

Techniques for Fostering Self-Regulated Learning via Learning Management Systems in On-Campus and Online Courses

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Abstract: Self-regulated learning has become an important component of education, both as a primary tool in online coursework and as a supplemental resource in face-to-face courses. Yet despite its importance, research suggests that rather than utilizing the full potential of learning management and course management systems, instructors primarily use them as a delivery mode for course content. Such underutilization limits the opportunities for students to engage in multimodal self-regulated learning. This article offers three techniques to implement fuller utilization of learning management systems (LMSs) and thus improve self-regulated learning: flipped learning, chunking, and microlearning. Research findings have led to support for each of these techniques. The authors provide examples of techniques used in their own courses and discuss how each facilitates self-regulated learning by utilizing the full capabilities of an LMS. Common findings and recommendations are also noted, with the goal of providing a framework for instructors to apply each technique via an LMS in their own courses.

Keywords: learning management system, self-regulated learning, chunking, flipped learning, microlearning.

Students who attend institutions of higher learning are often required to use a learning management system (LMS). These resources may be used to provide students with syllabi or course handouts; they may direct students to online resources or library guides; and they often supplement online instruction by breaking material into manageable modules through which students can work to master subject matter. Yet despite their importance, research suggests that rather than utilizing the full potential of LMSs and course management systems, instructors primarily use LMSs as a delivery mode for course content (Boekaerts, 1997; Vovides et al., 2007). The rapid shift to all-online learning driven by the COVID-19 pandemic put into stark relief some concerns about this use (Lederman, 2020) for instructors and students alike. For instance, faculty have noticed difficulties in their course delivery, as students sometimes claim they are unsure of what to do next. While there may be many explanations for this constellation of problems, one possibility is that underutilization of LMS tools limits the potential for students to participate in self-regulated learning. Enhancing the use of LMS resources may thus improve the ways that instructors can guide students through the learning process.

As faculty members from different disciplines at the same institution, we were struck by the idea that instructors on our campus are expected to use an LMS and yet some do not maximize their use of that resource to enhance student learning. Perhaps some faculty have limited training on how to enhance their use of an LMS. Others might believe that they are well trained in the uses of an LMS but in actuality use the system as they would a file cabinet in the corner of their office, that is, as a repository for course handouts or supplements that are seldom moved or used, save for brief consultation. Instructors may also have assumed that students have been trained in how to use an LMS and should thus know where, how, and when to obtain course materials. Some have expressed

impatience when students ask questions about how to locate and use materials. As well, some faculty members have either not sought or have not benefited from institutional training and support that would maximize the potential benefits of an LMS, and others have commented negatively on LMSs and online education generally (Walker et al., 2016; Zheng et al., 2018).

Such experiences led us to consider the ways in which instructors might improve their use of an LMS in their courses to better facilitate students' efforts at self-regulated learning and increase student engagement with course content. While we offer a few examples here of ways to more fully utilize an LMS that should integrate with almost any approach to instruction, the possibilities are endless. Instructors' training varies, and the technologies associated with each LMS often change rapidly. For these reasons, for any course we suggest a synthesis of known effective teaching techniques along with a deeper use of the LMS.

Literature Review

Self-regulated learning has become an important component of education, both as a primary tool in online coursework and as a supplemental resource in traditional face-to-face courses (Boekaerts, 1999). Boekaerts (1997, p. 161) defined this learning style as “a complex interactive process involving not only cognitive self-regulation but also motivational self-regulation.” At its core it involves teaching students how to teach themselves, which educators and practitioners both view as a vital skill in the workforce. Rather than adhering to the traditional model of instructors as experts and students as novices typified by autocratic lecturing, self-regulated learning assumes students have the capacity to educate themselves, with the instructor serving as a facilitator for the educational process. Stated more simply, self-regulated learning provides students with a roadmap for how to learn rather than focusing on specific course content. This is not to say that content does not matter. Ultimately, it is the job of all educators to make sure their students understand the material to which they are exposed. However, it is the delivery of this material that distinguishes self-regulated learning from its more traditional predecessors.

LMSs have emerged as effective tools for instructors adhering to the self-regulated learning model. These management systems (e.g., Blackboard, Canvas, eCollege, Angel, and D2L, among others) are software programs and platforms that host online tools to aid students in the learning process and manage course content (Vovides et al., 2007). The use of LMSs in higher education has risen steadily since the late 1990s. While much of this growth coincides with the growth of online education, LMSs are also used as supplemental resources for traditional face-to-face classes and as cornerstones of hybrid courses (Garnham & Kaleta, 2002). Mayer and others (Mayer, 2009; Moreno & Mayer, 2007) have emphasized the cognitive issues that arise with these learning formats and stressed the importance of designing courses that reduce the burdens of processing complex sources of information.

The recent reliance on online instruction due to the COVID-19 pandemic has revealed concerns about the effectiveness of online delivery. In some polls, a strong majority of students felt that online course delivery had not offered them a quality educational experience. Eric Fredericksen, associate vice president for online learning at the University of Rochester, expressed fear that the technologies used for higher education may transform higher education “in an evolutionary way, not a revolutionary way” (as cited in Lederman, 2020; Marcus, 2020; Trovato, 2020). While there are many explanations for these negative views, one possibility is that LMSs have not been utilized as fully as they could be. LMSs offer students a host of opportunities to engage in self-regulated learning. Among the many techniques for engaging students, three pair well with the LMS technology: flipped learning, chunking, and microlearning. (Major & Calandrino, 2018; Miller, 1956; Nwosisi et al., 2016).

Flipped learning is a type of blended learning in which students review course content outside of class meetings. This model is sometimes called the flipped classroom, backward classroom, reverse teaching, or the Thayer method. Material may include readings, videos, online lectures, and other sources (Nwosisi et al., 2016). Class time is typically reserved for discussion and working on assignments related to the content covered, and (in contrast to traditional lecturing) dialogue tends to be more organic in nature. Students may be given the responsibility of providing short lectures or presentations or of contributing smaller segments to a broader conversation. Flipped learning has become a widely accepted learning model in higher education. It pairs well with LMSs not only because the systems provide a delivery mode for course content but also because flipped learning utilizes the various components typically found in the systems (modules, library resources, online lectures, videos, discussion boards, etc.) to aid in the self-regulated learning process. In addition, studies have found that students favor the approach (O’Flaherty & Phillips, 2015) and that flipping the delivery of course content is beneficial to students, leading to better mastery of learning outcomes (Nwosisi et al., 2016).

Chunking is a concept identified by George Miller (1956) in his seminal work, “The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information.” While the crux of Miller’s paper focused on attention span and “cognitive overload,” the implications of this study led to chunking as a learning technique. Through his evaluation of previous studies, Miller found that people can hold seven (plus or minus two) chunks of information in mind at a time. And while the “magical number” has varied since his initial findings (with more recent studies suggesting a lower number), the concept of chunking has received additional empirical support (Gobet & Clarkson, 2010; Warfield, 1988). Mayer’s work complements these findings with its emphasis on the importance of multimedia course design. For Mayer, a “dynamic organization” of verbal, auditory, and pictorial information will help students integrate new information to complement prior knowledge (Mayer, 2009).

The technique of chunking involves exposing students to concepts, themes, and materials incrementally, with the underlying assumption that doing so in chunks (smaller segments) will boost attention span and avoid cognitive fatigue, thereby helping students retain the content better. LMS platforms offer educators multiple tools to deliver these chunks via the same technologies that make flipped learning a natural partner of learning management and course management systems (e.g., library resources and the like, mentioned above). Because of the overlap between flipped learning and chunking, the two techniques work well together, further maximizing the capacities of LMSs.

Borrowing from Miller’s (1956) concept of chunking, microlearning, sometimes referred to as bite-sized learning, is an approach in which students are exposed to and learn course content in “nuggets that are just the right size for cognitive processing” (Major & Calandrino, 2018). This approach complements the cognitive research offered by Mayer and others, which emphasizes “reducing the load for a single processing channel” (quotation from Mayer, 2009; see also Moreno & Mayer, 2007). A related instructional approach is microteaching, a technique originated in the field of teacher education that involves teacher-trainees presenting short lessons in class, followed by feedback from both the instructor and the teacher-trainees’ classmates (Kourieos, 2016; Richards & Farrell, 2011). Microlearning engages students to “solve a problem, direct their own learning, apply their knowledge, or connect with others” (Major & Calandrino, 2018).

LMS platforms provide instructors with the same set of tools as those for flipped learning and chunking that facilitate the efficacy of microlearning. While any of these tools can be used as the sole mode of delivery for a given lesson, they can also be used in conjunction with other tools as a way to supplement or complement content covered elsewhere on the platform. Moreover, several studies have shown support for the value of these tools in enhancing collaborative learning and providing a catalyst for reflection (Kourieos, 2016). Thus, while chunking encourages instructors to consider how to break information down into digestible segments, microlearning adds another important goal:

Instructors should also consider the process by which they are helping students master larger learning objectives. When bite-sized segments are connected to larger learning objectives, this approach has also gained support among instructors.

Implementation

In spite of many faculty members' awareness of the uses of technology in the classroom, few have made full use of their institution's LMS (Boekaerts, 1997; Vovides et al., 2007). For some instructors, this seems daunting, and most are familiar with the challenges that can arise when implementing such platforms in the classroom setting. Students who are directed to the LMS or who are asked to report back about an element of the course might not engage with those instructions, or they might say that they did not understand the instructions or did not have access to a computer. Yet faculty can use the LMS to set high standards and to cultivate responsibility. Many are already familiar with some basic approaches. In a preclass chat, if students report that they did not know how to find the materials in question, the faculty member can open up the LMS to demonstrate where to locate materials. They can ask a student to open up the LMS on their phone and narrate (or illustrate by projecting images of their LMS home page) where to locate materials to ensure that students learn how to complete such tasks on their own. Another benefit of such efforts is that they may encourage or improve peer-to-peer interactions in the class. Students who struggle with a skill appreciate modeling their efforts on how other students approach similar problems. As well, faculty members can demonstrate the importance of using the LMS by using low-stakes reminders in their classes: simple queries, short quizzes, or requesting private messages for status updates can all encourage dialogue about any developing assignment. Most of these introductory tasks take very little time and will set the stage for enhancing students' independent efforts on formal assignments in class.

Flipped Learning

Flipped learning can be used in combination with an LMS in the discipline of criminal justice. Consider a course on correctional ideologies in the United States that uses a well-known textbook in the field (Allen et al., 2016) to address five correctional ideologies: retribution, deterrence, incapacitation, rehabilitation, and restoration. As is the case with topics in many introductory resources, the correctional ideologies addressed in the textbook typically sacrifice depth for breadth. Textbook-led lecturing would cover the correctional ideologies, but only to the minimal depth the book provides. By employing flipped learning and using the full array of LMS tools, instructors can add additional depth to topics as they see fit. For instance, a traditional reading assignment might be supplemented with additional content for each ideology (e.g., videos, online journal articles) that is accessible from the university library's webpage via the LMS. This supplemental material exposes student to the theories behind the ideology and to empirical studies of its effectiveness. Such supplemental resources can be optional or required, at the instructor's discretion. The LMS can then foster deeper discussion: Questions can be provided on the LMS and students can work together to answer them during in-class discussions. These questions often pique the students' interest and lead to additional questions, resulting in a deeper appreciation of correctional ideologies than the textbook alone offers. By using the LMS both during regular class sessions and outside of class, students are guided into deeper thinking about the subjects they address.

It is worth noting that covering topics in such detail can take additional time, and occasionally a given class expresses interest in learning more about one or more topics. To improve responsiveness to such requests, "flex time" can be built into syllabi. For a semester-long (15- or 16-week) course, 1 or 2 weeks of flex time can be built in to the class schedule to accommodate additional student inquiry.

These events can be preplanned or can occur organically, and as long as the time is built in to the instructor's course schedule in advance, it does not matter when it is used. The faculty member can thus use the LMS to inspire deeper conversation about course material. Students assume greater responsibility in preparing for discussions and in using the LMS to build their arguments about the topics at hand. Instructors can customize the use of LMS tools as they see fit based on their disciplines, interests, and teaching styles, providing themselves with added flexibility while enriching their students' experiences both within and outside the classroom.

Chunking

Chunking is an instructional method in which students are exposed to course content in smaller, manageable segments, with the goal of helping students to understand complex concepts. Some use this method very well in online instruction, helping students wade through modules one step at a time (Major & Calandrino, 2018). They might use the LMS in a traditional way, providing students with important materials to help them prepare for major assignments. Yet many instructors simply ask students if they have questions, or they remind students that those materials are available.

To improve the ways that students use an LMS, a history course at our university devised a way to help students review material for upcoming exams and guide them through the steps of preparing an essay. The sequence often works well for students in introductory ("survey") courses, who may not know how to write an essay for history. In this class, the faculty member refers students to the LMS assignment page, which includes a description of how to write an essay and provides a review sheet that helps students to consider how to organize an essay about the material covered in class. The review sheet provides sample questions that might appear on the exam. The instructor announces that the students will be asked additional questions about that assignment in the next class meeting.

In the next class meeting, students are reminded that the exam questions are available, and further questions encourage them to break down the process of preparing a long essay. In the following class, a series of words on a PowerPoint screen are presented and students are asked, "based on the descriptions provided on the essay guidelines sheet, which of these is likely to count as a specific example?" Students reply—and not always correctly—and usually this results in peer-to-peer discussion about accumulating evidence and finding materials that will earn them more points on the exam. All the while, many have the essay guide open on their cell phones or laptops, and they refer to specific statements in those materials to foster a new sense of mission in preparing for the exam. In subsequent class meetings, students are reminded again about the exam and the review materials and urged to develop their "story line." Finally, after having generated a list of examples, the class returns to the review materials to focus on argumentation. At the end of any lecture, the instructor may point out how varied the examples were and then encourage students to consider ways to offer analytical comments that connects this material back to the questions that they can see in the review materials. Keeping the LMS available helps refer students back to their analytical objective ("does that comment really explain how and why your opinion is reasonable?"). The benefit of this approach is that the instructor can model ways in which an effective essay should be prepared and can help students with their rudimentary efforts at accumulating evidence or argumentation. As well, the instructor encourages students to break down preparations into smaller chunks. Finally, the instructor fosters student responsibility in those preparations, often encouraging student interaction in considering different approaches to an assignment. Students may interact with each other or the instructor to review course content and to practice argumentation.

This particular class is offered twice each semester by a full-time faculty member. Over time, as chunking was implemented, the student culture appeared to change. More students came to class

early to ask questions about preparing suitable examples. Others came to office hours or sent emails that demonstrated they were referring more frequently to the materials available in the LMS. In this case, enhancing the use of an LMS to illustrate to students how they might engage in self-regulation of their own learning demonstrated improved results. As illustrated in Table 1, a much greater proportion of the class spent more time on the exam. While recognizing the inferential limitations of quasi-experimental designs and small sample sizes, this observation is still noteworthy, particularly given the consistent positive correlation between time spent on the exam and average total score. Equally important, the higher average score in each group and the larger proportion of students earning higher grades (particularly in the “late” group) suggest that many students were able to independently regulate their own learning, with overall positive results for the class.

Table 1. Differences in student exam performance before and after implementing chunking.

Time spent on the exam (of 75 min)	Prior to implementing chunking			After implementing chunking		
	<i>N</i> (%)	Range of scores (%)	Average total score (%)	<i>N</i> (%)	Range of scores (%)	Average total score (%)
“Low” (≤ 55 min)	14 (34.15)	64–73	69.21	3 (10.71)	61–91	74.00
“Medium” (56–65 min)	17 (41.47)	64–86	76.00	5 (17.86)	72–86	76.20
“High” (66–75 min)	10 (24.39)	71–100	76.71	20 (71.43)	71–90	79.45

In addition, regular references to the LMS can assist with keeping students on course. Casual banter before the class begins, messaged reminders about “where you should be” in preparations, and encouraging students to report difficulties all inspire further discussion in class. For example, a student might blurt out, “So wait... I don’t get how you can use analysis to fit this material into Question 2. [Based on the materials provided in the LMS,] how could a person connect this topic to the question you asked?” Such queries turn into further opportunities to break down the process of writing an essay. The guidelines are present, so students can target specific skills such as accumulating evidence or refining analysis, and they can do so in ways that encourage experimentation and collaboration in the classroom. Over the past few years in this history “survey” course, students have referred to the rubrics when they ask questions, and the quality of essays has generally improved, especially regarding the use of specific detail, in accordance with the review sheet’s instructions about examples (see Table 1). While the method has required some effort in the class setting, it should also be noted that since rubrics provide characteristics of A, B, C, D, and F marks (with point ranges), students have not appealed the grades that they earned in this course for over 6 years. Most were aware of the particular skills they performed well (or which skills they may have needed to develop further), and the rubric helped them frame questions about how to approach their writing as the semester progressed. The LMS is thus a constant companion that helps students work at smaller skills that will be combined on the day of an exam.

Microlearning

Microlearning is a pedagogical style in which instructors expose students to course content in short doses (Major & Calandrino, 2018). The rationale for microlearning is that delivering course content

in brief segments makes it easier for students to consume and comprehend. LMSs enhance the opportunities to utilize this technique by providing instructors with channels by which to educate and engage their students outside of the classroom. For example, one topic covered in several criminal justice courses is capital punishment. Opinions about capital punishment vary widely based on individual thoughts, values, and beliefs, and these opinions are often rooted in emotion, not evidence. For instance, it is a common misconception that the death penalty is less expensive than life without parole, and it is also a common misconception that it is a valid deterrent against serious crime. Sentencing disparity and error (both wrongful convictions and wrongful executions) are also major concerns associated with the practice, and yet these topics are often covered superficially if at all. Finally, pro-capital-punishment perspectives should also be examined, including retribution and victim satisfaction. There are several undergraduate textbooks that summarize capital punishment effectively in a single chapter, but for empirical evidence and an explanation of it, a more in-depth look at the pros and cons of capital punishment may be desired.

For a complex topic such as this, modules for each subtopic of capital punishment (cost effectiveness, deterrent effect, sentencing disparity, wrongful convictions and executions, retribution, and victim satisfaction) can be assembled. Modules may enact microlearning by offering short online lectures, videos, and webpages to share the data behind each subtopic, explanations of the data, and whether the data provide support for or raise questions about the use of capital punishment as a sanction. Discussions led by guided questions from the instructor can also be created within the modules (or in class meetings) to facilitate dialogue and reflection among students. Depending on individual preference, an instructor can assign one to two modules a day, using them to supplement the content from the book chapter. These modules, while shorter in duration than many traditional LMS course segments, allow students to examine important factors relating to the use of capital punishment with more depth and focus than textbooks alone do. In addition, the modules facilitate self-regulated learning and encourage students to apply their knowledge and engage with colleagues in the class, all of which are hallmarks of microlearning (Major & Calandrino, 2018). By exposing students to microlearning opportunities, this approach inspires application as well, since it fosters deeper in-class discussions in which students may improve their developing knowledge about topics that have significant real-world applications.

Conclusions

LMSs are frequently employed in postsecondary education, and yet their current use is limited by some teaching faculty to mere storage of course materials and grades. The methods presented here are only a few of the many ways in which instructors can enhance student educational activities by increasing individual responsibility, enhancing self-regulated learning, and improving students' engagement with complex topics and skills. Beyond providing students with resources, the more active use of an LMS in class settings can lead to significant improvements in self-regulated learning. As these examples show, enhancing the ways in which an LMS is employed can improve students' inquiry and application skills, guide students through the process of learning, and thus heighten their responsibility in their own learning processes.

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