Learning Management Systems:
Best Practices in Asynchronous Online Learning

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Higher Education has embraced asynchronous online courses in education as a solution to meet the challenge of managing and transforming learning environments, particularly during the Covid-19 pandemic. To teach these courses, faculty generally rely on some form of learning management system (LMS) tools to handle design, learning content, student interaction, and assessment. However, as newer technology and best practices for learner experience emerges, these tools become outdated and limited. Universities struggle to find a balance between what is sustainable and financially feasible for scalability and integration into current systems. This conceptual qualitative study uses learning design methodology and pattern overview framework to identify best practice solutions for differentiating technology-enhanced learning design through reflective comparison to their own context.

Keywords: Learning Management System, learning design, best practice

Introduction

Many educational programs and courses moved online during the Covid-19 pandemic, which revealed various challenges and expectations for higher education teachers. Teachers had to transform from their in-person learning environment to one strictly online (Carvalho et al. 2020; Darling-Hammond et al. 2020). To teach an online course, teachers in higher learning generally rely on some form of learning management system (LMS; Ismail, Mahmood, & Abdelmaboud, 2018) and VoIP web-conferencing, most notably Zoom (Alexei & ALEXEI, 2021).

A Learning Management Systems (LMS) "is a web-based software application that is designed to handle learning content, student interaction, assessment tools and reports of learning progress and student activities" (Kasim & Khalid, 2016, p 55). According to Sulan, the main purpose of an LMS is to "facilitate the design of course arrangements, delivery of course content and learning tools, and management of course processes in asynchronous and synchronous learning environments." (2018, p. 90). LMS are Blackboard, Canvas, Moodle, and Desire2Learn, which account for 90.3% of institutions (Edutechnica, 2019). LMS are hosted on servers, while some institutions self-manage others outsource hosting on external cloud servers (Edutechnica, 2013). In the cases of Blackboard and Desire2Learn, only a vendor can host these LMS. Blackboard is often on top for commercial LMS cloud vendors (Pina, 2012). Canvas is at the top for free cloud based server LMS that provides most of the same features (Edutechnica, 2022).

Open source LMSs, like Sakai, can be self-managed and have become more popular with many of the same benefits including ease of delivery & access to learning content (Tagoe & Cole, 2020). Cavus & Zabadi (2014, p 521) define open source (OS) as "the source code of a software that is readily available to the public for extension and modification depending on the user's needs". OS allows the internal benefit of modification and development (Aberdour, 2007). Moodle often comes out at the top open source LMS (Cavus & Zabadi, 2014) one reason is that it allows course creators to add H5P files and SCORM packages to their courses.

In general, commercial and open-source LMS share virtually the same capabilities, however, commercial cloud servers require fees for cloud hosting (Kasim & Khalid, 2016) and open-source require server maintenance by specialized staff (Pina, 2012). For institutions, the main concerns are security of information (Alexei & ALEXEI, 2021), standalone vs. integrated systems, and self-hosted vs. vendor-hosted systems (Pina, 2012). By using a LMS instead of a public webpage, institutions limit access of instructional resources privately to users who are enrolled in the course, which increases for instructional use of materials under the Fair Use and Teach Act (Gibbons, 2005).

LMS course design and presentation is dependent on available plugins and features, which vary by LMS (Al-Ajlan, 2012), and may rely on updates to the server, if open source (Aberdour, 2007). Additionally, plugins and third party tools may not work due to security governance issues set in place under university protocols (Alexei & ALEXEI, 2021; Oyarzun & Pyke, J2020) or have issues following Web Content Accessibility Guidelines (Baldwin & Ching, 2021). For course design LMS provides a specific standardized interface instead of requiring them to use Hypertext Markup Language (HTML) or web page authoring programs to design their own (Hill, Wiley, Nelson & Han, 2004). Before LMS, delivery of content online was limited because it was publicly available on websites, which were not protected from copyright violation by fair use guidelines (Piña & Eggers, 2006). The layout and functionality of an online course affect how it is perceived (Lane, 2009).

Specifically, for online courses to provide quality learning experiences, instructors must convert their traditional instructional content and interaction to digital versions by utilizing emerging technologies and multimedia (Rapanta et al. 2020; Ní Shé et al. 2019; Thormann and Zimmerman, 2015). Unfortunately, "the dynamic digital environment requires an awareness of rapidly evolving legislation concerning digital copyright, attribution and access guidelines; multimedia skills such as video recording, editing and publishing; as well as digital literacies regarding online educational tools, platforms and integrity issues" (McInnes et. al, 2020).

Addressing all these issues of differentiation for learning and teaching strategies exceed the expertise and scope of an instructor's workload and role (Chao et al., 2010; Hattangdi et al., 2010; Vandenhouten et al., 2014; Vrasidas, 2004). Many teachers do not have the digital literacy skills, time, to choose tools and for creating authentic and engaging learning interventions (Conole & Wills, 2013) resulting in many LMS tools and functions being underutilized (Washington, 2019).

Both higher education and instructors need to spend more attention on the planning phase to design for learning (Goodyear, 2015). The development of a high-quality course for the online higher education format requires expertise beyond the scope of the teacher along with different types of teaching and learning strategies for the digital medium (Chao et al., 2010; Vandenhouten et al., 2014; Miller, 2007).

Research Design & Methods

This qualitative study is driven by a research question: " How do I teach an asynchronous online course successfully?". In search to answer this question and contribute to research, the study followed learning design methodology, which can be defined as:

"a methodology for enabling teachers/designers (TD) to make more informed decisions in how they go about designing learning activities and interventions, which is pedagogically informed and makes effective use of appropriate resources and technologies. This includes the design of resources and individual learning activities right up to curriculum-level design." (Conole, 2013, p. 8)

There are many ways to share effective ways of describing or representing a learning design (Conole & Wills, 2013). This paper is an exploratory study with the goal of summarizing best practice suggestions for optimal solutions (Coffield & Edward, 2009; Hargreaves, 2004). Learning design approaches help teachers to reflect on learning activities and student experiences. (Conole, 2013). TDs may not be aware of the most recent resources, which is essential to meet expectations (Hrastinski, 2020). A popular model framework that explains different aspects of a teacher's knowledge and use of technology is Mishra and Koehler's (2006) Technological Pedagogical Content Knowledge Model (TPACK), which includes technological, pedagogical , and content knowledge . This study focuses on pedagogical and technical knowledge. TPACK encourages teachers to identify what they do with technology (Kopcha et al, 2020). By identifying and presenting the researchers, TPACK products, in this paper aims to share possibilities and encourage teachers to use research to inform their designs for learning based on their context by reflecting (Oliver & Conole, 2003). The study exemplifies learning design by documenting explicit practices and literature on beliefs and practices for teaching (Conole, 2009). According to Sharpe & Oliver (2013) instructors and designers can use these prescriptive guides as reference to compare to their own practice based on perceived value, acceptance, perceptions.
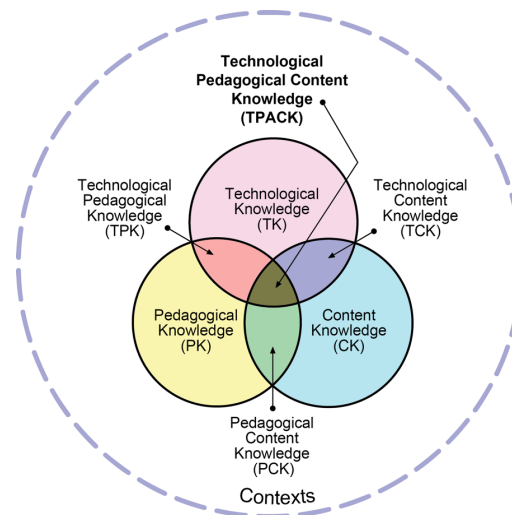
Figure 1. TPACK. from http://tpack.org

The study uses a pattern overview framework, "structured, text-based structured way of analyzing a pedagogic problem & conveying best practice solution" (Conole & Wills, 2013) to document the researchers' experience as an instructional designer, who used to work as an online teacher, and now develops asychronous courses online. This study takes the stance that instructors cannot be limited to the functions of a LMS and need to utilize the tools that are available on the internet (Hotrum, 2005) and should address four types of interaction in online learning environment: learner-content, learner-learner, learner-instructor, and learner-interface (Thurmond & Wambach, 2004)

Best Practice

Pedagogical

The ADDIE instructional design model can assist TD in developing online courses and instructional materials (Castro & Tumibay, 2021). ADDIE is a systematic approach to design learning that includes five phases: 1) Analysis, 2) Design, 3) Development, 4) Implementation, and 5) Evaluation. In this paper we focus on the design and development phases. ADDIE makes expectations explicit, which help stakeholders better understand the learning outcome, plan, and monitor instructional strategies (Denecke et al., 2017). For the course design part of ADDIE, TD can also use one of the 21 technology-enhanced learning design models listed by Bower and Vlachopoulos' (2018), with differentiation for guidance. In lesson design, aligning assessment, goals, and learning objectives which utilize learning taxonomy such as Bloom's verbs revised in tables can make practice more explicit (Harris, 2020). In addition, SMART can help write effective learning objectives following criteria to match intended learning outcomes (Chatterjee & Corral, 2017).

As discussed, institutionally supported LMS may lack functionality and instructors and designers might need to find 3rd party tools to meet learner needs, achieve higher functionality, or provide new affordance by searching online. Instructors can plan sequencing of a lesson according to instructional strategies based on the learning domain goals (Hill & Jordan, 2021). We can match instructional strategies and digital tools (Benner, D, Gracey, & Guhlin, 2020; Office of Digital Learning & Inquiry, 2021). Using rubrics to evaluate online tools with criteria and expectations, which can help find suitability of an e-learning tool for specific outcomes and classroom context (Anstey & Watson, 2018).

Technology- LMS

The learner-interface and learner-content are addressed by the LMS selection. As mentioned earlier, research shows that LMS usage depends on the instructor's pedagogical and technical skills rather than the number of functions. Institutional open-source LMS are bureaucratic controlled and prescribed to TD. For example, in 2008, the UH System, the University of Hawaii System switched commercial WebCT to an open source Sakai Project, as the official LMS (Ho, 2009). The software was customized and runs on an in-house infrastructure server. However, in order to ensure compliance with University of Hawaiʻi (UH) policies, State of Hawaiʻi Revised Statutes, and external regulations

for security UH must regulate access and modification to comply with local and state laws and federal requirements such as but not limited to: FERPA, HIPAA, PCI, FTC and FISMA at follows its own best practices (Information Technology Services, 2020). Some colleges like Education, within the institution have moved to the free cloud based LMS Canvas, which has a sleek design and has many of the desired functionality of an LMS (Sulun, 2018). The fact that it is free to teachers, hosted-free, and integrates with 3rd party tools, make it one of the best cloud based systems.

Technology- learner-learner, learner-instructor interactions

The first two main types of interaction: teacher-student and student-student can be addressed by incorporating social media platforms as part of the course design. Most LMS lack social interaction functions that can be found on social media tools (Siemens, 2004) and third party tools. Most social media tools are accessible via a mobile phone to enhance the course (Sevillano-García & Vázquez-Cano, 2015; Zhuhadar, Yang & Lytras, 2013). Slack, which allows users to join a chat channel via a link.

Discussion

The complete design of an asynchronous online course from start to finish could be shared following the ADDIE instructional design model. As mentioned earlier there are many ways to share effective ways of describing or representing a learning design (Conole & Wills, 2013). Additional ways to describe or represent a learning design may be explored to make explicit to other instructors and designers how to replicate a practice in another context. Additional, more types of interaction (Thurmond & Wambach, 2004) could be detailed. However, the explicit TPACK examples of addressing pedagogy and technology in online asynchronous learning may be used by instructors and designers to compare to their own context and improve their teaching towards best practices.

References

Aberdour, M. (2007). Open source learning management systems. Available on: www. epic. co. uk/content/news/oct_07/whitepaper. pdf.

Alexei, A., & ALEXEI, A. (2021). Cyber security threat analysis in higher education institutions as a result of distance learning.

Anstey, L & Watson, G. (2018). A rubric for evaluating e-learning tools in higher education. Educause Review. https://er.educause.edu/articles/2018/9/a-rubric-for-evaluating-e-learning-tools-in-higher-education

Baldwin, S. J., & Ching, Y. H. (2021). Accessibility in online courses: A review of national and statewide evaluation instruments. TechTrends, 65(5), 731-742

Benner, D, Gracey, L. & Guhlin, M. (2020). Matching High-effect Size Strategies & Digital Tools, Texas Computer Education Association. https://go.mgpd.org/hest

Bower, M., & Vlachopoulos, P. (2018). A critical analysis of technology-enhanced learning design frameworks. British Journal of Educational Technology, 49(6), 981–997. https://doi.org/10.1111/bjet.12668

Castro, M. D. B., & Tumibay, G. M. (2021). A literature review: efficacy of online learning courses for higher education institution using meta-analysis. Education and Information Technologies, 26(2), 1367-1385.

Cavus, N., & Zabadi, T. (2014). A comparison of open source learning management systems. Procedia-Social and Behavioral Sciences, 143, 521-526.

Chao, I. T., Saj, T., & Hamilton, D. (2010). Using collaborative course development to achieve online course quality standards. International Review of Research in Open & Distance Learning, 11(3), 106–126. http://www.irrodl.org/index.php/irrodl

Chatterjee, D., & Corral, J. (2017). How to write well-defined learning objectives. The journal of education in perioperative medicine: JEPM, 19(4).

Conole, G. (2013). Designing for learning in an open world. Berlin: Springer.

Conole, G., & Wills, S. (2013). Representing learning designs–making design explicit and shareable. Educational Media International, 50(1), 24-38.

Conole, G. (2009). Capturing and representing practice. In M. Tait, M. Vidal, U. Bernath, & A. Szucs (Eds.), Distance and elearning in transition: Learning innovation, technology and social challenges (pp. 579–594). Wiley.

Correia, A.-P. (2018) (Ed.). Driving Educational Change: Innovations in Action. eBook, available at https://ohiostate.pressbooks.pub/drivechange/

Crosslin, M. (2020). Effective Practices. In Creating Online Learning Experiences. https://socialsci.libretexts.org/Bookshelves/Education_and_Professional_Development/Book%3A_Creating_Online_Learning_Experiences_(Crosslin)

Dimitrios, T., Sofia, S., Paraskevi, C., Soultana, K., Triseugeni, R., Maria, S., & Athanasias, T. (2010). An adaptive and personalized open source e-learning platform. Procedia - Social and Behavioral Sciences, 9(1), 38-43.

Edutechnica. (2022). "LMS Data – Spring 2022 Updates", July 2022. https://edutechnica.com/category/edtech/

Edutechnica. (2013). "LMSS by the Numbers: Hosting and Versions." Edutechnica, 26 Oct. 2013, https://edutechnica.com/2013/10/26/lms-by-the-numbers/.

Gautreau, C. (2011). Motivational factors affecting the integration of a learning management system by faculty. Journal of Educators Online, 8(1), n1.

Gibbons, S. (2005). Library course-management systems: an overview. ALA Library Technology Reports, 41(3).

Goodyear, P. (2015). Teaching as design. Herdsa review of higher education, 2(2), 27-50.

Harris, L. & Jones, M. G. (2020). Measuring Student Learning. In J. K. McDonald & R. E. West, Design for Learning:Principles, Processes, and Praxis. EdTech Books. Retrieved from https://edtechbooks.org/id/measuring_student_learning

Hattangdi, A., Jha ,S. & Ghosh, A. (2010). A literature review of the perceptions of faculty about technology enabled distance education. International Journal of Arts and Sciences 3(18), 379-390. Retrieved from http://openaccesslibrary.org/images/TNT-TOR222.pdf.

Hill, J. & Jordan, L. (2021). Instructional Strategies. In J. K. McDonald & R. E. West (Eds.), Design for Learning: Principles, Processes, and Praxis. EdTech Books.

https://edtechbooks.org/id/instructional_strate

Hill, J. R., Wiley, D., Nelson, L. M., & Han, S. (2004). Exploring research on internet-based learning: From infrastructure to interactions. In Jonassen, D. H. (Ed.), Handbook of research on educational communications and technology (2nd ed.). New York: Simon and Schuster/Macmillan

Ho, C. P. (2009). E-Learning for University of Hawaii's Professional and Graduate Programs for Teachers on Neighboring Islands. International Journal, 3(1), 4-11.

Hotrum, M. (2005). 44. Breaking down the LMS walls. International Review of Research in Open and Distributed Learning, 6(1), 1-6.

Hrastinski, S. (2020). Informed design for learning with digital technologies. Interactive Learning Environments, 1-8.

Information Technology Services. (2020). University data governance and Data Classification Policies. Protecting Sensitive Information at UH :: ASK US, University of Hawaii System. Retrieved July 8, 2022, from https://www.hawaii.edu/askus/1266.

Jahanmir, S.F. and Cavadas, J. (2018). Factors affecting late adoption of digital innovations. Journal of Business Research. 88, (2018), 337-343.

Kasim, N. N. M., & Khalid, F. (2016). Choosing the right learning management system (LMS) for the higher education institution context: A systematic review. International Journal of Emerging Technologies in Learning, 11(6).

Kats, Y. (Ed.). (2010). Learning management system technologies and software solutions for online teaching: Tools and applications: Tools and applications. IGI Global.

Kopcha, Neumann, K. L., Ottenbreit-Leftwich, A., & Pitman, E. (2020). Process over product: the next evolution of our quest for technology integration. Educational Technology Research and Development : ETR & D., 68(2), 729–749.

Lane, L. (2009). Insidious pedagogy: How course management systems impact teaching. First Monday, 14(10).

McInnes, R., Aitchison, C., & Sloot, B. (2020). Building online degrees quickly: Academic experiences and institutional benefits. Journal of University Teaching & Learning Practice, 17(5), 2.

Ní Shé, C., Farrell, O., Brunton, J., Costello, E., Donlon, E., Trevaskis, S., & Eccles, S. (2019). Teaching online is different: critical perspectives from the literature.

Office of Digital Learning & Inquiry, Middlebury College. (2021). The Asynchronous Cookbook: Recipes for engaged & active online learning. https://pressbooks.middcreate.net/asynchronouscookbook/

Oliver, M., & Conole, G. (2003). Evidence-based practice and e-learning in higher education: Can we and should we? Research Papers in Education, 18(4), 385–397. https://doi.org/10.1080/0267152032000176873

Oyarzun, B. & Pyke, J. G. (2020). LMS Evaluation and Selection. In D. Barreto, A Rottmann, & S Rabidoux, Learning Management Systems : Choosing the Right Path For Your Organization. EdTech Books. Retrieved from https://edtechbooks.org/learning_management_systems/evaluation_and_selection

Piña, A. A., & Eggers, M. R. (2006). Teaching, administering and supporting blackboard, webct and desire2learn. In annual Technology in Education (TechEd) Conference, Pasadena, CA.

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the Covid-19 crisis: Refocusing teacher presence and learning activity. Postdigital science and education, 2(3), 923-945.

Sevillano-García, M., & Vázquez-Cano, E. (2015). The Impact of Digital Mobile Devices in Higher Education. Journal Of Educational Technology & Society, 18 (1), 106-118. Retrieved from http://www.ifets.info/journals/18_1/ets_18_1.pdf

Sharpe, R., & Oliver, M. (2013). Designing for learning in course teams. In H. Beetham, & R. Sharpe (Eds.), Rethinking Pedagogy for a Digital Age. New York: Routledge.

Siemens, G. (2004). Learning Management Systems: The wrong place to start learning. Elearnspace Weblog, 22.

Sulun, C. (2018). The evolution and diffusion of learning management systems: The case of Canvas LMS. Driving Educational Change: Innovations in Action, 86.

Tagoe, M. A., & Cole, Y. (2020). Using the Sakai Learning Management System to change the way Distance Education nursing students learn: are we getting it right?. Open Learning: The Journal of Open, Distance and e-Learning, 35(3), 201-221.

Thurmond, V., & Wambach, K. (2004). Understanding interactions in distance education: A review of the literature. International journal of instructional technology and distance learning, 1(1), np.

Vandenhouten, C. L., Gallagher-Lepak, S., Reilly, J., & Berg, P. R. (2014). Collaboration in e-learning: A study using the flexible e-learning framework. Online Learning, 18(3). 1–14. http://onlinelearningconsortium.org/

Vrasidas, C. (2004). Issues of Pedagogy and Design in e-learning Systems, 2004 ACM Symposium on Applied Computing, 911-914.

Washington, G. Y. (2019). The learning management system matters in face-to-face higher education courses. Journal of Educational Technology Systems, 48(2), 255-275.

Zhuhadar, L., Yang, R., Lytras, M., (2013). The impact of Social Multimedia Systems on Cyberlearners, Computers in Human Behavior, Volume 29, Issue 2. Pages 378-385, ISSN 0747-5632, http://dx.doi.org/10.1016/j.chb.2012.09.009.