

# Linking E-learning Tools with Experiential Knowledge Production in Higher Education Teaching-learning Processes: The Case of Open Source LMS

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**Abstract**—Despite requirements for constant innovation in Higher Education, the application of knowledge management constitutes a recent research field in this sector while a wide range of e-learning tools - like open source learning management systems (LMS) - constitute a basic part of universities infrastructures at present. As knowledge derived from direct experiences is one of the most important sources for innovations, this paper presents two approaches for experiential knowledge production in the Higher Education teaching-learning processes: (1) the managerial production approach and (2) the open production approach. In accordance with these approaches, the paper also describes how Moodle and Sakai - two of the most widely used open source LMS - support experiential knowledge production and concludes that: (1) these LMS don't have first class constructs to manage experiential knowledge production related concepts; (2) experiential knowledge related constructs can be represented through existing artifacts included in these LMS but this approach presents many limitations to support explicit connections between these constructs and; (3) LMS can extend current capabilities of tags or similar artifacts to represent high level meaning structures that link content from different LMS tools.

**Index Terms**—Knowledge management, knowledge production, experiential knowledge, higher education, teaching-learning process, e-learning, learning management systems

## I. INTRODUCTION

Higher education (HE) institutions have been in the knowledge business for a long time [1]. However, despite requirements for constant innovation, the application of knowledge management constitutes a recent research field in this sector [2] while a wide range of (open source) learning management systems, not used linked to knowledge management, are part of HE institutions infrastructures at present. As knowledge derived from direct experiences is one of the most important sources for innovations [3], questions arise about how experiential knowledge is produced in Higher Education teaching-learning process; but also to what extend do open source LMS support such production.

In finding answers to the above questions, this paper presents two theoretical approaches for experiential knowledge production in the HE teaching-learning process,

and how they are supported in Moodle and Sakai - two of the most widely used open source LMS [4].

## II. UNDERLYING CONCEPTS AND THEORIES

All people learn from their own experiences. As human beings we learn, sometimes unintentionally and unconsciously, from everyday activities and use that knowledge to mediate our actions. However, according to Eraut [5] learning from experiences (or experiential learning) refers to situations where experience is initially apprehended at the level of impressions, thus requiring (at least) a further period of reflection before it is assimilated. In consequence, this paper refers as “experiential knowledge” to things perceived from concrete experiences, things tacitly (or implicitly) learned or acquired after a period of reflection on experiences.

### A. The Experiential Learning Theory

There are several works linked to experiential learning, but as Lewis and Williams agree in [6], Kolb's experiential learning theory is one of the most influential works in this field. This theory proposes a four-stage cycle through which learners sense, reflect, think and act in order to learn from their experiences. Kolb calls this cycle the experiential learning cycle.

A number of works have framed research on the Kolb's experiential learning cycle [7]. In particular, Dixon's work on organizational learning cycle introduces the concept of dialogue in the reflection and conceptualization steps of the experiential learning cycle [8]. Thus, as shown in Fig. 1, the experiential learning cycle with the Dixon's concept of dialogue can be used as a theoretical framework for experiential learning at individual and group levels.

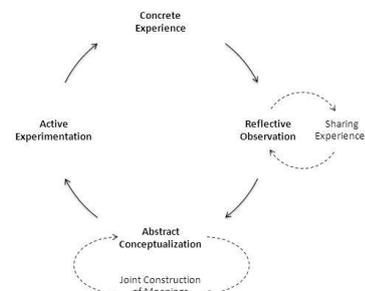


Fig. 1. Kolb's experiential learning cycle (in bold) with the Dixon's concept of dialogue

### B. Second-Generation Knowledge Management Theories

Knowledge management (KM) is a discipline that seeks to have an impact on knowledge processing in organizations.

Manuscript received May 7, 2012; revised June 9, 2012.

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According to McElroy [9] there are two well-known second-generation KM theories at present: The New Knowledge Management (TNKM) [10] and the Organizational Knowledge Creation Theory (N&T model) from Nonaka and Takeuchi [11]. Each theory represents an integrated approach to knowledge management and can be used as a theoretical framework for experiential knowledge production in organizations.

The Organizational Knowledge Creation Theory

The Nonaka and Takeuchi's theory distinguish two types of knowledge: tacit knowledge and explicit knowledge. It considers explicit knowledge as knowledge that can be formalized and articulated; while tacit knowledge as highly personal, and hard to formalize and articulate. The theory put emphasis on four patterns of interaction between tacit and explicit knowledge to represent different ways in which existing knowledge can be converted into new knowledge. These types of knowledge conversion are described in the well-known SECI model as: socialization, externalization, combination and internalization.

The SECI model by itself doesn't represent an integrated approach to knowledge management. However, it provides the theoretical foundation for another construct that fulfills McElroy's [9] criteria for a second-generation KM theory: the Nonaka and Takeuchi's five-phase model of the organizational knowledge creation process (see Fig. 2). In the five-phase model, knowledge production can be found covering three phases: sharing tacit knowledge, creating concepts and justifying concepts.

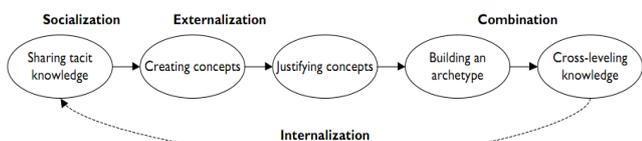


Fig. 2. The five-phase model. adapted from nonaka and takeuchi [11].

Sharing tacit knowledge is the process through which individuals share the tacit knowledge accumulated through direct hands-on experience. On the other hand, creating concepts is the process through which individuals build explicit concepts in cooperation with others. Here, the continuous dialogue between organizational members is the key to activate externalization at individual levels. Finally, through the justification of concepts, the new knowledge is evaluated to determine if it's truly worthwhile for the organization. It involves a process where organizational members provide objective verifiable evidences in favor of the new knowledge and verify that it's in conformity with organizational intentions [11].

The New Knowledge Management

Practitioners of The New Knowledge Management theory consider that people in organizations tend to self-organize around the production, diffusion and use of knowledge in accordance to the pattern described by the Knowledge Life Cycle (KLC). As a major concept of TNKM, the KLC describes how knowledge is produced and integrated at individual, group and organizational levels of analysis [12].

According to TNKM, knowledge production in the KLC is initiated in response to an epistemic gap. As a result, it produces knowledge claims through the sub-processes

indicated in the Fig. 3 where, as a normative model, problem claim formulation, knowledge claim formulation and knowledge claim evaluation processes (KCE) should be open in the sense of participation, as well as in the sense of knowledge claims criticism and refutation. In the KLC at organizational level, individual and group learning sub-processes are themselves KLCs and produce validated knowledge claims while the knowledge claim evaluation process, on the other hand, is oriented to knowledge claims falsification and error elimination through criticism.

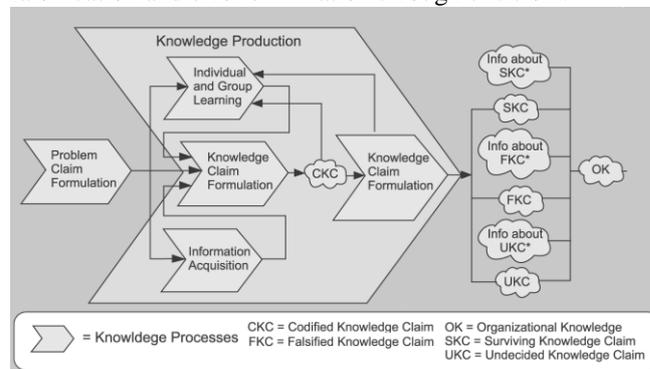


Fig. 3. Knowledge production processes at organizational level. adapted from firestone and mcelroy [12].

III. EXPERIENTIAL KNOWLEDGE PRODUCTION IN THE HIGHER EDUCATION TEACHING-LEARNING PROCESS

As well as knowledge management in Higher Education, experiential knowledge production in the teaching-learning process needs theoretical frameworks that take into account the particularities of this context. In accordance with this, this paper suggests two theoretical approaches for experiential knowledge production referred as: the managerial production approach and the open production approach. Managerial and open categories are taken from Peter's [13] work on KCE to highlight the role of this process in knowledge production. Both approaches take into account only experiential learning processes derived from students' activities in order to describe experiential knowledge production.

A. Experiential learning in the Higher Education Teaching-Learning Process

In formal higher education curriculum and teaching are formally organized; learning is intentional and explicit designed; and the teaching-learning process is structured in terms of courses, fields of study, subjects, topics, lessons and tasks. From students' perspective, the teaching-learning process is a successive sequence of tasks. Thus, tasks constitute the primary source of student's experiences in the teaching-learning process and the object of their attention to learn from experiences.

Following Kolb's experiential learning cycle, doing a task is a concrete experience on which students can reflect, conceptualize and take action. In any reflection act, students can attend to a discrete task or subsume separate tasks within a higher level object of attention –like a lesson- to construct their concepts. As result of this conceptualization, students -as managers of their own learning process- produce different types of concepts (or experiential knowledge) classified by Eraut [5] into: knowledge of

people, situational knowledge, knowledge of practice, conceptual knowledge, process knowledge, and control knowledge. Such concepts, as Eraut suggests, must be

recognized as fallible in the teaching-learning process. Therefore attempts to use such concepts have to take this into account.

TABLE I: MODEL AND SAKAI TOOLS SUPPORTING EXPERIENTIAL KNOWLEDGE PRODUCTION

	<b>Moodle 2.2</b> <b>(tools and artifacts)</b>	<b>Sakai CLE 2.7</b> <b>(tools and artifacts)</b>
<b>Sharing personal knowledge</b> (e.g. stories, beliefs, and claims)	Chat(message); Wiki(page); Blogs(entry); Notes (note); Assignments(response)	Blogs(entry); Chat Room(message); Mailtool(email); Messages(message); Podcasts(audio or video files); Porfolios(content); Wiki (page)
<b>Problem and knowledge claims formulation</b>	Chat(message+chat reports); Forum(topic+replies); Wiki(page+history); Blogs(entry+comments)	Blogs(entry+comments); Chat Room(message+history); Forum(topic+threads+replies); Porfolios(content+comments); Wiki(page+history)
<b>Connecting claims</b> (problem-problem, problem-knowledge and knowledge-knowledge)	Wiki (page links); Tags (blog post tags)	Wiki(page links)
<b>Knowledge claims evaluation</b>	Blogs(comments); Assignments(grade or feedback); Forum(ratings); Wiki(comments);	Blogs(comments);Forum(grade or comments); Portfolios(comments); Wiki(comments)

*A. Managerial Production Approach*

The contributions by Kolb [14], Nonaka and Takeuchi [11], and Dixon [8] are the main foundations of the managerial approach for experiential knowledge production in the HE teaching-learning process. This approach emphasizes on the role of teachers to justify the value of students’ experiential knowledge for the teaching-learning process.

The managerial production approach consists of four steps. First, students accumulate experiential knowledge from daily tasks. Here, students eventually go through all the four stages of the Kolb’s experiential learning cycle – but taking into account the particularities mentioned above. Secondly, students involve in joint activities and share personal experiences – e.g. by imitation, observation, practice and storytelling. Thirdly, students build experiential knowledge claims in cooperation with others. At this step, students articulate and test their own experiential knowledge, adjusting them if it’s necessary. And fourthly, teachers justify the value of experiential knowledge claims produced by students. Here, teachers and academic staff determine if experiential knowledge claims produced by students are truly worthwhile for the teaching-learning process.

*B. Open Production Approach*

The open production approach originates from the theoretical contributions of Firestone and McElroy [12], Dixon [8] and Kolb [14]. This approach emphasizes on the ongoing criticism to justify the value of students’

experiential knowledge for the teaching-learning process.

The open production approach consists of four steps. First, students accumulate experiential knowledge from the adjustment of their behaviors in daily tasks. At this step, students adjust their behaviors closing epistemic gaps or through the use of previously developed knowledge in the teaching-learning process (e.g. students’ beliefs and predispositions, knowledge claims and meta-claims). To close an epistemic gap students involve in problem claim formulation, knowledge claim formulation, and knowledge claim evaluation processes at the individual and group levels. The second and third steps of both approaches are similar. However, in the fourth step, different to the managerial approach, the open approach considers that stakeholders eliminate errors in experiential knowledge claims produced by students. This final step produces different types of experiential knowledge claims and meta-claims.

IV. LINKING OPEN SOURCE LEARNING MANAGEMENT SYSTEMS WITH EXPERIENTIAL KNOWLEDGE PRODUCTION IN THE HE TEACHING-LEARNING PROCESS

From the last decade Higher Education institutions have been using information and communications technologies (ICT) to support teaching and learning. In consequence particular e-learning tools, such as open source LMS, have become mission critical services for many universities at present.

According to the EDUCASE Evolving Technologies Committee [4], two of the most widely used open source LMS are Moodle and Sakai. However, even though they are not used linked to knowledge management in the HE context, they support experiential knowledge production in varying degrees. To illustrate this, the following table shows - based on the two approaches discussed above- which tools of Moodle and Sakai support (in an explicit way) experiential knowledge production processes.

The above table suggests that Moodle and Sakai don't have a first class construct to manage experiential knowledge production related concepts like knowledge claims and stories. However, it indicates that such constructs can be represented through artifacts (e.g. wiki pages and blog posts) included in these products. On the other hand, the table shows that both products provide specific tools that can be used to support experiential knowledge production processes, such as knowledge claims evaluation; but, present many limitations to make explicit connections between experiential knowledge production constructs.

As connecting claims seems to be one of the most critical limitations in Moodle and Sakai, we suggest that existing LMS artifacts like tags or similar should be extended in order to support the connection of different representations of knowledge claims. Thus, for instance, a hypothetical tag referring to "a lack of information" claim could link together claims coming from a wiki page, a chat conversation and a blog post as verifiable evidences in favor of it.

## V. CONCLUSIONS

This paper has attempted to fill existing gaps around the current support of experiential knowledge production in open source LMS. From a theoretical perspective, the paper presented two approaches for experiential knowledge production in the HE teaching-learning processes: (1) the managerial production approach and (2) the open production approach. Both approaches share many similarities to describe how students accumulate, share and build experiential knowledge but differ in the process followed to evaluate it.

In accordance with these approaches, two of the most widely used open source LMS (Moodle and Sakai) were linked to experiential knowledge production taking into account those tools that support (in explicit way) experiential knowledge production processes. The analysis of Moodle and Sakai products draw the followings findings:

- 1) These LMS don't have a first class constructs to manage experiential knowledge production related concepts.
- 2) Experiential knowledge related constructs can be represented through existing artifacts included in these LMS (e.g. wiki page and blog post) but this approach present many limitations to support explicit connections between these constructs.
- 3) LMS can extend current capabilities of tags or similar artifacts to represent high level meaning structures that link content created with different LMS tools.

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