Development of E-Learning System to Enhance Cognitive Skills of Self-directed Learners: A Case Study of Introduction to Information Technology Course

Sirichai Hemrungrote

School of Information Technology

Mae Fah Luang University, Chiang Rai, THAILAND
Contents

- Introduction
- Motivation
- E-learning Development
- Research Questions
- Population
- Results and Discussions
  - Grading
  - Satisfaction on Using E-learning System
  - Self-evaluation on SDL Cognitive Skills
- Conclusions
Introduction

- Nowadays, **e-learning** which exploits interactive technologies and communication systems presents its effectiveness in improving the learning experience.
- It has the potential *not only* to transform the way we teach and learn across the board, *but also* raise standards, and widen participation in lifelong learning.
Self-directed learning (SDL) is a type of learning in which learners are allowed to work on problems and tasks of their own choice, and are still provided learning support in context to their problems.

SDL has claimed to increase students’ confidence for independent learning.

The attention that SDL has received increases significantly, especially with the courses offered in higher education.
Knowles has defined SDL by suggesting that learners who take the initiatives tend to learn more effectively than those who wait passively to be taught.

This learning approach keeps them engaged, since they have to acquire knowledge on their own, and apply it along with their skills to find solutions to their problems, evolve their learning and be encouraged for lifelong learning.
Introduction (cont.)

- Long has pointed out the six cognitive skills that are particularly important to successful self-directed learning: **goal setting**, **processing**, **cognition**, **competence**, **decision making**, and **self-awareness**.

- There are **many attempts** to have e-learning technologies applied to the processes of self-directed learning.

- The introduction of SDL has to be given into the curricula using the **student-centered** approach.
Motivation

- The number of students who enrolled in the course of Introduction to Information Technology at Mae Fah Luang University is getting larger and larger in recent years.
  - It causes some problem on study resources, such as the limited number of classrooms and the computers.

- In order to solve these problems, e-learning system is developed in this study to support SDL by using induction module lessons.
The e-learning system for the course of Introduction to Information Technology is developed as a **web-based** system.

Web2.0 is employed and the system is driven by a **web server** and **Java** applications.
Students are motivated to organize their study by themselves.

- download all study materials
- try to understand each lesson
- work on exercises before the class
- discuss some unclear points with their friends
- complete the assignment and submit their works to the system.

The examination is also organized to be done online, but in the class, to avoid the occurrence of cheating.
The system provides a student interface that authorizes the one who logs in by correct pair of student identification number and password.
E-learning Development (cont.)

- A student can then access to system menu.
Inform, announce a student about the activities concerning the course, e.g. class cancelation, examination, makeup class, etc.

Allow students to download the study materials of each content or module lesson. The study materials are in forms of PPT, PDF document and SWF interactive animation.
E-learning Development (cont.)

- Allow students to download the exercises assigned by the instructor in forms of word document, excel, PPT, etc.
- Allow students to upload the file of his/her complete work to the system.
- This session of each module is opened for a limited time to avoid the occurrence of copied works.
Allow students to access a set of questions randomized from the question bank.

Even the examination has to be done online, students have to present themselves at the room in which the examination is organized to avoid the occurrence of cheating.

The session is meant to be opened only during the examination hours.
E-learning Development (cont.)

Allow students to check his/her score of assignments which have already been checked by the instructor, as well as the score of examinations checked by the system.

Allow students to download the software concerning all the lessons in his/her learning, such as MS Word, MS Excel, etc.
Allow students to access to the contact information of all instructors, such as phone number, email address, office address, etc.

Allow students to post the questions and discuss some unclear points of his/her learning, as well as something concerning the course.
Research Questions

The goals of classroom research design

(1) Motivate students respond to the developed e-learning system.

(2) Investigate the effects of such environments on six cognitive SDL skills.

(3) Survey the satisfaction of students using the system and students’ self-evaluation.

(4) Investigate the students’ assessment in term of grading.
The hypothesis that “the developed e-learning system has a positive effect on students’ SDL cognitive skills” is tested.

The effects of e-learning environment are examined based on self-evaluation on pre-learning and post-learning SDL cognitive skills; as well as the questionnaires in terms of system satisfaction toward the course.
The self-evaluation on SDL cognitive skills is about the following items.

1. **Goal Setting**
   - 'I set my own learning goals’

2. **Processing**
   - 'I have good management skills’

3. **Cognition**
   - 'I am open to new ideas’

4. **Competence**
   - 'I am confident in my ability’

5. **Decision Making**
   - 'I like to solve problems’

6. **Self-awareness**
   - 'I have a need to learn’
The survey of satisfaction on using e-learning system is about the following items.

(1) **Efficiency and benefit of the system**: menu suitability, document correctness, system response, document downloading, assignment submission process, user friendly, etc.

(2) **Web design**: beauty, modernity, amenity, page arrangement, font style, etc.

(3) **User support and services**: tutorial, troubleshooting rapidity, contact achievement.
The participants are comprised of 2,895 students who enrolled in the course of Introduction to Information Technology at Mae Fah Luang University, Chiang Rai, Thailand in the first semester of academic year 2013.
Grading

Note: A = 80-100, B+ = 75-79.99, B = 70-74.99, C+ = 65-69.99, C = 60-64.99, D+ = 55-59.99, 
Satisfaction on Using E-learning System

<table>
<thead>
<tr>
<th>Items</th>
<th>Responses (%)</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency and benefit of the system</td>
<td>33.43 50.36 14.57 1.21 0.43</td>
<td>4.15</td>
<td>0.54</td>
</tr>
<tr>
<td>Web design</td>
<td>23.25 58.75 16.25 1.75 0.00</td>
<td>4.04</td>
<td>0.46</td>
</tr>
<tr>
<td>User support and services</td>
<td>21.50 54.00 22.00 2.50 0.00</td>
<td>3.95</td>
<td>0.53</td>
</tr>
<tr>
<td>Overall satisfaction on using e-learning system</td>
<td>19.28 56.25 20.15 2.84 1.48</td>
<td>3.89</td>
<td>0.63</td>
</tr>
</tbody>
</table>

Note: SA = Strongly Agree (5), A = Agree (4), US = Unsure (3), DA = Disagree (2), SDA= Strongly Disagree (1), M = Mean, SD = Standard Deviation
## Satisfaction on Using E-learning System (cont.)

### User Support and Services

- **SA** = Strongly Agree (5), **A** = Agree (4), **US** = Unsure (3), **DA** = Disagree (2), **SDA** = Strongly Disagree (1), **M** = Mean, **SD** = Standard Deviation

<table>
<thead>
<tr>
<th>Items</th>
<th>Responses (%)</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency and benefit of the system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>33.43</td>
<td>50.36</td>
<td>14.57</td>
</tr>
<tr>
<td>A</td>
<td>50</td>
<td>23.25</td>
<td>16.25</td>
</tr>
<tr>
<td>US</td>
<td>19.28</td>
<td>56.25</td>
<td>20.15</td>
</tr>
</tbody>
</table>

### Overall Satisfaction

<table>
<thead>
<tr>
<th>Items</th>
<th>Responses (%)</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Efficiency and benefit of the system</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SA</td>
<td>33.43</td>
<td>50.36</td>
<td>14.57</td>
</tr>
<tr>
<td>A</td>
<td>50</td>
<td>23.25</td>
<td>16.25</td>
</tr>
<tr>
<td>US</td>
<td>19.28</td>
<td>56.25</td>
<td>20.15</td>
</tr>
</tbody>
</table>

### Note

- **SA** = Strongly Agree (5), **A** = Agree (4), **US** = Unsure (3), **DA** = Disagree (2), **SDA** = Strongly Disagree (1), **M** = Mean, **SD** = Standard Deviation
## Self-evaluation on SDL Cognitive Skills

<table>
<thead>
<tr>
<th>Items</th>
<th>Pre-learning responses (%)</th>
<th>Post-learning responses (%)</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SA</td>
<td>A</td>
<td>US</td>
<td>DA</td>
<td>SDA</td>
<td></td>
</tr>
<tr>
<td>Goal setting</td>
<td>18.18</td>
<td>33.63</td>
<td>34.25</td>
<td>11.35</td>
<td>2.59</td>
<td>3.53</td>
</tr>
<tr>
<td>Processing</td>
<td>15.34</td>
<td>25.58</td>
<td>43.23</td>
<td>14.62</td>
<td>1.23</td>
<td>3.39</td>
</tr>
<tr>
<td>Cognition</td>
<td>17.21</td>
<td>30.17</td>
<td>35.56</td>
<td>15.55</td>
<td>1.51</td>
<td>3.46</td>
</tr>
<tr>
<td>Competence</td>
<td>12.23</td>
<td>28.25</td>
<td>39.06</td>
<td>19.90</td>
<td>0.56</td>
<td>3.32</td>
</tr>
<tr>
<td>Decision making</td>
<td>20.16</td>
<td>29.02</td>
<td>37.76</td>
<td>12.64</td>
<td>0.42</td>
<td>3.56</td>
</tr>
<tr>
<td>Self-awareness</td>
<td>13.69</td>
<td>30.11</td>
<td>44.77</td>
<td>9.49</td>
<td>1.94</td>
<td>3.44</td>
</tr>
<tr>
<td>Overall SDL cognitive skills</td>
<td>16.14</td>
<td>29.46</td>
<td>39.11</td>
<td>13.93</td>
<td>1.38</td>
<td>3.45</td>
</tr>
</tbody>
</table>

Note: SA = Strongly Agree (5), A = Agree (4), US = Unsure (3), DA = Disagree (2), SDA = Strongly Disagree (1), M = Mean, SD = Standard Deviation
Self-evaluation on SDL Cognitive Skills (cont.)

Pre-learning responses

- US: 39%
- A: 30%
- SA: 16%
- DA: 14%
- SDA: 1%

Post-learning responses

- A: 55%
- US: 8%
- SA: 35%
- DA: 2%
- SDA: 0%

\[ SA + A = 45.60\% \]
Mean = 3.45, SD = 0.93

\[ SA + A = 89.79\% \]
Mean = 4.23, SD = 0.45
Conclusions

- E-learning system has been developed to enhance students’ cognitive skills of self-directed learners.
- Most students satisfied on the efficiency and benefit of the system, interface design, user support and services.
- Almost all students thought that their SDL cognitive skills were improved after using the system and managing their own studies among SDL environments.
- Most students enrolled in the course got more than 70 percent scores.
- The students provided positive feedback regarding the self-directed motivation of the web-based learning.
The summary of data reflected that SDL could be as effective as other standard forms of traditional learning.

- SDL might encourage students to learn inductively with the aid of teaching systems.

Lastly and most-importantly, this study has promised a significant to provide the motivation in the development of students’ cognitive skills as self-directed learners.

- Many of them commented that such SDL environments not only improved their knowledge and skills but also enhanced their ability to integrate what they have learnt to support other courses toward their study program.
Thank you for your kind attention.