The Fault in our Systems: LMS as a Vehicle for Critical Pedagogy

Kathryn R. Green
Michigan State University
Emory University

Haynes L. Chewning
Emory University

Postsecondary instructors and students alike perceive the primary function of a learning management system (LMS) as a means of static information dissemination, particularly assessment-related information such as grades. Subsequently, the most-used LMS features are those that facilitate such information transfer. Perhaps because of these usage patterns and perceptions, a growing number of scholars and practitioners are calling for alternatives to the LMS. This article argues, however, that the LMS is not limited to (nor designed around) its current use as a grade delivery service, but can, rather, be leveraged as a vehicle for critical pedagogy and praxis through technology. Specifically, we seek to explore some of the current uses and perceptions of the LMS in higher education, as well as considerations and implications for faculty and educational technologists working with these systems in higher educational contexts.

KEYWORDS**:** learning management systems, critical pedagogy, higher education, next generation digital learning environments

Introduction

Postsecondary instructors and students alike perceive the primary function of a learning management system (LMS) as a means of static information dissemination, with a particular focus on assessment-related information such as grades or assignment feedback (Galanek, Gierdowski, & Brooks, 2018). Subsequently, the LMS features most commonly used are those that facilitate the fixed transfer of information, whether via grades or course documents (Brooks & Pomerantz, 2017; Pomerantz & Brooks, 2017). Perhaps because of these perceptions and complementary usage types, there are a growing number of opponents to the LMS, many of whom call for alternative practices, tools, or an altogether dismissal of institutionally implemented teaching and learning technologies (e.g., Brown, Dehoney, & Millichap, 2015; Chen, 2019; DeSantis, 2012; Kowch, 2018; Rhode, Richter, Gowen, Miller, & Wills, 2017; Strommel, 2017). This article argues, however, that the LMS is not limited to (nor specifically designed around) its current de facto use as a grade delivery service, but can, rather, be leveraged as a vehicle for critical pedagogy and praxis through technology. Specifically, we seek to explore some of the current uses and perceptions of the LMS in higher education, as well as considerations and implications for faculty and educational technologists working with these systems in higher educational contexts. Through close examinations of some obvious and not-so-obvious resources, we explore areas for improvement, offer recommendations for practice, and discuss some of the more emergent opportunities for and challenges surrounding the use of learning management systems to facilitate inclusive, critical digital pedagogy and praxis.

This article was originally published in TechTrends, May 2020.
The final publication is available via SharedIt: https://rdcu.be/ch3H4

Learning Management Systems

Usage and Perceptions

Likely once considered a more fringe innovation in educational technology (Rhode, Richter, Gowen, Miller, & Wills, 2017), the LMS today is one of the most ubiquitous tools used in all levels of education, perhaps most noticeably in higher education institutions (Edutechnica, 2019; Rhode et al., 2017). From more traditional, face-to-face lectures to completely asynchronous online classes, the LMS is consistently considered one of, if not the most, important technologies in undergraduate education today (Brooks & Pomerantz, 2017; Legon & Garrett, 2017; Rhode, et al., 2017). Indeed, although reportedly in a period of overall decline (Edutechnica, 2019), the LMS market is currently valued at over nine billion dollars, with a projected global market value of $22.4 billion by 2023 (MarketsandMarkets, 2019). In the United States, the LMS is ubiquitous, widely seen as part-and-parcel of the postsecondary educational experience (Rhode et al., 2017), particularly in traditional (face-to-face) and blended settings, with approximately two-thirds of the market share (61.5%) split fairly evenly between Instructure Canvas (30.6%) and Blackboard Learn (30.9%), each of which served over six million undergraduate students classified as full-time enrollments in Spring 2019, at a combined total of 2,112 institutions (Edutechnica, 2019). Clearly, despite perceived and real shortcomings, the LMS has become an influential and integrated piece of the higher educational infrastructure.

How these systems are typically used seems to be fairly ubiquitous as well. Most students and faculty report generally high satisfaction with LMS functionality related to information dissemination (faculty) and reception (students), which is also the primary use reported by both groups (Brooks & Pomerantz, 2017; Pomerantz & Brooks, 2017). A recent study showed approximately 75% of faculty surveyed reported using the LMS exclusively or primarily for asynchronous, administrative functions (e.g., updating assignments, posting grades, activating modules), with somewhat limited use of discussion boards (still asynchronous but more interactive), even among faculty who reported having taught more completely or partially online courses (Pomerantz & Brooks, 2017).

Despite the ubiquity of the LMS across institutions and the generally high satisfaction with their most-used features, there is a growing dissatisfaction with the perceived role of the LMS as a tool and the current LMS-centric model of higher education. In the recent literature, unflattering and often mocking descriptions of the LMS as a tool seem rather commonplace (e.g., Chen, 2019; Hill, 2015), even going so far as to argue its very creation was a mistake (Morris, 2017). These critics often characterize the design of the LMS platform as overly static and administrative, arguing that other web-based spaces are better suited for engaging in more student-centered practices aligned with critical pedagogy and transformative praxis (Chen, 2019; Strommel, 2017). Specifically, they claim that the currently limited use of more interactive, high engagement functionalities within the LMS indicates the need for a paradigm shift (Brown, 2017; Galanek et al., 2018; Pomerantz & Brooks, 2017).

LMS Critics and Critical Pedagogy

Advocates for a "post-LMS world" (Brown, 2017 p. 12) tend to fall into one of two camps: replace the LMS with a better learning environment model or remove the LMS entirely. Although there is some debate as to whether it stands specifically in opposition to the LMS (Brown, 2017), a popular member of the first camp is the growing movement for a next-generation digital learning environment (NGDLE). Advocates of the NGDLE argue that the LMS is fundamentally a one-size-fits-all model designed by and for a paradigm of teaching that is outmoded and halfway out the door (Brown et al., 2015; Kowch, 2018). Architects of the NGDLE concept describe it as a collection of complementary digital learning spaces that are diverse, interoperable, learner-centric, and non-prescriptive (Brown, 2017). Conversely, the LMS is characterized as instructor-centric, with core functionalities specifically designed to limit online creative and community building capacity, precluding instructors and students alike from engaging in flexible, dynamic interactivity (e.g., DeSantis, 2012; Strommel, 2017). Instead, Brown et al. (2015) differentiate the NGDLE model as a web of interconnected systems, applications, and services, likening it at the end-user level to a smartphone experience, wherein one's home screen is full of self-selected apps and widgets.

Although similarly dissatisfied with the design and function of current LMS platforms, those in the second camp seem to view institutional tools like the LMS as fundamentally incompatible with more sophisticated, "high-level" digital pedagogical practices (Ertmer & Ottenbreit-Leftwich, 2010, p. 262). Rather than conceiving an alternative confederation of software to replace or augment current systems and practices, these critics propose a complete dissolution of systems meant to manage courses or students. Indeed, some scholars aligned with this philosophy (e.g., Morris, 2017; Strommel, 2017) have explicitly argued against the existence and continued use of the LMS altogether. Because the LMS is yet another system created in support of the banking model of education (Puroway, 2016), which views students as repositories into which knowledge can be deposited by instructors (Freire, 1970), with the current popular uses of the LMS seemingly supporting this model (Puroway, 2016; Strommel, 2017; Ertner & Ottenbreit-Leftwich, 2010). Thus, these scholars argue, maintaining its use is in and of itself a reinforcement of dominator-culture hegemony, and therefore perpetuates systems of oppression and cultural hegemony processes (Morris, 2017; Strommel, 2017).

While their specific critiques may differ, there is a general consensus among these critics that the LMS severely limits student-centered teaching practices, and argue that moving beyond our reliance on these systems is the best way to engage in critical pedagogy and praxis in the digital age. Conceptually, critical pedagogy and praxis are most often attributed to Paolo Freire, and the iterations seen in educational scholarship today draw from his 1970 book, *Pedagogy of the Oppressed* (Bradshaw, 2017; Giroux, 2011). Predicated on matters of equity and social justice in education, these complementary concepts champion teaching and learning practices that empower students through critical reflection, analysis, engagement, and action (Bradshaw, 2017). Freirean praxis suggests a reciprocity between theory and practice that not only actively uses theory to inform practice, but does so reflectively and intentionally, urging a

dialectic symbiosis that works to "transform" (Freire, 1970, p. 51) structural inequalities (Bradshaw, 2017). Importantly, praxis is not meant to be a mechanism for the emancipation of others or a vehicle for scholar-practitioners to deconstruct harmful power structures; rather, praxis is a practice in which individuals may engage in order to more fully articulate, understand, and then begin the work of meaningful transformation (Bradshaw, 2017). Whether in digital or analog spaces, we contend that the technology we use or eschew is merely a tool, which can be used for transformative or normative purposes. Just as Freire (1970) posited that education can be used to facilitated conformist thought or critical consciousness, we posit that the LMS is one of many opportunities we have for pursuing transformative teaching and learning practices in the digital age, depending not on the nature of the tool but, rather, of the user. While more dynamic, student-centered pedagogy that acknowledges the affordances and context of the digital age is certainly needed, the root of the issue may have less to do with shifting the deployment paradigm and more to do with shifting the design paradigm. That is, rather than assume a move to a broader, more complex network of services will address many of the pain points asserted by some scholar-practitioners, it may be more beneficial to consider first disrupting usage practices rather than their platforms. Specifically, we propose that student-centered, critical pedagogy and pedagogical praxis are achievable within current LMS platforms.

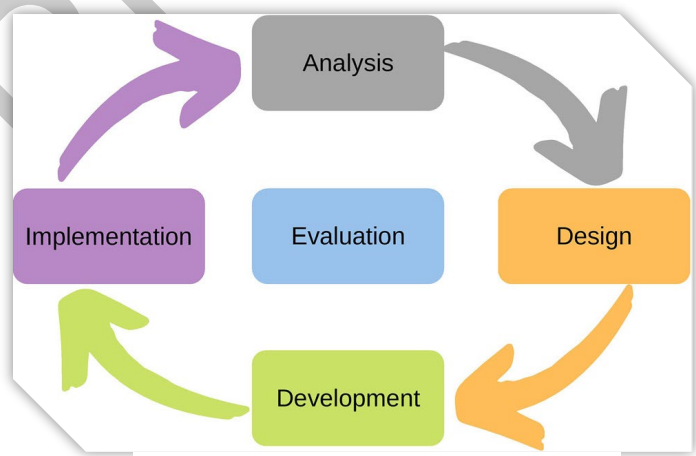

Figure 1. Recursive ADDIE model.

Recommendations and Considerations for Continued Use of the LMS

Even when new digital learning applications, systems and other tools are adopted, university faculty tend to use these tools in a similar manner across platforms, with their usage largely supporting the continuation of traditional, business-as-usual teaching practices, such as disseminating syllabi via LMS rather than via paper copies (Blin & Munro, 2008; Watty, McKay, & Ngo, 2016). These consistent use patterns are often an improvement of pre-digital teaching practices, but are not truly innovative (Blin & Munro, 2008). Thus, rather than adopt new systems or practices (institutionally or individually) that eschew the LMS, we offer the following recommendations for continued use of the LMS, as well as considerations of some of the most significant challenges and opportunities we see in achieving a design paradigm shift that privileges student-centered pedagogy in the digital age.

Additionally, although we contend that there are a variety of more dynamic alternatives to current static, status quo practices of using the LMS predominantly as a document repository, the extant literature suggests that many faculty and students are largely satisfied with this LMS usage (Brooks & Pomerantz, 2017; Pomerantz & Brooks, 2017). While some instructors may embrace the aforementioned dynamic alternatives,

This article was originally published in TechTrends, May 2020.
The final publication is available via SharedIt: https://rdcu.be/ch3H4

others may be generally content with their LMS use and seek only a more student-centered lens through which to approach their teaching and instructional design. Therefore, our below recommendations are intended to offer a balance of opportunities for radically transformative approaches, as well as opportunities to modify some of the most popular practices to be more in keeping with Freirean, student-centered pedagogical practices.

Design Practices

Some instructors may decide to attempt radical change in their LMS courses to meet the changing needs of their students. However, reimagining existing courses to include more dynamic, student-centered elements through the LMS can be a daunting prospect. While it can be easier in the short-term to transfer existing course content to the LMS and recycle much of it each semester, student-centered, critical digital pedagogy requires a more iterative approach that integrates curricular materials into the learning environment more cohesively and intentionally (Bradshaw, 2018; Davis, Chen, Hauff, & Houben, 2018; Estriegana, Medina-Merodio, & Barchino, 2019). Although this transformation can require more developmental labor, the result can provide a more usable course blueprint moving forward, and afford important benefits when faced with common teaching challenges; some studies, for example, have found such integrative use of the LMS highly beneficial in facilitating individualized, formative feedback (Hedtrich & Graulich, 2018) and maintaining engagement in larger introductory courses (Godlewska et al., 2019). Broadly, an iterative approach to changing LMS course content and activities would include four steps: planning, executing, reviewing results, and deciding how to move forward. Although there are a number of specific approaches and frameworks that offer their own guidelines (one of which, ADDIE, is discussed below), each of these frameworks almost unerringly follow this four-step cycle.

Often used by instructional designers, one popular framework for such an iterative approach is ADDIE (Analyze, Design, Develop, Implement, and Evaluate), which progressively moves through each phase. As shown in Figure 1, this process is cyclical, emphasizing the importance of each component individually and as they relate to the larger system (Bradshaw, 2018). However, although ADDIE is not an inherently linear or recursive model, one potential problem is that, if it is presented or approached as a "strictly linear arrangement" (Bradshaw, 2018, p. 337), it can become an overly rigid approach to design. Conversely, a recursive process approach can allow necessary flexibility to evaluate elemental changes incrementally and make revisions along the way.

Vignette: Professor Scully's iterative assignment. The following vignette serves as an example of an instructor engaging in an iterative design process such as ADDIE in order to implement changes to a course component to create a more interactive learning environment using the LMS.

Professor Scully teaches introductory biology for undergraduate students. Although she used to teach this course in a traditional, face-to-face format, she has recently begun trying to include more blended elements that leverage digital tools and, she hopes, facilitates more student-centered learning opportunities. Thus, having

recently introduced more flipped classroom elements, she relies heavily on her LMS, often utilizing discussion fora. Although most students meet the posting requirements for the assignment, Professor Scully believes they are satisfying the minimum requirements without substantively engaging with the material and each other. Since her goal is to facilitate student learning, not merely student performance for the sake of a grade, she hopes to modify an upcoming assignment to create a more interactive learning environment and help her students feel more empowered in their learning. She decides to create new assignment parameters including staggered deadlines for initial posts, peer responses, and final responses to peers from the initial poster, as well as requiring that each response be recorded as short video. She hopes that these changes will better support peer interactivity, and that the video responses will seem more conversational and less disembodied than written discussion posts.

In the first iteration of this trial, Professor Scully found that students were indeed more interactive due to the new assignment parameters, and informal feedback from students on the assignment changes was largely positive. However, she's still concerned the students are not necessarily understanding the material beyond textbook definitions, and has noticed that some of the student responses to each other are more superficial, with generic examples of content. Taking an iterative approach, Professor Scully modifies the assignment to include the aspects that previously worked (i.e., staggered deadlines and response stages, video posts) while modifying the discussion questions to support student application of course content (e.g., asking students to explain the role of mitochondria to a five-year-old). After these revisions, Professor Scully decides the new parameters produce much better interactions between students and, she believes, enhances learning outcomes. She decides to implement them in all future discussions.

As shown in the above vignette, engaging in cyclical, iterative reviews of one's teaching and learning design practices can provide important insights and allow for real-time modifications to those practices in ways that emphasize students as collaborators in their learning and embrace the potential of digital learning environments and tools. In order to engage in this kind of transformative, critical pedagogy and praxis using the LMS, however, faculty and educational technologists will likely require correspondingly robust resources to support this pedagogy. Fortunately, there are a number of pre-existing resources readily accessible to most practitioners either within their LMS or on their campuses.

Although the below options are not guaranteed to be available on every university campus or in every LMS, many boast a presence almost as ubiquitous as the LMS itself. Moreover, those not currently available may nonetheless cultivate a deeper interest in additional resource development and innovation opportunities. The options presented here are by no means exhaustive; rather, these suggestions are proposed as starting points for faculty and educational technologists. Thus, we name some commonly found resources as a way to prompt practitioners to critically reflect on ways they might take meaningful, transformative action in order to better manage existing resources and develop new ones.

Collaborative Partnerships

To develop more robust, learner-centric practices within the LMS model, practitioners ought to consider the potential resources and collaborative development opportunities hiding in plain sight on their own campuses. In particular, there are often many overlooked opportunities for establishing partnerships with other individuals, offices, and departments on campus, many of whom may already be engaged in work or initiatives complementary to transformative pedagogical practices using digital technologies. While some (such as instructional designers) are a more obvious resource for those seeking educational technology support, others (such as librarians) are unfortunately under-utilized potential partners in this endeavor. Additionally, there are a wealth of online resources and communities available for establishing off-campus partnerships and exploring a broader collection of potential best practices.

Library staff. Although librarians may not be the first resource considered in terms of educational technology support, they are often eager to engage in more active collaboration related to teaching and learning technologies (Tumbleson, Burke, & Long, 2019; Ziegler, 2019). One way in which librarians might contribute to more diverse, scaffolded pedagogy within the LMS is through engaging students in interdisciplinary information literacy training. Information literacy is critically important within higher education, and a core component of digital equity and inclusion, in keeping with the call for more personalized, flexible, and learner-centric pedagogical paradigm shifts (Brooks & Pomerantz, 2017; National Digital Inclusion Alliance, 2019; Tumbleson et al., 2019).

Whether a student is in an introductory history course or a higher-level science course, they need to know how to find good sources and use them effectively in their writing. Many courses likely already have or would benefit from having a library instruction component to address information literacy. A single in-class meeting with a librarian is an option of limited value (Tumbleson et al., 2019), because the information about available library resources may not fit within the time constraints of the course. Furthermore, if students were introduced to the available resources before the class meeting, the time could be used for an open discussion of issues related to using the resources or other areas of concern. One way to make better use of limited class time with librarians is to incorporate their content into the LMS course (Ziegler, 2019). By moving beyond a single in-class meeting, librarians are able to establish better relationships with students who might otherwise not realize the breadth of the resources available to them (Tumbleson et al., 2019).

Instructional designers. Instructors of face-to-face courses, with the exception of institution or department mandated components, typically have complete control over the content they teach and how they teach it. Although they are experts in their fields, they are not always aware of current best practices for course content delivery and increasing or retaining student engagement in the distracted world of today. As faculty begin or continue to add online components to face-to-face courses they should consider collaborating with instructional designers. Using the latest educational pedagogy and leveraging available technology, instructional designers work with faculty to reconfigure their courses to define clear learning objectives and meet the changing needs of students while respecting the desires of faculty in managing their own courses

(Ritzhaupt & Kumar, 2015). The most successful collaborations manifest when faculty and instructional designers work together as equals and faculty trust the expertise of instructional designers and are comfortable modifying the ways they deliver some content (Richardson et al., 2018). Instructional designers in higher education institutions tend to fulfill many organizational needs by balancing course design, instructor training, project management, and end-user support typically in an LMS (International Futures, 2016). Depending on the extent to which an instructor wants to embrace blended learning, they may leverage all the skills of the IDs. By cultivating these collaborative partnerships, instructors can then rely on these area experts to relieve some of the administrative and organizational burden of iterative, reflective, and engaged teaching, thereby allowing instructors to focus on the students, and spend more time and energy on facilitating critical and transformative learning environments.

Leveraging Existing Functionalities

For those interested in moving beyond static LMS usage, most LMS platforms have a host of native functionalities that move beyond the current typical use of the LMS as a gradebook and course document repository. For example, many popular external resources (e.g., Google Apps, Flipgrid, Badgr) can be directly integrated into the LMS and associated courses via Learning Tools Interoperability (LTI) applications. Created by the IMS Global Learning Consortium, LTI applications are an industry standard, supported by major LMS platforms including Blackboard, Canvas, Desire2Learn, Moodle, and Sakai, among others, enabling users in a tool-consumer (the LMS) to initiate a secure connection to tool-providers (external tools) in order to seamlessly access external resources (IMS Global Learning Consortium, 2019).

LTIs broaden the utility of LMS courses by providing access to external tools without leaving the LMS interface, simplifying user access to external tools, and incorporating external content directly into assignments, pages, or other content areas. Many vendors list their tools on the EduAppCenter (EAC), a collaborative online marketplace where anyone can submit LTI apps (EduAppCenter, 2019). The EAC is useful for discovering new tools in that it allows for filtering by category, grade level, supported LMS platform, extensions (where the tool appears once configured), and whether a tool is open-access or requires authentication. Tools can also be discovered through the IMS Global interoperability certification list (IMS Global Learning Consortium, 2019).

LTI apps provide expansive new content and functionality to an LMS. For example, instructors may incorporate the practice of badging to an LMS course for completing various learning objectives, which some research suggests is conducive to higher retention rates for some students (Ziegler, 2019). Badging can additionally serve to support iterative and reflective instruction incrementally by tracking student concept mastery and engagement. Such real-time data can help instructors establish a more responsive and active partnership with their students without needing to track and monitor these data manually, often enabling instructors to review macro-level patterns at a glance. Overall, the LTI standard and its broad support across many educational technology tools makes it possible for the LMS to be a hub in the interconnected web

envisioned by NGDLE architects, through which many tools connect (Brown et al., 2015).

Access in Praxis: Open Access and Web Accessibility

Equity and inclusivity are integral to pedagogical praxis (Bradshaw, 2018), whether in analog or digital spaces. The concept of digital access is often associated with ensuring web users with disabilities are not excluded from full and equal participation and engagement online (a consideration too often overlooked in many settings, including educational). However, there can be additional pain points precluding students without disabilities from having equal access in digital learning environments as well. Whatever the barrier, all students ought to be afforded the infrastructural supports necessary to their potential success, whether it be through ensuring PDFs are readable for screen reader technologies or through selecting course materials that don't exacerbate the financial burdens of modern college students. In order to truly engage in praxis and student-centered critical pedagogy (digital or otherwise), attention to students' accessibility constraints is necessary and emergent.

Open access materials. There can also be barriers to access beyond those affecting students with disabilities. Higher education in the United States has become exorbitantly expensive, with nationwide student loan debt of over one trillion dollars affecting more than two-thirds of Americans (Vitez, 2018), 17% of whom are currently in default (Barr, Chapman, Dearden, & Dynarski, 2019). These loans include budgeting a significant amount for textbooks and course materials each year, with an average recommended budget exceeding $1,200 (Jarvis, 2019). Since 1977, textbook prices have skyrocketed at rates over triple that of inflation (Jarvis, 2019; Vitez, 2018). Textbooks and related course materials such as bundled access codes have become prohibitively expensive; research conducted by the U.S. Student Public Interest Research Group (PIRG) found that approximately three billion dollars of federal financial aid money is spent on textbooks, and almost 70% of U.S. college students reported not purchasing required materials for courses before due to cost (Vitez, 2018), despite also reporting concern that this decision would likely negatively impact their grade in the course (Jarvis, 2019).

Some of the steep cost of course materials can be attributed to increasingly popular practices like bundling. Bundling is the publishing practice of combining textbooks with supplementary materials, such as lab manuals or access codes to online materials, such as quizzes (Vitez, 2018). Earlier in this article, we discussed the utility of LTIs; many of the most popular have been developed by major textbook publishers (e.g., Pearson Mastering), which allow homework assignments, quizzes, and other supplementary materials available via access codes to be integrated into courses directly within the LMS. The popularity of these tools can often be attributed to the same cause as the popularity of adopting textbook bundles: these tools and supplementary materials streamline the course planning process for instructors by providing ready-made curricular materials in easy-to-use environments. Although these materials can be educationally useful for students and ease the time constraints by which many instructors are bound in their course planning, these bundles preclude students from renting or purchasing used textbooks at more reasonable price points, as well as

eliminating their capacity to resell any materials once the semester is over (Vitez, 2018). Indeed, reducing secondary market capacity through these one-stop shops of digital learning materials seems to be the wave of the textbook industry future, if Pearson's recent move to digital-first textbooks is any indication (Jarvis, 2019), which allows the publisher to more cohesively integrate their materials into online learning platforms only accessible by purchasing a code.

Fortunately, there are alternative solutions that preserve the integrative ease and functionality of these digital learning tools while defraying the excessive cost to students. Open educational practices (OEP), such as open textbooks or other open educational resources (OER), offer much more affordable and, accordingly, accessible opportunities for students to engage fully with course content. These resources can include peer-reviewed, open license textbooks, such as Rice University's open textbook publisher OpenStax; course materials, such as homework assignments; and a variety of digital tools designed to support teaching and learning in the public domain (Vitez, 2018).

Despite the benefits of such resources, however, research indicates that OER are under-utilized, with only around five percent of college courses requiring open (rather than traditional) textbooks, and less than 20% of university faculty surveyed in one study reporting any awareness of OER (Allen & Seaman, 2016). Fortunately, with respect to LMS integration, OER repositories are available as LTIs across many of the major LMS platforms, including Blackboard, Canvas, and Moodle, with new partnerships emerging regularly. As these resource banks continue to grow, their credibility and utility grow as well, provided stakeholders such as educational technologists and university faculty are willing to explore these more financially accessible options for their students.

Web accessibility. Continued efforts are needed to improve the accessibility of web content for all users. Particularly when it comes to student-centered teaching, it behooves us to consider which students we situate at that center and which ones we may inadvertently position at the margins (Green & Tolman, 2019). It is clear at this point that the LMS is overwhelmingly used as a tool to disseminate and access informational materials (Brooks & Pomerantz, 2017; Li & Tsai, 2017; Pomerantz & Brooks, 2017; Rhode et al., 2017). This is, of course, a serious problem when some students cannot fully access those materials. Although this paper largely argues that much more can and should be done in terms of LMS usage, even maintaining the status quo could be significantly improved by attending more closely to web content accessibility.

Studies examining the relationship between current LMS student usage and variables such as engagement, performance outcomes, and motivation have found generally, sometimes strongly, positive correlations between participatory behaviors and performance (You, 2016); time spent accessing theoretical content and engagement in other course activities, as well as overall academic achievement (Cerezo, Sanchez-Santillan, Paule-Ruiz, & Nunez, 2016); and online participatory behavior patterns and student motivation in a given course (Li & Tsai, 2017). Accordingly, content that is not readily accessible to some students may severely limit their capacity to engage as fully as their classmates. However, ensuring content published within the LMS is accessible can

be reasonably simple. Basic steps like including closed-captioning when uploading videos, adding alt-text to images and presentation slides, and optimizing PDFs to be recognizable as text can reduce accessibility barriers for students as they access online materials (Fichten, Asuncion, & Scapin, 2014). Additionally, instructors can strengthen the accessibility of their courses by ensuring in-class materials, such as video clips, are uploaded to the LMS platform as well, so students with disabilities or language barriers can revisit content they may not have been able to synthesize in class (Fichten et al., 2014).

Implications: LMS as a Vehicle for Praxis

In his call for educational praxis, Freire (1970) emphasized the power of critical reflection in order to effect transformative change through meaningful action. Prior to their current ubiquity, early prototypes and adoptions of LMS and LMS-like software were hailed as innovative (Davis et al., 2018; Rhode et al., 2017), widely seen as indicative of the power of digital technologies to transform teaching and learning practices (Davis et al., 2018; Estriegana et al., 2019). Such sentiments tend to appear at the onset of each so-called innovation in educational technology (consider, for example, the one-time insistence that MOOCs were the new face of higher education coursework [Davis, et al., 2018]). While the LMS appears for now to be a much less transitory fad than MOOCs, calls for its retirement seem to channel the introductory energy of most "new" movements in education and educational technology. That is, those advocating for new systems and those advocating for the dissolution of such systems altogether appear to be calling for the same core goal: teaching and learning practices that are actually innovative and transformative. Like Freire did so many years ago, these scholars and practitioners are clamoring for transformative change through meaningful action.

If the LMS has so far failed to achieve its transformative potential, however, we posit that the fault lies not in our systems but in ourselves. The perception of the LMS as most useful for information dissemination may be less a product of its actual functionality and much more a product of the manner in which we use it. If an alternative system were employed (or: if the idea of such a system were abandoned altogether), would classroom learning environments become more student-centered? Would we naturally engage in transformative teaching and learning? Or would we merely return to analog information dissemination, using paper syllabi, in-person quizzes, and offline gradebooks?

This argument for a reconsideration of the LMS as a vehicle for critical pedagogy and praxis is not a dismissal of alternative mechanisms for transformative teaching and learning, nor is it a suggestion that the LMS or the resources discussed in this article are the best possible mechanisms by which to achieve these goals. Rather, it is a call to critically reflect on the uses and perceptions of existing systems and technologies meant to support pedagogical innovation in the digital age. It is a call to consider whether our current practices are facilitating that innovation or are, instead, inhibiting it. Although critics of the LMS have levied some reasonable (and some less reasonable) charges against these platforms' current use, we argue here that these critiques might be

rectified by using that selfsame tool more effectively, as a catalyst for change rather than an inhibitor.

Conclusion

Through an examination of the current uses and perceptions of the LMS in postsecondary contexts, this paper set out to unpack and address some of the more pervasive criticisms of these systems. These critics argue that open and dynamic digital learning environments must move away from institutional tools such as the LMS in order to facilitate more innovative, student-centered teaching and learning practices. However, this article argues that many of the stated goals of LMS opponents are not only achievable through more robust and creative uses of the platforms but may indeed be far more actionable in terms of both the ease with which they can be adopted by instructors and the extent to which their use can be supported by and within higher education institutions.

Ensuring the development and maintenance of robust services and systems that support innovative, student-centered pedagogical praxis is critical, and should continue to be a priority as we become more reliant on digital technologies in our teaching and learning practices. While no one tool is likely to serve as a cure-all for the challenges many of us notice in our institutions, greater attention must be paid to the role of design and intentionality in selecting and using educational technologies. The recommendations and considerations explored here are not prescriptive but have hopefully provided greater insight into opportunities for critical pedagogy and praxis even within institutionally selected tools such as the LMS. After all, in some instances, static information dissemination may be necessary, as in distributing syllabi or course particulars. In other cases, LMS functionalities such as discussion fora, live chats, and multimedia options may provide more robust opportunities for student-centered learning environments. Regardless of tool or platform, the common themes for such pedagogy seem to be intentionality and a willingness to treat transformative teaching and learning as iterative, reflective practices.

This article was originally published in TechTrends, May 2020.
The final publication is available via SharedIt: https://rdcu.be/ch3H4

Compliance with Ethical Standards

Conflict of Interest. The authors declare that they have no conflict of interest.

Human and Animal Rights. This article does not contain any studies with human participants or animals performed by any of the authors.

This article was originally published in TechTrends, May 2020.
The final publication is available via SharedIt: https://rdcu.be/ch3H4

References

Allen, I. E., & Seaman, J. (2016). *Educational Resources in U.S. Higher Education, 2015-16*. 75.

Barr, N., Chapman, B., Dearden, L., & Dynarski, S. (2019). The US college loans system: Lessons from Australia and England. *Economics of Education Review*, *71*, 32–48.

Blin, F., & Munro, M. (2008). Why hasn't technology disrupted academics' teaching practices? Understanding resistance to change through the lens of activity theory. *Computers & Education*, *50*(2), 475–490.

Bradshaw, A. C. (2017). Critical pedagogy and educational technology. In A. D. Benson, R. Joseph, & J. L. Moore (Eds.), *Culture, learning, and technology* (1st ed., pp. 8–27).

Bradshaw, A. C. (2018). Reconsidering the instructional design and technology timeline through a lens of social justice. *TechTrends*, *62*(4), 336–344.

Brooks, C. D., & Pomerantz, J. (2017). *ECAR Study of Undergraduate Students and Information Technology, 2018*. Research Report. Louisville, CO: ECAR.

Brown, M. (2017). The NGDLE: We are the architects. *EDUCAUSE Review*, *52*(4), 11–18.

Brown, M., Dehoney, J., & Millichap, N. (2015). Next generation digital learning environment. EDUCAUSE Learning Initiative (ELI), Papers and Reports.

Cerezo, R., Sánchez-Santillán, M., Paule-Ruiz, M. P., & Núñez, J. C. (2016). Students' LMS interaction patterns and their relationship with achievement: A case study in higher education. *Computers & Education*, *96*, 42–54.

Chen, B. (2019). Designing for networked collaborative discourse: An un-LMS approach. *TechTrends*, *63*(2), 194–201.

Davis, D., Chen, G., Hauff, C., & Houben, G.-J. (2018). Activating learning at scale: A review of innovations in online learning strategies. *Computers & Education*, *125*, 327–344.

DeSantis, N. (2012, February 26). Self-described "EduPunk" says colleges should abandon course-management systems. *The Chronicle of Higher Education*. Retrieved June 9, 2019, from http://www.chronicle.com/article/self-described-edupunk-says/130917

EduAppCenter. (2019). Retrieved June 9, 2019, from http://www.eduappcenter.com/

Edutechnica. (2019). LMS data – Spring 2019 updates. Retrieved June 9, 2019, from https://edutechnica.com/2019/03/17/lms-data-spring-2019-updates/

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education*, *42*(3), 255–284.

Estriegana, R., Medina-Merodio, J.-A., & Barchino, R. (2019). Student acceptance of virtual laboratory and practical work: An extension of the technology acceptance model. *Computers & Education*, *135*, 1–14.

Fichten, C. S., Asuncion, J., & Scapin, R. (2014). Digital technology, learning, and postsecondary students with disabilities: Where we've been and where we're going. *Journal of Postsecondary Education and Disability, 27*(4), 369-379.

Freire, P. (1970). *Pedagogy of the oppressed*. New York: Continuum.

Galanek, J. D., Gierdowski, D. C., & Brooks, D. C. (2018). *ECAR Study of Undergraduate Students and Information Technology, 2018*. Retrieved from June 1, 2019, from http://www.educause.edu/ecar/research-publications/ecar-study-of-undergraduate-students-and-information-technology/2018/introduction-and-key-findings

Giroux, H.A. (2011). *On critical pedagogy.* New York: Bloomsbury Academic.

Godlewska, A., Beyer, W., Whetstone, S., Schaefli, L., Rose, J., Talan, B., … Forcione, M. (2019). Converting a large lecture class to an active blended learning class: Why, how, and what we learned. *Journal of Geography in Higher Education*, *43*(1), 96–115.

González-Marcos, A., Alba-Elías, F., Navaridas-Nalda, F., & Ordieres-Meré, J. (2016). Student evaluation of a virtual experience for project management learning: An empirical study for learning improvement. *Computers & Education*, *102*, 172–187.

Green, K. R. & Tolman, S. (2019). Equitable means accessible: Using universal design for learning and student development theory to inform online pedagogy. In L. Kyei-Blankson, J. Blankson and E. Ntuli (Eds.), *Care and culturally responsive pedagogy in online settings* (pp. 125-147). Hershey, PA: IGI Global.

Hedtrich, S., & Graulich, N. (2018). Using software tools to provide students in large classes with individualized formative feedback. *Journal of Chemical Education*, *95*(12), 2263–2267.

Hill, P. (2015). LMS is the minivan of education (and other thoughts from #LILI15) -. Retrieved June 9, 2019, from http://eliterate.us/lms-is-the-minivan-of-education-and-other-thoughts-from-lili15/

IMS Global Learning Consortium. (2019). Learning tools interoperability. Retrieved June 9, 2019, from http://www.imsglobal.org/activity/learning-tools-interoperability

International Futures (2016). Instructional design in higher education. Retrieved June 1, 2019, from http://intentionalfutures.com/wp-content/uploads/2017/08/Instructional-Design-in-Higher-Education-Report.pdf

Jarvis, W. (2019, July 17). A textbook giant is going 'digital first.' That might not be good for affordability. *The Chronicle of Higher Education*. Retrieved July 18, 2019, from http://www.chronicle.com/article/A-Textbook-Giant-Is-Going/246717

Jester, N. (2018). Representation within higher education curricula: Contextualising and advocating for feminist digital activism. *Teaching in Higher Education*, *23*(5), 606–618.

Kowch, E. G. (2018). Designing and leading learning ecosystems: Challenges and opportunities. *TechTrends*, *62*(2), 132–134.

Legon, R., & Garrett, R. (2017). The changing landscape of online education (CHLOE): Quality

Matters and Eduventures survey of chief online officers, 2017. Retrieved July 12, 2019, from http://www.qualitymatters.org/node/1040

Li, L.-Y., & Tsai, C.-C. (2017). Accessing online learning material: Quantitative behavior patterns and their effects on motivation and learning performance. *Computers & Education*, *114*, 286–297.

MarketsandMarkets. (2019). LMS market worth $22.4 billion by 2023. Retrieved June 9, 2019, from http://www.marketsandmarkets.com/PressReleases/learning-management-systems.asp

Mercer-Mapstone, L., & Mercer, G. (2018). A dialogue between partnership and feminism: Deconstructing power and exclusion in higher education. *Teaching in Higher Education*, *23*(1), 137–143.

Morris, S. M. (2017). Critical digital pedagogy and design. Retrieved June 5, 2019, from http://www.seanmichaelmorris.com/critical-digital-pedagogy-and-design/

National Center for Education Statistics (2018). Number of faculty in degree-granting postsecondary institutions. *Digest of education statistics*. Retrieved June 9, 2019, from http://nces.ed.gov/programs/digest/d17/tables/dt17_315.10.asp

National Digital Inclusion Alliance. (2019). NDIA: Definitions. Retrieved June 10, 2019, from http://www.digitalinclusion.org/definitions/

Noguera, I., Guerrero-Roldán, A.-E., & Masó, R. (2018). Collaborative agile learning in online environments: Strategies for improving team regulation and project management. *Computers & Education*, *116*, 110–129.

Pomerantz, J., & Brooks, D. C. (2017). *ECAR Study of Faculty and Information Technology 2018*. Louisville, CO: ECAR.

Puroway, A. W. (2016). Critical advising: A Freirian-inspired approach. *NACADA Journal*, *36*(2), 4–10.

Rhode, J., Richter, S., Gowen, P., Miller, T., & Wills, C. (2017). Understanding faculty use of the learning management system. *Online Learning*, *21*(3).

Richardson, J. C., Ashby, I. N., Alshammari, A. S., Cheng, Z. E., Johnson, B., Krause, T., . . . Wang, H. (2018). Faculty and instructional designers on building successful collaborative relationships. *Educational Technology Research and Development, 67*(4), 1-26.

Ritzhaupt, A., & Kumar, S. (2015). Knowledge and skills needed by instructional designers in higher education. *Performance Improvement Quarterly, 28*(3), 51-69.

Shay, S., & Peseta, T. (2016). A socially just curriculum reform agenda. *Teaching in Higher Education*, *21*(4), 361–366.

Strommel, J. (2017). If bell hooks made an LMS: Grades, radical openness, and domain of one's own. Retrieved June 5, 2019, from http://www.jessestommel.com/if-bell-hooks-made-an-lms-grades-radical-openness-and-domain-of-ones-own/

Tumbleson, B., Burke, J., & Long, J. (2019). Assessment, analytics, and analysis: Demonstrating the impact of LMS embedded librarians on student learning. *Journal of Library and Information Services in Distance Learning*, *13*(1–2), 196–214.

Vitez, K. Open 101: An action plan for affordable textbooks (Student PIRGs report). Retrieved July 18, 2019, from http://studentpirgs.org/2006/08/01/textbooks-21st-century/

Watty, K., McKay, J., & Ngo, L. (2016). Innovators or inhibitors? Accounting faculty resistance to new educational technologies in higher education. *Journal of Accounting Education*, *36*, 1–15.

You, J. W. (2016). Identifying significant indicators using LMS data to predict course achievement in online learning. *Internet and Higher Education, 29*, 23-30.

Ziegler, A. (2019). Framework + digital badges = online instruction for today. *Journal of Library & Information Services in Distance Learning*, *13*(1–2), 235–241.

This article was originally published in TechTrends, May 2020.
The final publication is available via SharedIt: https://rdcu.be/ch3H4