

Literature Review: The Effects and Uses of Mobile Learning Devices in Classrooms

Curtis White

Lamar University; DLL Program

Student Number L20408847

The Effects and Uses of Mobile Learning Devices in Classrooms

In 1973, Dr. Martin Cooper made the first mobile phone call in the United States of America.

Ten years later, Motorola commercialized the very first mobile phones. Almost at the same time, the first foldable, portable computers were being developed and sold. Again, ten years later, in 1993, European cell phone designers integrated texting into phones. In yet another ten years, the addition of cameras and internet capability made the first smart phones in 2002. In 2010 alone, an estimated 200 million laptops and over 1 billion mobile phones were manufactured and sold. The advent and ubiquity of these new technologies has influenced the nature and availability of information, communication, and interaction in nearly every sphere of Western culture.

Literature Review

The impact of these mobile, personal, and highly versatile technologies on education is still evolving. All over the world, educators are innovating new ways to use Information Communication Technologies (Grant, et al., 2015; Isaacs, 2012; Lugo, & Schurmann, 2012) that were unimaginable twenty years ago. From initiatives leveraging texting for education in remotest Africa (Isaacs, 2012) to 1:1 iPad initiatives in districts across America, educators and policy makers are all daring to make these new tools work to improve the efficiency, adaptability, depth, and reach of our educational efforts (Johnson, Adams, Estrada, & Freeman, 2015).

Out of these efforts, we see a growth of blended educational practices (or Blended Learning, BL): those that utilize online, asynchronous and personalized access to information and educational tools through Mobile Learning Devices (MLD's) both inside and outside of traditional brick-and-mortar learning environments. At times, these are facilitated through programs that furnish students with the devices to be used (such as in 1:1 laptop initiatives).

Other times, institutions develop an environment that welcomes students to “Bring Your Own Device” (BYOD) to the classroom. Regardless of the distribution or type of MLD’s in the classroom, they can impact every aspect of education in different ways. Consequently, there is a growing body of literature to explore the breadth and depth of these changes. Some researchers have worked to develop frameworks for understanding how BYOD and BL adoption. Others focus on the effectiveness of BYOD and BL on student learning and engagement. Lastly, there are useful accounts of the successes and challenges of BYOD and BL integration attempts into various content areas.

Frameworks

As the power and availability of MLD’s has increased in classrooms, many different models for understanding how to integrate and plan for MLD inclusion into the classroom have been developed. One framework is the SAMR model (Puentedura, 2013). It sees the inclusion of new technologies in stages, where instructors may move through Substitution, Augmentation, Modification, and Redefinition.

Another model to understand the ways MLD’s can be used is through the DSAP framework (Wasko, 2016). Instead of considering the level of change involved in MLD integration, this framework considers the different facets of the educational process that MLD’s can be integrated into, especially in BL environments: content Delivery; Student practice with dynamic feedback; Assessment; and Productivity tools.

A thorough exploration of the different categories of use BYOD has in the classroom is provided by Song and Kong (2017). Their report suggests seven different categories of use (resource access, communication, resource collection, resource submission, knowledge construction, resource sharing and representation) along with different categories of learning

activities (e.g. reflective or explorative). By categorizing and sorting the different uses of MLD's in the classroom, they create a detailed matrix of learning and teaching activities uniquely afforded by BYOD environments.

These frameworks, and others (Brown, 2016; Cochrane, Antonczak, Keegan, & Narayan, 2014; Wong, Tatnall & Burgess, 2014) help categorize and clarify the different ways we have integrated (or might integrate) MLD's into our educational environments. But they do not necessarily address the reason why we would want to use them: increased student learning. To learn more about this, we turn to different studies.

BYOD and BL Effectiveness

There are two aspects of BYOD effectiveness that are generally mentioned in current literature: student engagement and student learning. There is a growing consensus in the literature in these areas. When new learning tools (like MLD's) are incorporated into the learning environments, students respond positively and indicate that they find these tools useful (Chen & Chiou, 2014; Wu, Tennyson, & Hsia, 2009, George, Dreibelbis, & Aumiller, 2013; Roberts, 2013; Imazeki, 2014; Song, 2014; Eachempati, Kumar, & Sumanth, 2016; Pereira, et al., 2007; Garofalakis, Lagiou, & Plessas, 2013; Godzicki, Godzicki, Krofel, & Michaels, 2013; Zhou, Simpson, & Pinette 2012). Additionally, studies have shown that students also improve their understanding of a variety of content areas via increased evaluation scores (Chen, & Chiou, 2014; Pereira et al., 2007; Stockwell, Stockwell, Cennamo & Jiang, 2015). While there are trends for certain modalities of BL or BYOD that have been shown to be effective, actually validating increased student achievement is still an active area of research.

Several warnings should be mentioned here. Incorporation of new teaching methods or devices does not perforce translate to greater learning (see, e.g., Andrews, Leonard, Colgrove, &

Kalinowski, 2011). BL, BYOD, or any other innovative learning environment must be appropriately designed and implemented in order to be effective (Pierce, 2015). Teachers, too, should understand the pitfalls of and motivating philosophies behind new techniques to maximize their effect (O'Bannon, & Thomas, 2014). Parents are also important stakeholders whose influence has a notable effect in MLD inclusion (Kiger & Herro, 2015). In some cases, the addition of MLD's may be detrimental to accurate student assessment (Dawson, 2016) or even student health (Merga, 2016). Increased engagement alone may not be enough reason to justify the adoption of MLD's in the classroom. Finally, a lack of vision for MLD adoption and integration may cause long-term failure of MLD initiatives (Chambers, 2014).

After looking at the bigger picture of whether or not BYOD or BL strategies are effective, educators still need to know what techniques, tools, and strategies have actually been effective. Several articles open the doors into classrooms to help us understand how MLD's can be used in the classroom.

BYOD Classroom Strategies

MLD's in the classroom have been used in a variety of ways (again, see Song & Kong, 2017 for a review of the MLD modalities). Roberts (2013) explores how to increase collaborative discussions by using collaborative online documents. Replacing a whiteboard (or chalkboard) with a cloud-based document that can be edited in parallel by many students at once can be an effective way to enrich classroom interactions. In this way, Roberts and others (Godzicki, et al., 2013; Zhou, Simpson, & Pinette 2012) show how MLD's can change the way students create and share their understanding.

George, Dreibelbis, and Aumiller (2013) explore the use of real-time survey tools and video libraries to enhance classroom dynamics in Medical School. By pausing a lecture with

well-designed videos and thought-provoking questions, student engagement can be increased. This allows a new way to collaborate between students and allow a form of communication that would be difficult or impossible in larger classroom settings. Others (Imazeki, 2014; Garofalakis, Lagiou, & Plessas, 2013) apply similar techniques successfully in teaching other topics like economics or science.

The previous examples illustrate lightly integrated MLD's into a BYOD environment without becoming fully "blended". Others, (Godzicki, et al., 2013; Stockwell, et al., 2015; Song, 2014) describe how to integrate online libraries, content creation tools, online discussion boards and classroom activities into effective learning environments.

As shown, BYOD strategies have been applied to a wide variety of subjects, and in a broad manner of application. A simple comparison of the application of MLD's in the classroom will illustrate the point: Song (2014) applies these methods to a primary science classroom while Roberts (2013) addresses undergraduate Social Studies classes.

Limitations and Future Research Needs

After review of the literature above, it seems that we can have cautious optimism about the use of MLD's in the classroom. Student engagement can be improved. Student understanding and performance can be improved, at least when the design is appropriate and the implementation successful. There are, however, still gaps to be filled in.

While not suggesting so directly, Merga (2016) points to a potential danger. It seems that the typical response in adopting new innovations is: "if some is good, more is better". But there may be times or subjects or our students may not be bettered by the integration of BYOD, or BL strategies. Knowing when these strategies fail (or are at least worse than other techniques) would be valuable for educators to know.

A second aspect that will serve as the motivation for this report is mentioned explicitly by Brown (2016). His analysis of the current research includes a critical evaluation of the strengths and weaknesses in literature to date. Specifically, there has been little investigation into the nature of the effect of MLD's on the ones using the tools. It is usually assumed that the students or teachers use tools that are themselves transparent and unaffacting on the processes taking place. But, this assumption may not be true. What are the ways that students and teachers are affected by using MLD's in their classrooms? How are the discussions that take place altered by the presence and use of MLD's? These questions are both interesting and important to answer as educators continue to explore new methods of incorporating MLD's into a variety of classroom practices.

References

- Andrews, T. M., Leonard, M. J., Colgrove, C. A., & Kalinowski, S. T. (2011). Active Learning Not Associated with Student Learning in a Random Sample of College Biology Courses. *CBE Life Sciences Education, 10*(4), 394-405. doi: 10.1187/cbe.11-07-0061
- Brown, Michael Geoffrey. (2016). Blended instructional practice: A review of the empirical literature on instructors' adoption and use of online tools in face-to-face teaching. *Internet and Higher Education, 31*, 1-10.
- Chambers, Bradley. (2014). L.A. cancels iPads-in-the-schools program: a failure of vision, not technology. Retrieved 5/3/2016, 2016, from <http://www.macworld.com/article/2599988/lausd-ipad-cancellation-is-a-failure-of-vision-not-technology.html>
- Chen, B. H., & Chiou, H. (2014). Learning style, sense of community and learning effectiveness in hybrid learning environment. *Interactive Learning Environments, 22*(4), 485-496. doi:10.1080/10494820.2012.680971
- Cochrane, Thomas, Antonczak, Laurent, Keegan, Helen, & Narayan, Vickel. (2014). Riding the wave of BYOD: developing a framework for creative pedagogies. *Research in Learning Technology, 22*, 1-14. doi: 10.3402/rlt.v22.24637
- Dawson, P. (2016), Five ways to hack and cheat with bring-your-own-device electronic examinations. *British Journal of Educational Technology, 47*(4), 592–600. doi:10.1111/bjet.12246
- Eachempati, P., Kumar, K. K., & Sumanth, K. N. (2016). Blended learning for reinforcing dental pharmacology in the clinical years: A qualitative analysis. *Indian Journal of Pharmacology, 48*S25-S28. doi:10.4103/0253-7613.193315

- Garofalakis, John D., Lagiou, Eirini V., & Plessas, Athanasios P. (2013). Use of Web 2.0 Tools for Teaching Physics in Secondary Education. *International Journal of Information and Education Technology*, 3(1), 6-9. doi: 10.7763/IJiet.2013.V3.224
- George, Daniel R., Dreibelbis, Tomi D., & Aumiller, Betsy. (2013). Google Docs and SurveyMonkey™: Lecture-based active learning tools. *Medical Education*, 47(5), 518-518. doi: 10.1111/medu.12172
- Grant, Michael, Tamim, Suha, Brown, Dorian, Sweeney, Joseph, Ferguson, Fatima, & Jones, Lakavious. (2015). Teaching and Learning with Mobile Computing Devices: Case Study in K-12 Classrooms. *TechTrends: Linking Research & Practice to Improve Learning*, 59(4), 32-45. doi: 10.1007/s11528-015-0869-3
- Godzicki, L., Godzicki, C., Krofel, M., & Michaels, R. (2013). *Increasing motivation and engagement in elementary and middle school students through technology-supported learning environments*. (Master's thesis) Available from ERIC.
- Imazeki, Jennifer. (2014). Bring-Your-Own-Device: Turning Cell Phones Into Forces for Good. *The Journal of Economic Education*, 45(3), 240-250.
- Isaacs, Shafika. (2012). *Turning on Mobile Learning in Africa and the Middle East. Illustrative Initiatives and Policy Implications*. Paris, France: United Nations Educational, Scientific and Cultural Organization.
- Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2015). NMC Horizon Report: 2015 K-12 Edition. Austin, Texas: The New Media Consortium.
- Kiger, Derick, & Herro, Dani. (2015). Bring Your Own Device: Parental Guidance (PG) Suggested. *TechTrends: Linking Research and Practice to Improve Learning*, 59(5), 51-61.

- Lugo, M. T. & Schurmann, S. (2012). *Turning on Mobile Learning in Latin America. Illustrative Initiatives and Policy Implications*. Paris, France: United Nations Educational, Scientific and Cultural Organization.
- Merga, Margaret K. (2016). 'Bring Your Own Device': Considering potential risks to student health. *Health Education Journal*, 75(4), 464-473. doi: 10.1177/0017896915599563
- Pereira, J. A., Pleguezuelos, E., Merí, A., Molina-Ros, A., Molina-Tomás, M. C., & Masdeu, C. (2007). Effectiveness of using blended learning strategies for teaching and learning human anatomy. *Medical Education*, 41(2), 189-195.
- Pierce, Dennis. (2015). 6 Solutions to BYOD Challenges. *T H E Journal*, 42(6), 24-25.
- Roberts, Scott L. (2013). The "Chalk Talk" 2.0: Using Google Docs to Improve the Silent Discussion in Social Studies. *Social Studies*, 104(3), 130-136. doi: 10.1080/00377996.2012.703972
- Song, Yanjie. (2014). "Bring Your Own Device (BYOD)" for seamless science inquiry in a primary school. *Computers & Education*, 74, 50-60. doi: <http://dx.doi.org/10.1016/j.compedu.2014.01.005>
- Song, Yanjie, & Kong, Siu Cheung. (2017). Affordances and constraints of BYOD (Bring Your Own Device) for learning and teaching in higher education: Teachers' perspectives. *The Internet and Higher Education*, 32, 39-46. doi: <http://dx.doi.org/10.1016/j.iheduc.2016.08.004>
- Stockwell, B., Stockwell, M., Cennamo, M., & Jiang, E. (2015). Blended Learning Improves Science Education. *Cell*. Vol 162, pp 933-936.

- Wasko, Christopher W. (2016). Using the DSAP Framework to Guide Instructional Design and Technology Integration in BYOD Classrooms. *Journal of Digital Learning in Teacher Education*, 32(3), 85-94. doi: 10.1080/21532974.2016.1169957
- Wong, L., Tatnall, A., & Burgess, S. (2014). A framework for investigating blended learning effectiveness. *Education & Training*, 56(2), 233-251.
doi:<http://dx.doi.org.ezproxy.library.wisc.edu/10.1108/ET-04-2013-0049>
- Wu, J., Tennyson, R., & Hsia, T. (2009). A study of student satisfaction in a blended e-learning system environment. *Computers & Education*. Vol 55, pp. 155-164.
- Zhou, W., Simpson, E., & Pinette Domizi, D. (2012). Google docs in an out-of-class collaborative writing activity. *International Journal of Teaching and Learning in Higher Education*, 24(3), 359-375. Retrieved from <http://www.isetl.org/ijtlhe>