Designing Effective Pedagogical Approaches with Next-Generation LMS for Students in Higher Education

Thanomporn Laohajaratsang
Information Technology Service Center and Faculty of Education
Chiang Mai University, Thailand

Abstract

This research examines a selection of academic articles, existing evidence, and early indications of newly-designed Learning Management System (LMS) tools/functions, and then analyzes and synthesizes the concepts to form a thorough description of the components within the concept of next-generation LMS. The comparison of conventional LMS and next-generation LMS was undertaken by considering nine issues. The result of the examination identified six major components of next-generation LMS including 1) Learning Tools Interoperability (LTI)/other integration standards 2) analytics, advice and learning assessment 3) social media design formats, such as Facebook wall format, posting, "like", e-portfolio, and others 4) mobile-first attributes/smart phone elements of content and functionality 5) game components/rewards for motivation, and 6) Artificial Intelligence (AI) functions. Among major LMS platforms, CourseNetworking was selected as the best example of a next-generation learning platform and the research tool to design an effective learning approaches model around it. A qualitative finding related to next-generation LMS (CourseNetworking) usage is reported. Data from the interviews supports the concept of the six major attributes of next-generation LMS. Lastly, the research focuses on an effective pedagogical approaches model for next-generation LMS, based upon two prevailing methods, personal learning environment (PLE) with self-regulated learning and socially-mediated learning.

Keywords: Next-Generation LMS, Effective Pedagogical Approaches, Higher Education

Next-Generation Learning Management System (LMS)

For the past two decades, Learning Management System (LMS) has remained the most popular academic application among higher educational institutes (Brown et al., 2015). Despite its widespread use in higher education, more and more educators are voicing frustration about LMS as it is focused on faculty's course delivery and administration rather than student learning process and activities (Brown & Adler, 2008; Harasim, 1999; Jafari & Baylor, 2012; Marra & Jonassen, 2001; McLoughlin & Lee, 2010; Valjataga, Pata, & Tammets, 2011). LMS is inflexible and not well-suited to newer approaches to learning and teaching that reach beyond the course and instructor-centered perspectives of the past (Downes, 2005; Feldstein 2017a; Mott & Wiley 2009; Straumsheim, 2015).

Higher education around the world is now trying hard to transform teaching and learning from its traditional emphasis on teaching and the instructor to a new focus on learning and the learner. It is also trying to move away from a standard course model for courses, experimenting, instead, with a variety of more flexible learning models. As the most widely-used academic application, LMS needs to be supplemented with and/or replaced by a new digital architecture and new learning components that contribute to and enable the transition that higher education is currently experiencing. Pedagogical-wise, the next-generation LMS must offer a learning environment that is not merely personalized and collaborative but also flexible, intuitive and data-driven. Technology-wise, it must be interoperable and integrative, as well as capable of incorporating learner analytic functions to enable learners to customize their LMS, to set personal educational goals, to make good decisions along their educational paths, to move freely between public and private online spaces, and to capture collaborations flexibly and ubiquitously. (Brown et al., 2015; Downes, 2005; Feldstein 2017a; Mott & Wiley 2009; Open Academic Environment, 2017; Straumsheim, 2015).

Conventional LMS Versus Next-Generation LMS

In order to give a clearer picture of the next-generation LMS, a comparison of conventional LMS and next-generation LMS was undertaken by considering nine issues. The comparison can be summarized as follows:

Table 1: Major Differences between Conventional LMS and Next-Generation LMS

Issues	**Conventional LMS**	**Next-Generation LMS**
Main Features/ Functions	Course delivery and management tools	Course delivery and management tools & social networking tools
Centeredness	Content-centric, knowledge push approach	Learner-centric, offers both knowledge push and knowledge pull approach

Issues	Conventional LMS	Next-Generation LMS
Types of Learning Supported by LMS	Formal learning	Formal, informal, and life-long learning
Types of Tools	Pre-defined selection of tools	A variety of tools for learners to choose from, according to their needs
Structure	One-Size-fits-all	Interoperable, personalized, and flexible
System Design Concept	Centralized, closed and bounded; structured, heavy, rigid	Distributed, loosely coupled and open, free-form, lightweight, flexible
Look and Feel	Formal Tone	Social media format, fun, effective and easy-to-use UX, UI
Next-Generation Functionality	Limited or not available	Smart and personalized learning tools

Table 1 summarizes a comparison between conventional LMS and next-generation LMS based on nine issues: main features/ functions, centeredness, learning design process, types of learning support, types of tools, structure, system design concept, look and feel, and, lastly, next-generation functionality.

I. Main focus

Conventional LMS focuses on course delivery and management. The emphasis is put on institutional and instructor efficiency and convenience, not student participation and learning (Mott & Wiley, 2009). Meanwhile, Next-Generation LMS provides not only support for course administration, but also generates new learning opportunities via other specialized learning tools/applications that students prefer. With integration standards like the IMS Learning Tools Interoperability (LTI), or other integration standards, such as JS widgets, webhooks, xAPI, Zapier integrations (and API calls to support the concept), integrated next-generation LMS can incorporate a variety of student tools/applications which can promote learner-generated content as well as content sharing opportunities.

II. Centeredness

Conventional LMS is content-centric and supports knowledge push approach. Next-generation LMS is learner-centric and promotes knowledge pull approach. As mentioned above, a next-generation LMS can integrate with a variety of tools to make a custom platform via the use of LTI or other

integration standards (Brown et al., 2015; Feldstein, 2017b). Therefore, learners are free to customize their LMS by choosing their favorite tools and applications. They can also gain access to vast amounts of online resources available, select the required information and customize it to their learning needs. Next-generation LMS allows students to set their own goals, direct, regulate, monitor, and assess their own learning.

III. Learning design process

In terms of the learning design process, conventional LMS focuses on top-down, hierarchical, command-control and one-way flow of knowledge (mainly from faculty to students). Meanwhile, the learning design process of next-generation LMS promotes bottom-up, emergent and symmetric relationships (Mottt & Wiley, 2009). With next-generation LMS, a large number of learners can join online learning and discussion both synchronously and asynchronously, from around the world. Students can move freely between public and private online spaces and support collaborations flexibly and ubiquitously (Jafari & Baylor, 2012).

IV. Types of learning supported by LMS

Conventional LMS supports formal learning whereas next-generation LMS, benefiting from the affordances of social learning and other innovative learning tools/applications, promotes not only formal learning, but also informal and life-long learning (Mottt & Wiley, 2009). Students can generate content, communicate their ideas, and freely choose to share ideas with faculty, colleagues and/or a broader community. Learning supported by next-generation LMS is uninterrupted and life-long because it allows students learning continuity in conjunction with their social networks. Next-generation LMS also promotes the connections between learners, instructors, content, and a broader community across semesters, classes, programs and institutions (Brown et al., 2015).

V. Types of tools

While conventional LMS consists of pre-defined selection of tools, next-generation LMS allows learners to integrate a variety of tools according to their needs or preferences (Feldstein, 2017a). Examples of plugged-in tools/applications for next-generation LMS range from Web2.0 tools, social media and OER resources such as Facebook, Blogs, Wiki, open-content, MERLOT, MOOC to innovative learning tools such as CN, Piazza or Perusall, and others.

VI. Structure

Conventional LMS is designed under a one-size-fits-all design concept. Meanwhile, next-generation LMS is developed with flexible and personalized design structure (Brown et al., 2015). Next-generation LMS makes use of students' analytic data based on their test scores/quizzes and data connected to their learning behaviors to analyze and offer customized feedback or instruction. In

addition, next-generation LMS supports blended and ubiquitous learning. Students can access Next-Generation LMS conveniently and easily via mobile device. Two important components in personalizing next-generation LMS are the learner analytic function and the mobile accessibility function.

VII. System format

In an attempt to provide every application and tool available within a single LMS, conventional LMS today has become centralized, closed, structured, heavy and rigid while next-generation LMS is distributed, open, free-form, lightweight and flexible to correspond with the notion that the best strategy of tool-making is to offer a variety of specialized tools simultaneously, rather than trying to make one single tool that attempts to accomplish everything (Dede, 2008).

VIII. Look and Feel

Since the new generation of learners is deeply steeped in the culture of social media and games, in order to engage them, alternative interface design (User-eXperience (UX) and User-Interface (UI)) must be used for next-generation LMS. Conventional LMS supports formal faculty-designed course structure that limits UX and UI. Meanwhile, next-generation LMS highlights student contributions, and, therefore, course structure is devoted to a user-friendly running list of students' posts, and reflections on posts, similar to a Facebook "wall." Also, next-generation LMS stresses the motivational aspect. Using game design format, next-generation LMS that incorporates gamification (or game) with awards, badges, certificates, and other components in the design can be highly motivating and helps keep students engaged in their learning (Jafari & Baylor, 2012).

IX. Next-generation functionality

Last but not least, so-called "**next-generation LMS"** must incorporate **learning tools of the Future**. Because conventional LMS is mainly focusing on course management and delivery, it makes little or no use of next-generation tools/functions; as a result, students are provided with a "one-size-fits-all" learning environment. However, one of the goals of next-generation LMS is to translate teaching and learning into a smart and engaging learning environment for students (Brown et al., 2015). Purdue's Course Signals, or Blackboard's Retention Center (early warning tools for faculties on students who need assistance) and Dashboard (learning analytics) provide existing examples of next-generation functions. However, next-generation LMS is expected to provide an even more personalized learning experience in the near future. It will have the capability to think, reason and learn (Jafari, 2017). It is expected that intelligent agent-based tools/functions/features offering a totally personalized learning space for each student in higher education will be incorporated in next-generation LMS very soon.

Next-Generation LMS Tools/Functions

The notion of next-generation LMS is not a new idea. Groups of thought leaders such as Educause Learning (Brown et al., 2015), SURF Foundation in Netherlands, Downes (2006), Mott and Wiley (2009), Jafari & Baylor (2012), Weiss (2015), Feldstein (2017b), have already begun to propose alternatives to LMS. Generally, the solutions suggested are presented as more component-based, offering a greater degree of flexibility together with the potential for a more topic-centered or discipline-centered focus (rather than course-centered focus). They also suggest the next-generation LMS must support personalization, encourage student-centered learning and expansive learning by creating more connections between learners, instructors, content, and the broader community across semesters and across classes, programs, and institutional boundaries. In addition, next-generation LMS must generate new learning opportunities for students and promote effective pedagogical approaches.

In order to make this happen, several suggestions have been made by thought leaders (Baker, 2017; Brown & Millichap, 2015; Conde et al., 2014; Feldstein, 2017a; Fournier & Kop, 2010; Franciso et al., 2014; Henri & Charlier, 2010; Weiss, 2015) including the use of 1) LTI or Learning Tools Interoperability (LTI) or other integration standards 2) analytics, advising and learning assessment 3) social media design formats such as Facebook wall format, posting, e-portfolio etc. 4) mobile-first attributes, or smart phone elements of content and functionality 5) game components or rewards for motivation, and 6) artificial intelligence (A.I.) functions to provide students with personalized learning experiences.

Hence, it is deemed necessary for us, educators, to seek learning solutions that incorporate these components, and to design effective pedagogical approaches with the platforms for our higher education students.

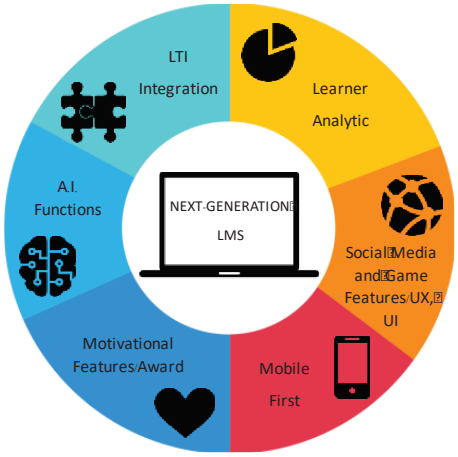

Figure 1: Six Essential Components of Next-Generation LMS

THE CN: The Next-Generation LMS

In order to make the concept of next-generation LMS more concrete, it is necessary for the researcher to identify an LMS that currently incorporates future elements of the next-generation LMS. Among LMS platforms that have been grounded in modern instructional theories, it was found that the LMS "CourseNetworking" (or CN) prevails as the best example of a next-generation learning platform (Figure 2). This is because CourseNetworking (CN) adopts the design concepts and components which characterize learning management systems of the future.

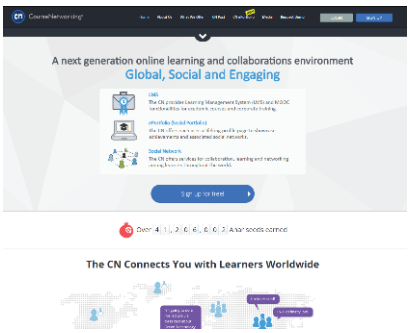

Figure 2: CourseNetworking or CN

Table 2 explains the relationship between next-generation LMS characteristics and CN Tools with expected learning benefits.

Table 2: Relationship between next-generation LMS characteristics and CN Tools with Expected Learning Benefits

Issues	Next-Generation LMS	Next-Generation LMS Tools/ Functions (CN)	Expected Learning Benefits
Main Features/ Functions	Not only supporting course administration, but also generating new learning opportunities via other specialized learning tools/applications that students prefer	-LTI (Learning Tools Interoperability) integration, allowing it to exchange information with other educational applications - Concept design with social networking as the foundation for learning; for example, working area is devoted to a running list of students' posts and reflections on posts. The appearance is similar to a Facebook "wall."	New learning opportunities with social networking as the foundation for learning

Issues	Next-Generation LMS	Next-Generation LMS Tools/ Functions (CN)	Expected Learning Benefits
Learning Design Process	Bottom-up, emergent, and symmetric relationships	Learning design is organized a way that promotes student-centered, expansive, and intercultural learning. Topic- or discipline-centered focus (rather than course-centered).	Students can customize their LMS, set personal educational goals, make informed decisions along their educational paths, and move freely between public and private online spaces.
Types of Learning Supported by LMS	Formal, informal, and life-long learning	With social media as the foundation for development, all three types of learning are promoted. With a social space design, students' informal collaboration and connections are encouraged.	Students can benefit from the affordances of social media. Learning can occur across semesters, classes, programs and institutions.
Types of Tools	Allowing a variety of tools to plug-in by LTI or other integration standards	LTI and SCORM interoperability integration	Students can customize their LMS and gain access to their favorite tools/ applications.
System Design Concept	Distributed, loosely coupled and open, free-form, lightweight, flexible	A lightweight platform that can integrate with repository, teaching and learning, and networking features	Students can enjoy all the integrated features to learn and collaborate with their social networks openly and freely.
Structure	Interoperable, personalized, flexible and ubiquitous learning	Analytic tools, system for tracking student activities (called Anar Seed), and Mobile app version	Students can enjoy personalized instruction/feedback from the instructors and access learning via mobile device 24/7.
Look and Feel	Social media format, fun, and easy-to-use user interface and user experience (UI, UX)	Looks and feels like social media with Facebook user Interface and User Experience (UI, UX)	Students are engaged, resulting in more meaningful learning.

Issues	Next-Generation LMS	Next-Generation LMS Tools/ Functions (CN)	Expected Learning Benefits
Next-Generation/ Artificial Intelligence Functions	Offer newly-designed smart functions	Personalized learning agent called "Rumi", which can play the role of digital mentor, personal teaching assistant, and a mobile classmate.	A smart 'recommender' system guides students and recommends relevant information and/or pedagogical tools to assist learners in the design of their personalized learning.

From Table 2: Course Networking (or CN) has not only integrated the nine issues of next-generation LMS design attributes and elements, but also has acquired all six essential components suggested by thought leaders which are 1) Learning Tools Interoperability (LTI) or other integration standards 2) analytics, advice, and learning assessment 3) social media design format such as Facebook wall format, posting, "like", e-portfolio, and more 4) mobile-first attributes. or smart phone elements of content and functionality 5) game components or rewards for motivation, and 6) Artificial Intelligence (AI) functions. Therefore, in this research study, the researcher selected CourseNetworking (or CN) as the research tool in order to design effective learning approaches around it and investigate how the newly-designed learning approaches with the next-generation LMS (here=CN) affect students' learning behaviors and attitudes.

Qualitative findings related to next-generation of Learning Management System (CN) usage

During November and December, 2017, four instructors from two universities in the U.S. were interviewed by the researcher regarding their use of the next-generation LMS (CN). The demographic data of the four subjects, including their face-to-face and online teaching experiences, years of LMS use, as well as the detailed data on their use of next-generation LMS (i.e. number of courses, methods of LMS use, learning results, major functions, things they like or dislike about LMS use, etc.) were collected and summarized.

It can be concluded from the interview data that CN possesses all the six major attributes of the next-generation Learning Management System (CN). Tables 3 summarizes the six major attributes of next-generation LMS, and the tools available in CN supported by the data from the interviews.

Firstly, all the subjects (interviewees) expressed that they like using CN because of the social media design format—user-friendly interface with Facebook wall—which allows their students to use

it easily. In addition, student-centered tools such as posts, reflections (comments), and polls, were also described as major reasons why their students prefer using CN.

Secondly, all subjects reported that their students like using CN because it is available in a mobile version. Their students can easily access the CN mobile app on their smart phones to easily join in class discussions and/or work collaboratively with their peers as frequently as they wish.

Thirdly, all the subjects confirmed that the unique reward system, called "Anar Seeds system" (or micro points earned by completing learning activities), is very motivational for their students. Anar Seeds help instructors to measure the students' level of engagement and contribution in the class objectively. Meanwhile, it also helps students to both get motivated to become more involved online discussions/activities, and be competitive with their peers as well.

Fourthly, though not reported directly by the subjects, it can be concluded from the interviews that CN has analytics tools such as class engagement and contribution (by examining the "Anar Seeds" with details of all learning activities), grades and scores, etc. that enable both instructor and students to track the students' learning progress.

Fifthly, all the subjects preferred CN as their primary communication and collaboration tool of learning because they think CN is a cutting edge technology/tool, as it routinely incorporates advanced, new and smart functions.

Finally, with the newly developed tool called "Rumi", CN will launch a smart agent, which can help the students curate and select useful online resources that will respond to each other's interests, experiences, and preferences. With the smart agent, students will be guided to discern whether certain online resources will be useful for their learning or not.

However, it was found that none of the subjects appreciated the LTI capability of CN. LTI capability refers to the function that enables CN to integrate all the other plug-ins while enabling other LMSs to integrate CN as their plug-in too. This is not surprising because LTI capability is a technical term which relates to the CN capability system rather than the pedagogical side of CN.

In summary, based on the data from all the subjects, the researcher concluded that CN is an excellent example of next-generation LMSs since it incorporates all six major attributes of the next-generation LMS.

Table 3: Six Major Attributes of Next-Generation LMS and Data Supported by Interviews

Attributes of Next-Generation LMS	Availability in CN	Remarks
1) Social Media Design Format* with Student-Centered Tools	Facebook Wall Format	
	Post, Reflections, Polls Functions Social E-Portfolio	
2) Mobile First*	Mobile version	
3) Game Components or Rewards*	Anar Seeds and Badges	
4) Analytics tools*	Analytics Tools	
5) Next-Generation Function (Smart – Agent or A.I.)*	Rumi Smart Agent**	**Under Development
6) LTI or Learning Tools Interoperability*	LTI capability	N/A

*- All the six components of next-generation LMS

Effective Pedagogical Approaches Model for Next-Generation LMS

Designing effective pedagogical approaches is crucial. Whether or not students actually achieve their learning outcomes, effective approaches to teaching and learning play a significant role. Instructors can turn well-designed lesson plans, under suitable learning perspectives, into valued activities for quality learning. Also, with the right technologies, like next-generation LMS, instructors can offer learner-centered, self-regulated and socially-mediated learning approaches to best support student learning.

Current research on innovative learning approaches revealed that one of the prevailing learning methods responding well to the changes among today's students, especially in their social media use, is "personal learning environment" or PLE. PLE is a term that was first coined at the annual JISC-CETIS conference in 2004 (Schaffert & Hilzensaur, 2008; Buchem, Attwell & Torres, 2011). After that, the PLE concept became the theme of the JISC-CETIS annual conference in 2005. Since then, researchers have continued to explore the concept of PLE (Martindale & Downdy, 2010).

Like many academic terms, personal learning environment (PLE) can mean different things to different educators, depending on the contexts in which they describe it. For some, PLE is defined as a specific set of learning tools/systems that a student deploys to interact with and manipulate online learning environments and resources (Van Harmelen, 2008; Martindale & Dowdy, 2016). For many, it refers to an individual's learning process or procedure utilized for connecting to, interacting with, and sharing online resources that can/will extend the knowledge of the individual (Dabbagh & Kitsantas, 2011; Downes, 2006;). Some others discuss the definition of PLE with a strong emphasis

on learners' ownership and control, and their empowerment to be in charge of their own learning (Attwell, 2006; Fourneir & Kop, 2010; McLoughlin & Lee, 2010). For some, PLE is also described as both systems (tools) and as concepts, which involve a decision on how an individual creates his/her online learning networks (Siemens, 2007).

PLE and self-regulated learning

In this research, PLE is referred to as learning ecology, rather than a set of tools or applications, in which an individual student uses the next-generation LMS (the CN) to pursue his/her educational goals. Each student is allowed to curate the online information or knowledge freely, reflect on what they found, and share their own thoughts on relevant issues. PLE is personal, and practice is needed in order to make PLE meaningful and tangible to an individual student. Each student will be encouraged to create his/her personal learning network or PLN. Every step of student's learning process under PLE is enabled by next-generation LMS (CN) as the major learning platform. Next-Gen LMS can provide each student with a learning space to regulate his or her own learning, customize it, and personalize it around individual learning goals. Lastly, PLE here in this study involves not only manifestation of self-regulated learning, but also socially-mediated learning.

Based on a review of literature on PLE, it is suggested that as PLEs are built bottom-up, starting with personal goals, information management, individual knowledge construction, and then progressing to socially mediated knowledge and networked learning (Dabbagh & Reo, 2011; Turker & Zingel, 2008). PLEs require the development and application of self-regulated learning skills (Dabbagh & Kitsantas, 2011; Mayes and Freitas, 2013).

According to Zimmerman, 2000, self-regulated learning has many advantages; mainly, it teaches students about goals, how to set them, and the process for successfully attaining them. Additionally, this process of goal setting and goal attainment expands the students' skill base further, as it requires them to work independently and proactively to achieve the goals that they have defined for themselves.

The three phases of Self-Regulated Learning (Zimmerman, 2000) comprise the following:

1) *Forethought phase, or Goal setting and planning with self-beliefs phase*
   Sample activities include creating a personal profile and a private or personal learning space by self-generating content and managing the content for personal productivity or organizational e-Learning tasks (i.e. creating online bookmarks, media resources and personal journals or calendars)
2) *Performance phase or Monitoring phase*
   Activities include sharing and collaborating in activities, enabling the blog's comment feature, creating a collaborative workspace using wiki, and fostering informal learning

communities (creating social learning space). Self-regulating or self-monitoring processes should be encouraged during this phase. Required strategies for students to perform more formal learning tasks should be identified.

3) *Self-reflection phases or Self-evaluation phase*
   At this stage, evaluation or self-reflection should be used by students to influence the forethought phase of subsequent efforts, leading the students to make adjustments to the PLE created in phase 1 of the framework and individualize it by design.

For Dabbagh and Kitasantas (2011), there are four steps of self-regulation. They are: 1) identify personal goals; 2) manage information; 3) individual knowledge construction; and 4) progressing to socially-mediated knowledge and networked learning. Motivation is an important factor required throughout all four steps.

Self-regulated learning can be considered a crucial learning approach in order for an individual student to successfully enable the creation of PLE. This is because self-regulated learning skills can help an individual student acquire basic and complex personal knowledge management skills that are essential for creating, managing and sustaining PLEs through social-media (here is next-generation LMS). Hence, it is necessary for an individual student to identify learning goals, design learning methods, monitor and control his/her learning activities, execute his/her learning strategies, and finally assess, as well as reflect on, his/her own learning.

As stated by Kitsantas and Dabbagh (2012, page 3), the relationship between PLEs and self-regulated learning is, "*interdependent and synergistic, requiring the simultaneous, progressive and transformative development and application of self-regulated learning skills……*"

It can be said that both PLEs and self-regulated learning are inter-related learning concepts. Together, they can help develop student's personal knowledge management skills as well as further extend the knowledge of an individual student.

PLE and Types of Learning Supported

Personal learning environment (PLE) can promote both formal and informal learning (Dabbagh & Kitsantas, 2011; McLoughlin & Lee, 2010). Also, with its powerful learning opportunities, PLE can support the student's life-long learning (Arenas, 2008; Carter & Nugent, 2011).

Socially-mediated learning with next-generation LMS

Another learning approach that educators must pay attention to is socially-mediated learning (Anderson, 2012), which refers to a learning approach based on social network as the foundation for learning. Students are encouraged to interact with peers, teachers, networks, and communities from public to private, from various levels ranging from groups, classes, departments, and institutions, to the global community level. Through networking, students will connect, collaborate, interact and share desired information/ knowledge. Students are encouraged to create learner-generated content or produce artifacts or projects after making sense out of information they find or receive, and, finally, publish, share, and communicate their ideas to the public (Hart, 2013; Jackson, 2015; Jarche, 2014). Recent research studies have revealed that socially-mediated learning renders positive effects upon the learning results of today's students (Anderson, 2012; Cifuentes et al., 2011). With the support of next-generation LMS, socially-mediated learning can become very powerful.

A good example of a socially-mediated learning model is the "Seek-Sense-Share" model by Jarche (2014). According to Jarche (2014), individuals can develop their professional networking by making connections with other professionals through a continuous process of seeking, sense-making and sharing. By seeking, individuals are to curate the information they need. This can be mainly supported by the use of search tools. Sense is how individuals personalize information and utilize it. Sensing includes reflection and putting into practice what one has learned. This is a crucial process since learning mostly takes place during this step. By making sense of the information one retrieves, we are creating meaning and perhaps learning to use what we have learned. Lastly, sharing involves distributing our understanding of what we have learned to the public and making it accessible to others. It was found that this model has recently been practiced in more dynamic learning ecologies, such as teachers and students in the higher education level (Jackson, 2015).

Two learning approaches (Self-Regulated Learning and Socially-Mediated Learning) under Personal Learning Environment (PLE) with next-generation LMS

With next-generation LMS, each student can successfully create a learning ecology in which he/she plans, manages, monitors, assesses and reflects on his/her own learning with self-regulated learning methods as well as creating his/her own personal learning networks and interacting with resources, peers, instructor, and community through socially-mediated learning.

In this research, the emphasis is on next-generation LMS (CN) that allows learners to manage and maintain a learning space (PLN) that

1) facilitates their own learning activities (Self-Regulated Learning (SRL) and

2) at the same time allows learners to make connections to peers and social networks across time and place (Socially-Mediated Learning or SML).

In this study, the guidelines of designing effective pedagogical approaches using next-generation LMS (CN) have been developed. However, for further study, it is also deemed necessary for the researcher to further investigate how students can use next-generation LMS (CN) and its pedagogical affordances to help support and promote their self-regulated learning and socially-mediated learning under PLE context (McLoughlin & Lee, 2010; Valjataga et al., 2011). Future investigation should focus on higher education students' learning results when using pedagogical approaches (PLN and self-regulated learning) with next-generation LMS (CN).

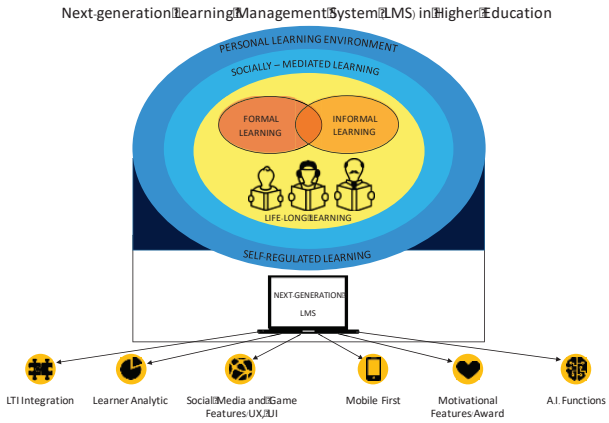

Figure 3: Effective Pedagogical Approaches Model for Next-Generation LMS

Conclusion

By studying a selection of academic articles and the existing evidence and early indications of newly-designed LMS tools/functions, it is shown that the thought leaders in learning technology area have come to agree on a set of issues and components of the next-generation LMS. Nine concepts and six major components of tools/ functions are reported in this research study. A proposed model on effective pedagogical approaches with the next-generation LMS has also been developed with a focus in on two learning approaches (Self-Regulated Learning and Socially-Mediated Learning) under Personal Learning Environment (PLE) with Next-Generation LMS. However, the proposed model still needs to be further explored in the near future in terms of its impact upon higher education students' learning results. Lastly, it must be noted that although the focus of this research is on "Next-Generation LMS," for students to personalize, control, and regulate their own learning, an instructor still plays an important role in thoughtfully leveraging the capabilities technology can offer in order to best support student learning.

References

Anderson, T. (2012). Networks, Web 2.0, and the connected learner. In R.A. Reiser & J.V. Dempsey (Eds.), *Trends and Issues in Instructional Design and Technology* (pp. 299-308). Boston, MA: Allyn & Bacon.

Anderson, T. (2016). Theories for Learning with Emerging Technologies. In G. Veletsianos (Ed.), *Emergence and Innovation in Digital Learning* (pp. 35-50). AU Press: Athabasca University.

Arenas, E. (2008). *Personal Learning Environment: Implication and Challenges*. Retrieved September 8, 2016 from, https://www.researchgate.net/publication/255649578_PERSONAL_LEARNING_ENVIRONMENTS_IMPLICATIONS_AND_CHALLENGES.

Attwell, G. (2006). *Social software, personal learning environments and lifelong competence development.* Retrieved January 9, 2016 from, https://www.scribd.com/document/24892900/Social-Software-Personal-Learning-Environments-and-Lifelong-Competence-Development-Graham-Attwell.

Attwell, G. (2007). "e-Portfolios – the DNA of the Personal Learning Environment?" *Journal of E-learning and Knowledge Society 3(2)*, 39-61.

Baker, J. (2017). Updating the Next Generation Digital Learning Environment for Better Student Learning Outcomes. *Educause Review. July/August 2017*. Retrieved September 8, 2017 from, https://er.educause.edu/~/media/files/articles/2017/7/erm17413.pdf.

Brown, J.S., & Adler, R.P. (2008). Mind on fire: Open education the Long Tail, and Learning 2.0. *Educause Quarterly, 42(6)*, 16-32.

Brown, M., Dehoney, J., & Millichap, M. (2015). *Educause Review. May/June 2015.* What ‘s Next for the LMS? Retrieved August 24, 2016 from, https://er.educause.edu/articles/2015/6/whats-next-for-the-lms.

Buchem, I., Attwell, G., & Torres, R. (2011). Understanding personal learning environments: Literature review and synthesis through the activity theory lens. Retrieved January 5, 2015 from, https://www.scribd.com/document/62828883/Understanding-Personal-Learning-Environments-Literature-review-and-synthesis-through-the-Activity-Theory-lens.

Carter, T., & Nugent, J. (2011). Personal learning networks: Implications for self-directed learning in the digital age. In V. Wang (Ed.), *Encyclopedia of Information Communication Technologies and Adult Education Integration* (pp.226-240). Hershey, PA.

Cifuentes, L., Alvarez Xochihua, O., & Edwards, J. (2011). Learning in Web 2.0 environments: Surface learning and chaos or deep learning and self-regulation? *Quarterly Review of Distance Education, 12*(1), 1-21.

Conde, M., Franciso, J., García-Peñalvo, M., Rodrí guez-Conde, M., Alier, M.. & Piguillem, J. (2014). An evolving Learning Management System for new educational environments using 2.0

tools. *Interactive Learning Environments*. 22(2), 188-204.

Dabbagh, N., & Kitsantas, A. (2012). "Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning." *The Internet and Higher Education 15(1)*, 3-8.

Dabbagh, N., & Reo, R. (2011). Impact of Web 2.0 on higher education. In D. W. Surry, T. Stefurak, & R. Gray (Eds.), *Technology Integration in Higher Education: Social and Organizational Aspects* (pp. 174–187). Hershey, PA: IGI Global.

Dede, C. (2008). Theoretical perspectives influencing the use of information technology in teaching and learning. In J. Voogt and G. Knezek (Eds.), *International Handbook of Information Technology in Primary and Secondary Education*, 43-62. New York: Springer.

Downes, S. (2005). E-Learning 2.0. *E-Learning Magazine*. Retrieved November 10, 2017 from, http://elearnmag.acm.org/featured.cfm?aid=1104968.

Downes, S. (2006). *Learning networks and connective knowledge. Instructional Technology Forum*. Retrieved July 18, 2018 from https://www.tonybates.ca/2008/07/21/learning-networks-and-connective-knowledge%E2%80%99-instructional-technology-forum/

Feldstein, M. (2017a). A flexible, interoperable digital learning platform: Are we there yet? E-Literate posted on May 28, 2017. Retrieved October 20, 2017 from, http://mfeldstein.com/flexible-interoperable-digital-learning-platform-yet/.

Feldstein, M. (2017b). Monday July 13, 2017. *Educause Review.* What is the Next Generation? Retrieved September 5, 2017 from, https://er.educause.edu/articles/2017/7/what-is-the-next-generation.

Fournier, H., & Kop, R. (2010). Researching the design and development of a personal learning environment. Paper presented at the 2010 PLE Conference. Retrieved October 5, 2017 from http://pleconference.citilab.eu/cas/wp-content/uploads/2010/06/ple2010_submission_88.pdf.

García-Peñalvo, F. J., & Alier, M. (2014). Learning management system: Evolving from silos to structures. *Interactive Learning Environments*, 22(2), 143-145.

Harasim, L. (1999). A framework for Online-Learning: The Virtual-U. *Computer 32(9),* 44-49.

Hart, J. (2013). My daily PKM routine (practices and toolset). Retrieved 03/05/2017 from http://www.c4lpt.co.uk/blog/2013/11/30/my-daily-pkm-routine-practices-and-toolset/.

Henri, F. & Chalier, B. (2010). *Personal learning environment: A concept, an application, or a self-designed instrument?* Paper presented at the International Conference on 9th Information Technology-Based Higher Education and Training (ITHET), 2010, Retrieved January 5, 2015 from, http://ieeexplore.ieee.org/abstract/document/5480062/?reload=true.

Hill, P. (2017). *State of Higher Ed LMS Market for US and Canada*: Spring 2017 Edition. E-Literate posted on May 15, 2017. Retrieved September 17, 2017 from, http://mfeldstein.com/state-higher-ed-lms-market-us-canada-spring-2017-edition/.

Jafari, A. (2017). *Code Name: Rumi Agent*. Retrieved November 15, 2017 from,

https://cyberlab.iupui.edu/Current%20Projects/Rumi%20Agent%20Project/index.html.

Jafari A., & Baylor A. (2012). *From course management to course networking: Conceptualizing a new learning environment based on social networking*. Retrieved September 5, 2017 from, https://www.thecn.com/document/CN_white_paper_v1-1.0_final.pdf.

Jarche, H. (2014). The Seek>Sense>Share>Framework. Inside Learning Technologies. Retrieved March 5, 2017 from, http://jarche.com/2014/02/the-seek-sense-share-framework.

Kitsantas, A., & Dabbagh, N. (2010). *Learning to Learn with Integrative Learning Technologies (ILT): A Practical Guide for Academic Success.* Greenwich, CT: Information Age Publishing.

Marra, R.M., & Jonassen, D.H. (2001). Limitations of online courses for supporting constructive learning. *The Quarterly Review of Distance Education, 2(4)*, 303-317.

Martindale, T., & Dowdy, M. (2010). Personal Learning Environments. In G. Veletsianos (Ed.), *Emerging Technologies in Distance Education* (pp. 177-193). Edmonton: Athabasca University Press.

Martindale, T., & Dowdy, M. (2016). Issues in Research, Design, and Development of Personal Learning Environments. In G. Veletsianos (Ed.), *Emerging and Innovation in Digital Learning* (pp. 119-141). Edmonton: Athabasca University Press.

Mayes, T. & de Freitas (2013) Technology-enhanced learning: The role of theory. In H. Beetham & R. Sharpe (Eds). *Rethinking Pedagogy for a Digital* Age*: Designing for 21st century learning* (2nd ed., pp 20-29). New York, NY: Routledge.

McLoughlin, C., & Lee, M. J. W. (2010). Personalized and self-regulated learning in the Web 2.0 era: International exemplars of innovative pedagogy using social software. *Australasian Journal of Educational Technology, 26(1)*, 28-43.

Mott J., & Wiley D. (2009). *Open for Learning: The CMS and the Open Learning Network. E in Education*. Volume 15 No. 2. Retrieved November 20, 2016 from, http://ineducation.ca/ineducation/article/view/53/529.

Open Academic Environment (OAE) (2017). Retrieved September 15, 207 from, http://oaeproject.org/assets/pdf/OAE_Vision_2017.pdf.

Schon, S., & Hilzeinsaur, W. (2008). *On the Way towards Personal Learning Environments: Seven crucial aspects*. Retrieved October 11, 2016 from, https://www.researchgate.net/publication/28264175_On_the_way_towards_Personal_Learning_Environments_Seven_crucial_aspects.

Siemens, G. (2007). *PLEs- I, acronym, therefore I exist. Elearnspace: learning, networks, knowledge, technology, community* (Blog Post) Retrieved from, http://elearnspace.org/blog/archives/002884.html.

Straumsheim, C. (2015). *Brick by Brick: Educause releases a blueprint for next-generation learning management systems, recommending a "Lego approach*. Retrieved October 11, 2016 from,

https://www.insidehighered.com/news/2015/05/11/educause-releases-blueprint-next-generation-learning-management-systems.

The New Media Consortium (2015). *Next Generation LMS*. Retrieved October 2, 2017 from, https://www.nmc.org/horizon_topic/next-generation-lms/#_edn4.

Turker, M., & Zingel, S. (2008). *Formative interfaces for scaffolding self-regulated learning in PLEs. eLearning papers*. Retrieved March 7, 2016 from, http://www.elearningeuropa.info/files/media/media15975.pdf.

Valjataga, T., Pata, K., & Tammets, K. (2011). Considering students' perspective on personal and distributed learning environments. In M.J.W. Lee & McLoughlin (Eds.), *Web 2.0-based E-Learning: Applying social informatics for tertiary teaching* (pp.85-107). Hershey: PA, IGI Global.

Van Harmelen, M (2006). Personal Learning Environments. In R. Kindshuk, P. Koper, P. Kommers, D.Kirschner, W. Didderen & Sampson, D. (Eds.), *Proceeding of the Sixth International Conference on Advanced Learning Technologies* (pp. 815-816). Los Alamitos, CA: IEEE Computer Society.

Weiss, C. (2015). *Top 10 Next Gen for LMSs for 2015-1016*. Report from the Craig Weiss Blog. Retrieved September 20, 2017 from, https://elearninfo247.com/2015/09/03/top10nextgen1516/.

Zimmerman, B. (2000). Self-regulatory cycles of learning. In G. A. Straka (Ed.), *Conceptions of Self-directed Learning, Theoretical and Conceptual Considerations* (pp. 221). Routledge: New York.

The author

Dr. Thanomporn Laohajaratsang is the consultant of the Information Technology Service Center and an Associate Professor in the Department of Learning Technology, Faculty of Education, Chiang Mai University, Thailand. Her research interests include digital innovation in teaching and learning, integration of ICT educational system and design of future learning environments.

Contact information

Name: Assoc. Prof. Thanomporn Laohajaratsang, Ph.D.
Institutional affiliation: Chiang Mai University, Thailand
Mailing address: Department of Curriculum, Instruction and Learning Technology, Chiang Mai University, 239 Huay Kaew Road, Suthep District, Muang, Chiang Mai, Thailand 50200
Email address: thanompo.l@cmu.ac.th