Self-Directed Learning Management System: Enabling Efficacy in Online Learning Environments

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ABSTRACT

A traditional learning methodology known as self-directed learning (SDL) is used in this study as a foundation to design a learning management system that can help students improve their abilities to self-manage and monitor their overall learning activities and performances. Such capabilities have been shown in past research as being critical to success in online learning environments. While research has demonstrated that SDL skills exist to a degree in all learners and their competency levels can change, this study investigates whether students’ SDL abilities can improve as a result of using a designed personal learning system, Self-Directed Learning Management System (SDLMS). SDLMS is aimed at enabling students to be more proactive in planning, organizing, and monitoring their course activities. The features of SDLMS are designed based on activities that are deemed critical according to literature on SDL and its related fundamental concepts. Initial results of an exploratory study indicate that while learners feel it is very important to manage their online learning activities, they do not have a comprehensive systematic process. Study participants strongly agree that they would benefit from a tool that empowers them to actively interact and collaborate with others, tracks various course-related tasks, and measures milestones as a means to provide a self-monitoring mechanism to achieve learning goals.

Keywords
Self-directed learning, online learning, learning management system

INTRODUCTION

Due to its convenience of learning any time and any place, online learning has gained popularity with many students. Availability of the Internet and accessibility to online courses have led to a substantial growth in enrollment of online courses nationwide. The compounded annual growth rate for learning online is significantly higher than that of the growth rate for all of US higher education. Despite the growing success in enrollment, the rate of attrition is a major concern and while the causes are many and complex, frequently cited reasons deal with the difficulty of students to manage their overall learning process.

According to Naidu (2003), “students in e-learning and other flexible learning environments, who often work independently with self-instructional study materials, need help with organization and management of resources, as well as the skills to critically reflect on information they may have gathered” (p. 362). It is further stated that very few tools exist to support the cognitive processes for e-learning and other technology-enhanced learning environments, whereas conventional face-to-face educational settings have benefitted from a considerable number of cognitive tools and strategies.

In order to overcome the challenges faced by students in online learning environments, this study adopts the foundation of SDL theory to design a learning system, SDLMS, that will foster and improve the students’ abilities to take an active role by planning critical learning activities, monitoring performances and milestones, organizing and utilizing course resources, collaborating with peers, establishing rapport with the instructor, and building individualized cognitive processes. According to research, SDL skills exist to varying degrees in all learners and the ability levels can improve (Knowles, 1975; Guglielmino, 1977; Caffarella, 1986). The purpose of this study is to design and build an artifact that enable online learners to improve their competency levels as learners that are self-directed.

The first section describes the nature of online learning. Next, the concept of SDL is discussed with elements that define the critical activities. The SDL process model, Figure 1, is used as basis for designing the artifact using the research framework.
of design science. The process of designing the product and the process is modeled after Walls, Widmeyere and El Sawy (1992, 2004). The later sections deal with the planned research method and it’s implications for further work.

ONLINE LEARNING

Distance education evolved as computer-based learning initially where computers served as a means of interactive learning for individuals into e-learning, where course materials are more widely and effectively distributed (Volery and Lord, 2000). The researchers further explain that the current method of online learning brings participants together as a networked community through the use of the Internet and multiple technologies, and enhances interaction with course content and communication with fellow class members. An online learning environment is essentially computer-based learning in a relatively open system that facilitates access to resources and encounters with other participants (Wilson, 1996). Much like computer-aided instruction, in e-learning, members can access the content on their own time and follow different paths to get through the academic material; however, online learning extends the ability for participants to communicate through interactions and discussions (Bouhnik and Marcus, 2006).

Benefits of Online Learning

Amongst the many benefits cited by researchers, some of the reasons for online learning growth are the lack of time and place boundaries that online learning affords. Students have the benefit of retrieving course information at their convenience in terms of when, where, which content, and how much (Bouhnik & Marcus, 2006; Liaw, 2007; Shotsberger, 2000). The flexibility conceivably appeals to many students including working professionals and adult learners, who otherwise would not have the opportunity to take classes and pursue a degree or a certificate. This convenience of learning has lead to a significant increase in student enrollment for online learning. According to surveys published by Sloan-C (Allen and Seaman, 2006), from 2002 to 2006, the compounded annual growth rate for learning online is 21.5 percent, compared to that of a 1.5 percent increase for all of US higher education. The growth is expected continue over the years.

Challenges of Online Learning

While a significant growth has been experienced, many studies have also identified challenges to online learning. Attrition rates are estimated to be 10 to 20 percent higher than that of a traditional face-to-face learning environment (Carr, 2000). More recent research shows a greater drop out rate of approximately 20 to 30 percent higher for online learners (Dutton and Perry, 2002; Bouhnik and Marcus 2006).

While causes for attrition are many and complex, some reasons cited for dropping out of course work include lack of self-discipline, inability to self-manage the learning activities, inadequate initiative taken for learning, ineffective time management and organization skills, lack of cognitive strategies, difficulty building rapport and maintaining interaction with peers, insufficient dialogue and feedback from the instructor, and overall absence of learning atmosphere and a firm framework (Bouhnik and Marcus, 2006; Roblyer, 1999; Tyler-Smith, 2005). Similarly, a survey by Sloan-C (Allen and Seaman, 2005) states that the factor most cited by academic leaders of every institutional size and type as the biggest barrier to widespread adoption is students lacking self-discipline in managing their learning. Thus, a need exists, and has long been identified to help students attain self-directed learning skills and capabilities.

SELF-DIRECTED LEARNING

Self-Directed Learning (SDL) is an approach where students empower themselves and take ownership of their learning activities. Instead of simply following instructions, as explained by Boud (1981), the distinguishing characteristic of SDL is that students take a significant role and accountability for their own learning. Similarly, Knowles describes the concept as follows:

[…] a process in which individuals take an active role in their overall learning process. It can be accomplished independently or with the help of others through the process of diagnosing needs, establishing learning goals, identifying human and material resources needed, adopting and implementing appropriate learning strategies, and assessing learning outcomes (Knowles, 1975, p. 18).

According to Bolhuis (1996) and Garrison (1997), SDL is viewed as an integration of ‘self-management’ and ‘self-monitoring’ (Abdullah, 2001). Abdullah explains that self-management relates to the external context of the learning process, including decisions about learning activities and use of resources. On the other hand, self-monitoring relates to internal
monitoring of the learning process, and the cognitive responsibility taken to achieve learning goals (Abdullah, 2001). Brookfield (1985, 1986) adds that SDL is realized when external activities and internal reflective dimensions are fused. While these and other SDL studies have served to describe SDL concepts, there has not been a study that prescribes the needed conceptual process as a tool that could aid in SDL. As such, the SDLMS being proposed in this paper, and derived from the literature, provides features to improve competency levels in SDL by combining aspects of external activities to improve self-management with methods that reinforce cognitive responsibility to improve self-monitoring.

**Model for Self-Directed Learning Process**

Based on the literature and related fundamental concepts of SDL, the following model is proposed as a framework to design the SDLMS:

![Figure 1. Self Directed Learning Process](image)

Phase I – Establish Learning Goals: This activity involves identifying what the learner hopes to accomplish from a given learning experience and participation in a course.

Phase II – Locate and Access Resources: This phase involves identifying what resources the learner may need and gaining access to them for use as part of the learning activity.

Phase III - Adopt and Execute Learning Activities: This step involves deciding on a specific plan of action that is aligned with the established goals and use of available resources.

Phase IV - Monitor and Evaluate Performance: This step allows the learner to assess and measure actual results to the intended goals.

Phase V - Reassess Learning Strategies: This phase involves evaluating the overall learning process and making necessary adjustments to improve learning results. The assessment can involve modification of activities in one or more of the phases.

The five-phase process can be seen as an iterative flow of activities to fit the learner’s needs. The primary concept of the model is based on research findings that students must be proactive in managing their learning processes rather than wait for learning to be passed on by the instructor, as similarly described by other researchers. According to Brookfield (1981), Smith (1982), and Tough (1978), in a SDL environment, the student takes ownership for their learning experience, either independently or with assistance from others.

**DESIGN OF THE LEARNING MANAGEMENT SYSTEM**

This research consists of building and evaluating in the context of design science. In design science, knowledge and understanding of a problem domain and its solution are achieved in the building and application of the designed artifact.
(Hevner, March, Park, and Ram, 2004). This study is based on building the artifact, SDLMS, to support learners in online learning environments, and evaluating how well the artifact performs in improving SDL abilities.

According to Walls, Widmeyer, and El Sawy (1992, 2004), there are two aspects to a design theory: design product and design process. This study addresses both design aspects, which are dependent on one another.

**Design Product**

The design product according to Walls et al., 1992, involves addressing four components of an Information System Design Theory (ISDT), which are meta-requirements, meta-design, kernel theories, and testable design product hypotheses. The design product for this study is described in three levels that are equally critical to the development of the product.

The first level is the system development environment, which sets the foundation for the development strategy. The second level is the system functionalities, which address the essential items for managing the artifact. The third level are the user features that need to be available to facilitate self-direct their learning efforts.

### Level 1: System Development Environment

**Meta-Requirements:**

- a) Accessibility
  - Open source software; service-oriented application; platform and browser independent; and small code footprint
- b) Reliability
  - Service-oriented application; database tuning; and exception handling
- c) Customization, Interoperability, Scalability, and Extensibility
  - Platform independence; browser independence; open source application; and customization capability
- d) Open structure
  - Open access to create and edit documents; maintain editing history; and enable undo or roll-back of edit changes

**Meta Design:**

### Level 2: System Functionalities

**Meta-Requirements:**

- a) Browser independence
  - Web-based software accessible from any web browser
- b) Access to usage statistics
  - Collect user statistics, user pattern, and web-page traffic
- c) Dynamic operating environment
  - Immediate implementation of program changes
- d) Backup and recovery
  - Roll-back changes, undo changes, and simplified backup system
- e) User self-administration and profile creation
  - User initiated password resets and changes; user managed tasks for lower risk activities
- f) User rights management
  - Administration and management of users and their roles
- g) Security
  - Detect and mitigate system abuses (e.g., unauthorized access, hacking, and harassment)

### Level 3: User Features

**Meta-Requirements:**

- a) Capture personal learning goals
  - Enable tracking and maintaining of learning goals; facilitate sharing of goals with peers; and access feedback from the instructor
- b) Maintain resources
  - Gain access to learning materials; enable sharing of resources
- c) Organize and track activities
  - Enable organization of tasks and priorities; maintain a calendar of activities; enable sharing of learning strategies; and receive guidance on planning of tasks
- d) Monitor and measure performance
  - Monitor achievement of goals; measure performance of activities; and track and document evidence of personal learning
Level 3: User Features (Continued)

<table>
<thead>
<tr>
<th>Meta-Requirements</th>
<th>Meta-Design</th>
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<tbody>
<tr>
<td>e) Evaluation of learning progress</td>
<td>Enable self-reflection and assessment; facilitate sharing of learning experience with others; receive guidance from instructor</td>
</tr>
<tr>
<td>f) Personal work space</td>
<td>Enable creation of new documents and ability to link to other files; facilitate user-friendly editing</td>
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<tr>
<td>g) Collaborative capabilities</td>
<td>Enable others to view and edit documents; facilitate group pages; enable tracking of changes and “watch” features</td>
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<tr>
<td>h) Communication tools</td>
<td>Email; threaded discussion; message board; and chat</td>
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**Design Process**

The design process according to Walls et al. (1992) involves addressing three components of an Information System Design Theory (ISDT), which are design method, kernel theories, and testable design process hypotheses. The design process for this study is based on the kernel theories of evolutionary prototyping (Crinnion, 1992), usability testing theory (Dumans and Redish, 1999), and emergent agile development (Truex, Baskerville, and Klein, 1999). The design process for this study is based on an existing design by Zhang (2007), where the outline of the design process is similarly appropriate for this study.

The design method, which is set of procedures to follow in construction the artifact, are based on the stated kernel theories and the related meta-requirements.

<table>
<thead>
<tr>
<th>Kernel Theory</th>
<th>Design Method</th>
<th>Meta-Requirement</th>
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<tr>
<td>Evolutionary Prototyping</td>
<td>- Continually refine and rebuild the system prototype based upon a cycle of:</td>
<td>Conciseness, portability, and customization</td>
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<tr>
<td></td>
<td>collecting user requirements, redesigning the prototype, and evaluating it</td>
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<td></td>
<td>with users.</td>
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<td></td>
<td>- Use research methods such as preliminary studies, focus groups, and usability</td>
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<td>tests to achieve the goal of building a robust prototype.</td>
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</tr>
<tr>
<td>Usability Testing Theory</td>
<td>- Study time, accuracy, recall, and emotional response when users use the</td>
<td>Accessibility, reliability, usability, and security</td>
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<td></td>
<td>prototype to complete desired tasks. Consider further improvements.</td>
<td></td>
</tr>
<tr>
<td>Emergent/Agile Development</td>
<td>- Maintain close communication with developers, focus groups, and end-users.</td>
<td>Usability, customization, and integration</td>
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<td></td>
<td>Be open to feedback and suggestions.</td>
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<td></td>
<td>- Improve user satisfaction with rapid and continuous delivery of useful</td>
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<tr>
<td></td>
<td>functions.</td>
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<tr>
<td></td>
<td>- Integrate the system with existing learning process. Be open to change when</td>
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<tr>
<td></td>
<td>initiated by the users.</td>
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</table>

**Platform for the Artifact**

In constructing the artifact, various social software were compared for their suitability in meeting the established development environment (level 1) and system functionalities (level 2). In addition, it was important that the application enabled further customization and development to seamlessly integrate the designed user features (level 3). The platform that best met the criteria is MediaWiki. The fundamental capabilities of a wiki when compared to other social software, as described by Wagner (2005) include abilities to provide two-way mode of conversation, share and co-edit, and a dialog mode of many-to-many. Effectively, these features facilitate collaboration, sharing, and opportunities for receiving feedback, which are critical elements to learning and developing competencies as a self-directed learner. In addition, the application allows information to be presented topically and indexed bi-directionally, as well as having all changes maintained chronologically (Wagner 2005). These features further enable a student to organize one’s learning space and build a wealth of learning resources, which play a vital role in self-managing the learning process.
METHODOLOGY

Participants

This research will be a quasi-experiment involving two classes of undergraduate students enrolled in upper division business management courses taught online at a public university. Each course will have approximately 30 students enrolled, which represents a total of 60 participants for the study. The participants will have similar background in terms of having used the computer as an integral part of the course for some time, holding a junior or senior status at the university, and having similar disciplines of study within the business college. The results of the study are expected to be generalizable to undergraduate students, upperclassman, majoring in business, and participating in online courses.

Variables

In this study, the independent variables will be the various learning activities that students conduct to proactively manage and monitor their learning processes, as described in the SDL Model (Figure 1). The dependent variable will be the change in SDL abilities for the students in the experimental group compared to that of the control group. The results will be analyzed in detail to determine what variables most heavily influenced SDL abilities, and which features, if any, were not an influence. In addition to measuring the change in ability to self-direct learning activities, other characteristics that will be measured include user satisfaction, ease of use, and overall perception of the SDLMS.

Procedure and Instrumentation

The study will include assigning a class of students in each of the control and experimental groups rather than randomly assigning participants to either group. Providing the same software to a given class will ensure consistency among users when communicating or exchanging information online. In addition, keeping the two classes separate as control and experimental groups is an ideal solution to prevent participants from communicating with one another and influencing their behaviors and perceptions of the outcome (Creswell, 2008).

In conducting the study, the control group will use basic version of a wiki application. The experimental group will use the proposed wiki-based self-directed learning management system (SDLMS). The students will receive a brief training on using their designated system for the course. The study will be conducted for ten weeks, which is the duration of the course. During the term of the course, all students will receive course materials, have access to communications tools (i.e., email, threaded discussions, and chat), and conduct standard activities as learners in an online learning environment. Prior to using the assigned system, the students will take a survey to assess their ability to learn as self-directed learners. The same survey will be taken at the end of the quarter.

The survey instrument for this study is referred to as Self-directed Learning Competencies Self Appraisal Form (SDLCSAF), which was designed by Caffarella and Caffarella (1986). The questions are developed in the form of Likert scales and measures self-perceived competencies for SDL abilities. According to Caffarella and Caffarella (1986), the survey has been validated for construct and content validity by a team of experts in SDL (Drs. Lucy Guglielmino, Kay Haverkemp, Roger Hiemstra, and Malcolm Knowles).

Hypotheses

The primary scope of this study is to measure the effectiveness of the SDLMS in increasing students’ competency levels to self-direct their learning efforts in an online learning environment. The following hypotheses will be tested for design of the product:

H1: A student’s level of competency in SDL will increase as a result of SDLMS.
H1.1: A student’s ability to establish and track learning goals will increase as a result of using SDLMS.
H1.2: A student’s ability to locate, access and utilize resources will increase as a result of using SDLMS.
H1.3: A student’s ability to plan and execute learning activities will increase as a result of using SDLMS.
H1.4: A student’s ability to monitor and evaluate performance will increase as a result of using SDLMS.
H1.5: A student’s ability to reassess learning strategies will increase as a result of using SDLMS.

H2: The ISDT design process will result in successful design and development of an artifact that meets the needs of users and goals of this research.
**Data Analysis Procedure**

The quantitative data from the pretest and posttest surveys will be analyzed using SPSS. Some of the information to assess include demographic information, computer proficiency level, and assessment of descriptive statistics and correlation of technical features of the application with the ability to self-direct learning accordingly.

In addition to evaluating the change in competency levels, some additional assessments include perceived value of SDLMS, perceived learning results, satisfaction and willingness to take another online course.

**Expected Results**

The goal of this study is to inform research regarding design of an artifact for online efficacy. The research method will capture a product process and a design process to define the building of the artifact. Also, the study will provide practical guidance to online educators, administrative leaders, and instructional designers, as they can benefit from the design theory of functionalities and features that are essential to reinforce and improve SDL abilities for students learning in online environments.

In the case that this study fails to prove the hypotheses, there still exists valuable information to be gained from the results. This includes understanding what particular components of the application are of significant value in enabling self-directedness, what type of individuals the SDLMS best serves, and identifying specific behaviors and abilities the SDLMS reinforces. This information will allow future studies to improve the design of the learning system.

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**REFERENCES**