems as a means to provide students with content on line (through course web sites). Provision of learning activities online (such as discussion forums to engage students with the topic outside of class time) and for provision of online feedback from both instructors and peers was often lacking. The T5 model, introduced at the University of Waterloo, proposed that teachers also consider tasks (to engage students with content), tutoring (feedback to tasks), teamwork (opportunities for collaborative learning), topics (content information provided via texts, learning objects or web sites) and tools (such as a variety of technology or non-technology options) when creating online learning environments (Salter et al. 2009).

More recently, with the emergence of wireless classrooms and mobile technologies, discussions on the appropriateness of students' use of mobile devices, particularly the use of laptops in class, have been explored. These mobile technologies can be considered as 'tools' in the Salter et al. (2009) model. An aspect sometimes lacking however, in the descriptions of how tools such as laptops are used in class, is greater consideration of how to successfully integrate tasks and feedback (along with the tool/laptop) to keep students focused on the content of the lesson.

An intense debate has grown (Lindroth & Berquist, in press) with arguments for and against the use of laptops and other mobile technologies in the class room (Fried, 2008; Young, 2006; McVay et al., 2005; Fisher, Keenan& Butler, 2004; Gardner, 2004; Kotz & Essien, 2002; Graham, 2001). Increasingly, in the wireless classrooms common today, many students bring laptops to class, ostensibly for note taking. However, instructors report challenges in keeping students on track, and many students report that rather than attending to the lecture, the temptation to 'surf the net' and/or use chat or instant messages to contact friends takes precedence during class over note taking (Young, 2006). According to Young, professors worry that as the wireless networks and laptops become ubiquitous, "students will direct about as much attention to the front of the room as airline passengers do to a flight attendant reviewing safety information" (p.27, Young, 2006). The term ubiquitous has been coined to describe the increasingly common campus configuration in which most, if not all students and faculty, have laptops and all buildings have wireless access. The proliferation in the use of portable laptops and other electronic devises is creating a change that can be described as a shift from e-learning (electronic learning) to m-learning (mobile learning) (Lee & Chan, 2005).

In our observations, students bring their laptop to lectures with the intention (or excuse) of taking notes, but that note-taking often proves impractical as tools have not evolved sufficiently to allow real-time note taking, especially with complex matters such as math or physics. The notion of 'continuous partial attention' (Stone, 2009) seems to aptly describe the behaviour of these increasingly mobile students. According to Stone, continuous partial attention differs from multi-tasking. When multi-tasking, people often do things that are automatic and require very little cognitive processing (such as talking on the phone while eating lunch), whereas continuous partial attention requires giving partial attention to a number of things at the same time. The in class habits of students who seem to be paying 'continual partial attention' to the lecture have been noted by the teachers participating in the current study in some informal research conducted in their large classes. Activities such installing software and maintaining remote systems were commonly reported by students and observed by teachers; these types of activities can be done with little or no attention, but require constant partial attention.

In a recent study, the majority of 36 award winning faculty surveyed in Hong Kong, Canada, and Australia reported that students almost always or often used their personal laptops in class (Hong Kong, 78%, Canada, 67%, Australia, 60%), (Salter, in press). Based on the findings of many studies reporting on how laptops interfere with learning in the classroom (Fried, 2008; Prescod & Dong, 2006; Newman & Smith, 2006; McVay et al., 2005), this high usage of laptops is a cause for concern. According to Lindroth (2007), however, "The question is not, as I see it, if one should ban laptops from lectures, or cure the student from inappropriate behavior but rather how one can foster a positive utilization of the laptops from an organizational point of view" (Lindroth, 2007). In most cases under criticism, the classroom design was not changed to shift from a traditional didactic approach of lecturing in the large lecture class to use the learning environment to provide an integrated use of the technology into the design of the lesson and the lecture (Lindroth & Berquist, 2010).

This paper describes an innovative in-class strategy that was implemented for a large lecture class of 650 students (this is the official number although often more attend the class). The project used technology in a way that was designed to encourage students to engage fully in the class by using laptops during the lesson in a directed way that directed their focus on the lecture.

Methodology

The course that was the focus of this project was entitled 'Informatics and Society', a large lecture course run at a research intensive European university. The professor teaching this course had observed that more and more students were bringing laptops to lectures, especially lectures with more than 100 attendees. Due to the open access policy at the university, often as many as 800 students/listeners attend the lecture, and in some cases even more. In the light of the discussion in the education literature on the pros and cons of using laptops in class, and the increasing number of students showing up for class with laptops, ways to give students a channel to participate in the lecture using the laptop during the class were explored. The goal was to encourage a shift in students' behaviour

from continuous partial attention, that included passively listening to the lecture while using the laptop for other purposes, to a focused approach that directed them to be attentive to the subject of the class by using the laptop to comment on/question/add to, the lecture material. A system was designed that acted as a 'black box' for students' note-taking during the class using a type of 'slide-casting'/ 'livecasting' approach that was comprised of two main components: the use of a 'livecast' system during the lecture and the use of a web page that updates itself to add a new text field for every slide that is shown during the presentation. While students viewed the slides shown during the class, they were able to submit notes that were subsequently attached to the slides shown.

'Slidecast' is a term that is used commonly to describe an audio podcast combined with a slide show. For the purposes of this course, the professor prepared the slides for the class in the usual way to produce an in-class slide presentation. During the lecture, the students brought their laptops to class and used a 'livecast' system. The system created for this course was comprised of two components. During the lecture, students used the livecast system; to use the system they brought a laptop to the lecture hall and connected to the internet during class. During the lecture, students loaded the web page; the webpage updated itself to add a new text field for every slide shown during the presentation. Students used these text fields to add their own notes, such as comments, questions, links and other ad-hoc material for each slide. The livecast system served as a sort of 'blackbox' during the lecture, 'swallowing' all the student notes without showing them to the participants at the time. Following the lecture, students were able to access the system and see all of the notes providing them with a rich resource along with the points on the slides that served as well as resources for their review and further comment. The goal was to harness their energy in class through the use of active notetaking during class that was related to the content of the slides and presenter's discussion, as well as provide a resource for review and consolidation following the class.

After the class, students accessed the system through the system created for this course, called the 'Slidecasting Studio'. In the studio, students could refer to the slides from the lecture and also view all notes posted by participants during the lecture. Additionally, notes and material from the teacher were also posted during the lecture by a script running on the presenter's computer. Students were able to continue to post contributions in the studio following class, extending and enhancing the content accumulating there and continuing the learning after the class time.

Over time, a number of didactical concepts were developed that were made possible by the infrastructure provided through slidecasting 2.0. These adaptations included ways to award students bonus points for good postings, to allow for discourse areas, and to allow for additional student activities. The first addition was the feature of honouring good postings by students. Good posting were things such as interesting addenda, intelligent questions, good or current links that would provide additional information on the topic and so on. Using an accumulative points system, students were awarded points for good postings, thus rewarding students for good contributions to the system. An existing tumblelog system with a simple tagging system (soup.io) was used as a portfolio substitute so that students could reference their slidecasting posts for the teacher to see and evaluate. In order to encourage work throughout the course and avoid having the bulk activity at the end of the semester, submissions to the students' portfolios were restricted to a weekly limit of weekly points worth of work.

Secondly, 'discourse areas' were added to selected slides in the Slidecasting Studio so that the teacher was able to post interesting questions for discussion among the students. Students' contributions to the discourse areas could be turned in for evaluation via their portfolio, if the students felt that their comments were interesting and added value to the discussion,.

Thirdly, 'activities' were posted to accompany specific slides that extended the exploration of the content beyond the Slidecasting Studio. An 'activity' provided the students with a 'task' to complete such as finding a good 'real world' example that related to something postulated in the lecture and further document their example according to some guidelines. Students' worked on such activities autonomously on their own initiative and posted their 'deliverables' (completed work) into their portfolio for subsequent evaluation.

Finally, pre-class activities were posted in the form of excerpts of the future lecture (eg. five or so slides) that were posted a couple of days ahead of the lecture along with questions for the students to discuss. Students were allowed to transfer one particularly good posting from each of these discussions into their portfolio. In this way students were able to engage with the content ahead of the lecture and through this method, the teacher became aware of their previous knowledge, misconceptions, prejudices and latent conflicts, and was able to correct misconceptions during in the lecture.

Results

The project was evaluated by observing the students' engagement in class during the semester, monitoring the activity online in terms of number of notes posted and follow up questions posed and through feedback in the formal course evaluations. The active use of the system demonstrated continued enthusiastic use of the system that was sustained during the semester. Students consistently provided positive feedback about the system; their suggestions regarding useful ways to organize the content were used to continue to develop the system.

A quite interesting distribution of grades was noted in this course that differs from the normal bell shaped curve of grades that appears in most courses of this size. The "bathtub" curve of grade distribution indicated that a lot of students excelled, achieving an A grade, fewer students achieved a B, very few students had a C, a larger number received a D and even more failed. A speculative interpretation of this pattern is that perhaps there is a successful separation of those students who were interested and willing to work, (resulting in more students receiving an A than the normal curve) from those who tried to play the system and merely "pass" whatever requirement was asked of them. This finding is of course tentative as a comparison of grades of specific students with their actual use of the system was not performed, but additional evaluation will be conducted in the coming semester.

Students were able to select activities that they chose to engage more deeply with, as shown by their additions to, and comments on, selected lecture material and by their subsequent incorporating of their expanded items to their portfolio. Compared to the traditional "assignment + deadline" approach, students worked at their own pace throughout the course. Different strategies were observed in the ways that students chose activities to work on. From our initial observations, it seems that students chose activities to work on according to their strength and interests; this hypothesis will be explored in the next offering of the course. Based on our early positive findings, we are continuing to improve the current system and will continue to evaluate the subsequent iterations of the system.

Educational Implications and Discussion

Technical support was required to develop the system used in this project and the teacher involved was interested in trying new technology to engage students. A detailed description of how the students and teachers engaged with this project follow.

Students Use of the System

Students interacted with the system through a number of mechanisms that allowed them to both interact with the system and with each other in the studio. A simple, single-level reply function enabled them to have basic discussions in the Slidecasting Studio. They were able to award 'star-ratings' for single postings to signal ones they might wish to refer to for further reference or to highlight what they thought was a good posting. An overview page listed potential points of interest for each student, such as active threads of postings where s/he contributed to slides, or noted 'active' slides that had attracted an exceptional number of recently posted notes. Finally, a search function allowed students to search the content of the slides and all the notes for keywords and phrases.

The system was designed to incorporate these features so that it functioned as what is typically called a 'web 2.0 system', as a form of social software for dialogue and networking about the course. In so doing, the students' comments on the lecture became a local 'cloud' of sorts within the social networking tool, thus turning the burden of the huge number of students into an asset to help them in their understanding and learning through creating their own resource.

Teacher Use of the System

To use slidecasting 2.0 in the course, the teacher made notes available to the system in a special format. Through the software installed on the presentation computer, the teacher was able to post notes and other material into the livecast during the lecture. Following the lecture, the teacher was able participate in the discussion about each slide, correct misconceptions, answer questions and honour good statements by students. In this sense, the system opened a new channel for discourse about the content of a lecture that is structured by the slides of the presentation. In our

experience, this served to structure the communication in a way that made it more appealing and also manageable. Even if the number of postings was large overall, they were distributed among the many slides of the lecture, therefore, each discussion stayed comfortably small. Instructor time to review and comment on postings was manageable and not increased from a normal expected workload during a course.

Conclusion

The paper describes a pilot project in a large lecture class that incorporated an innovative approach to the use of laptops in class. The system created engaged students as active learners both in class and outside of formal class time. The students took ownership of their learning strategies by choosing topic areas they wished to explore more deeply following class time. This was an exploratory project and more formal evaluation will be done in the next iteration of the course. Initial findings show this as a promising way to engage students in large lecture classes through their productive use of personal laptops in class.

References

Biggs, J., & Tang, C. (2007). *Teaching for quality learning at university*. Maidenhead: Open University Press.

Bligh, D. (2000). *What's the use of lectures?* San Francisco: Jossey-Bass.

Bonwell, C. C., & Eison, J. A. (1991). *Active Learning: Creating Excitement in the Classroom*. Washington, DC: ASHE-ERIC.

Brown, R. (July 2009). *Colleges & Universities with Laptop or Notebook Computer Initiatives*, Westminster College, Retrieved from http://www.wcmo.edu/wc_users/homepages/staff/brownr/NotebookList_files/sheet001.html

Chickering, A.W., & Gamson, Z. (1987). Seven principles for good practice in undergraduate education. *AAHE Bulletin*, 39, 3-7.

European Commission. (2008). *The use of ICT to support innovation and lifelong learning for all – A report on progress*. Commission Staff Working Document, Brussels: European Commission. Retrieved from http://ec.europa.eu/education/lifelong-learning-programme/doc/sec2629.pdf

Fisher, L., Butler, M., & Keenan, P. (2004). Student experience of laptop use in undergraduate business education: a longitudinal study of mobile ICT'S in action, *International Academy for Informatics Education Research Conference*, 10-12 December 2004, Washington, DC, USA.

Fried, C.B. (2008). In-class laptop use and its effects on student learning, *Computers and Education*, 50, 906-914.

Gardner, B. (2004). Bringing laptops to class – the front lines of curricular computing. *Proceedings of The 32nd Annual ACM SIGUCCS Conference*, October 10-13 2004, New York, USA.

Geske, J. (1992). Overcoming the drawbacks of the large lecture class. *College teaching*, 40(4), 151-154.

Graham, S. (2001). Mobilizing a graduate school. *Proceedings of the 29th Annual ACM SIGUCCS Conference*, October 17-20 2001, Portland, USA.

Hartley, J., & Davies, I. (1978) Note taking: a critical review, *Programmed Learning and Educational Technology*, 15, 207–224.

Kotz, D., & Essien, K. (2002). Analysis of a campus-wide wireless network. *Proceedings of the Annual International Conference on Mobile Computing and Networking*, September 23-28 2002, Atlanta, USA.

Lee, M.J.W. & Chan, A. (2005). Exploring the potential of podcasting to deliver mobile ubiquitous learning in higher education. *Journal of Computing in Higher Education*, 18 (1), 94-115.

Lindroth, T. (2007). The laptop as alibi. *Proceedings of the 30th Information Systems Research Seminar Scandinavia IRIS 2007*, 11-14 August 2007, Tampere, Finland.

Lindroth, T., & Bergquist, M. (2010). Laptopers in an educational practice: Promoting the personal learning situation. *Computers & Education*, 54(2), 311-320, Retrieved from
http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VCJ-4XJP5SP-1&_user=28301&_rdoc=1&_fmt=&_orig=search&_sort=d&_docanchor=&view=c&_searchStrId=1126798900&_rerunOrigin=google&_acct=C000003298&_version=1&_urlVersion=0&_userid=28301&md5=bfb52b046dcdd48e3606d9fd186220f2

McKeachy, W. J. (1999). *Teaching Tips*. (10th ed.) Boston: Houghton-Mifflin.

McVay, G.J., Snyder, K.D. & Graetz, K.A. (2005). Evolution of a laptop university: a case study. *British Journal of Educational Technology*, 36(3), 513-524.

Newman, W., & Smite, E.L. (2006) Disruption of meetings by laptop use: is there a 10-second solution? *Proceedings of CHI 2006 ACM*, 24-27 April 2006 (pp. 1145-1150), Montreal, Canada.

Prescod, F., & Dong, L. (2006). Learning style trends and laptop use patterns: Implication for students in an IT business school. *Proceedings of ISECON 2006*, v23, Dallas [§3543 (refereed)]

Salter, D., Pang, M.Y.C., & Sharma, P. (2009). Active tasks to change the use of class time within an outcomes based approach to curriculum design, *Journal of University Teaching & Learning Practice*, 6(1), Article 4. Retrieved from http://ro.uow.edu.au/jutlp/vol6/iss1/4

Salter, Diane (in press). Approaches to teaching and technology use among international award winning university teachers.

Stone, L. (2009). Continuous partial attention – not the same as multi-tasking, *Business Week*, Retrieved from http://www.businessweek.com/business_at_work/time_management/archives/2008/07/continuous_part.html

Young, J.R. (2006). The fight for classroom attention: professor vs. laptop, *The Chronicle of Higher Education*, 52(39), 27-29.