The Development of a Learning Management Model According to the Concept of Self-Reliance with Inquiry-Based Learning to Enhance System Analysis and Design Skills

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This study has the objective to develop a learning management model according to the concept of self-reliance with inquiry-based learning to enhance skills in system analysis and design for students. The author uses documentation research as the main process to study related books, research, and articles both domestically and internationally for 58 topics. The documents are analysed by Systematic Review. From the results of this study, the learning management model to enhance system analysis and design skills for students by self-reliance consists of 3 steps as follows: Step 1 Delivery of Knowledge Phase; Step 2 Creating Knowledge Phase which integrates 5 steps of inquiry-based learning consisting of 1) Knowledge Management Stage, 2) Quest Design Stage, 3) Action Investigations Stage, 4) Discussion and Conclusions Stage, and 5) Discovery delivery Stage, and Step 3 Applied Knowledge Phase. The result of the learning management supports students to have the two higher skills of system analysis and design skills which are 1) problem analysis skills 2) Summarising Skills by self-reliance.

Key words: Self-Reliance, Inquiry-Based Learning, IBL, System Analysis and Design Skills.

Introduction

The learning management is an activity in which people use their knowledge creatively to integrate different educational concepts to develop learning management models (Nathathai...
Gall et al., 2019). This is to support others to learn and to have knowledge and expertise sustainably through the designed learning management.

The present tertiary education system in Thailand focuses on students having expertise in their fields for their future career. However, the present learning management focuses on the delivery of knowledge phase in terms of theory only. This makes students lack desirable skills and expertise in their fields. They do not have opportunities to apply theoretical knowledge in practice and to use self-evaluation. This is consistent with computer learning management in every field due to the nature of the subject which focuses on students learning system analysis and design skills in practice. This is because these skills are the main process to design and develop the computer system. However, the system of educational management which focuses on theoretical knowledge leaves students unable to analyse and design the system, including the computer system.

From the mentioned problems, the author wants to study the concepts of education systematically to develop a learning management model which focuses on real practice by self-reliance. From the study, the author found that sustainable learning by using the self-reliance concept which was developed by Julius Nyerere (Julius Nyerere, 1967) is a concept that can make students develop the knowledge by themselves. This prioritises the learning management focusing on letting students practise by themselves. Moreover, the author found that Inquiry Based Learning (IBL) is a learning management model in the 21st century that focuses on encouraging students to find knowledge, think, and solve problems by themselves systematically by stimulating students to be curious and find knowledge by questioning and trying to find answers by themselves under the most suitable environment (Fred W. Kolkhorst et al., 2018; Kulli Kori et al., 2015; Stanislav Avsec et al., 2014).

From these problems and the importance of the knowledge that the author gets from the study of educational theory systematically, the author agrees to apply the self-reliance concept integrated with inquiry-based learning to develop the learning management model that enhances skills by allowing students to practise. Then, the author develops the learning management model according to the self-reliance concept with inquiry-based learning which will be used to develop students to have system analysis and design skills by self-reliance.

Literature Review

Self-Reliance

Self-reliance is an original concept by Julius Nyerere (1967). Therefore, it is the concept which helps students to generate knowledge by themselves by using practical skills with an applied knowledge phase from the theoretical part in working for the real situation or virtual situation.
This will make students get knowledge additionally by themselves. Moreover, students will learn how to apply knowledge in different situations. Students will have sustainable learning by self-reliance which will be the skill creation for employees in the future (Hasibuan et al., 2018; B. Ablodun et al., 2017; Babatimehn Muyiwa et al., 2017; Stella N. Lemchi et al., 2016; Athman Kyaruzi Ahmad et al., 2014; Msuya C. P. et al., 2014). In other words, self-learning has the objective to increase efficiency and improve students’ skills (Sventhana V. Lapteva et al., 2019). In addition, self-learning has an influence on developing the working skills of students (Wong et al., 2019).

From the study, self-reliance is a concept which has the objective to make students rely on themselves by focusing on the creation of practical skills in their fields. From the study of this concept, the author found that it is a concept which educators have applied in learning management for a long time. However, the author does not find clear steps of learning management. The author, therefore, analyses from research methodologies and research results. Then, the author synthesises the steps for ease of learning management in three stages as follows:

**Step 1** Delivery of Knowledge Phase involves organising activities to investigate and deliver knowledge both in theory and in practice to students, which is related to system analysis and design skills in terms of two issues, Problem Analysis Skills, and Summarising Skills. This is to verify the original knowledge of both theory and practice to make students ready to be self-reliant in the expected skills.

**Step 2** Creating Knowledge Phase involves the activity design to support students to create their own knowledge from real practice and situations or virtual situations which are related to system analysis and design skills to enhance the incomplete knowledge from the delivery of knowledge phase by various thinking activities and activity designs. Activity selection will mainly depend on the required skills.

**Step 3** Applied Knowledge Phase involves allowing students to apply their knowledge and system analysis and design skills from the previous learning management to design a new system or computer system. This is conducted by self-reliance to make students learn how to apply system analysis and design skills for problem solving in real situations or virtual situations. Students will learn how to use different skills in different situations. For ease of understanding, the author likes to present the steps of the learning management according to self-reliance as in Figure 1.
Therefore, it can be concluded that self-reliance will result in students having desirable skills and expertise in their fields. Moreover, students have opportunities to apply theoretical knowledge in real practice and opportunities to assess their skills by themselves or with the help of experts. The learning management that students can apply by self-reliance has an influence on developing the working skills of the students.

**Inquiry Based Learning (IBL)**

Inquiry-based learning is a learning management technique in the 21st century focusing on allowing students to find knowledge, think, and solve problems by themselves systematically, by stimulating students to be curious, find knowledge from questions, and try to find answers by themselves under the most suitable environment (Fred W. Kolkhorst et al., 2018; Kulli Kori et al., 2015; Margus Pedaste et al., 2015; Stanislav Avsec et al., 2014; Siu Cheung Kong, 2014).

From the study, the author synthesises the mentioned learning management to get suitable steps for creating activities focusing on skill development by self-reliance. From the synthesis, 5 steps of IBL learning management are derived as follows:

**Step 1** Knowledge Management Stage is a step of assumption to find information, researching for answers, verification of original knowledge, and adding new knowledge to be the basis for answer searching.

**Step 2** Quest Design Stage is applying results from step 1 to design activities and questions to find answers for real situations or virtual situations to get system analysis and design skills.
Step 3 Action Investigations Stage is applying design in real practices.

Step 4 Discussion and Conclusions Stage is the interpretation and reporting of results from action investigations in the forms of conclusions, figures, charts, etc. to present the findings.

Step 5 Discovery Delivery Stage is a step of opportunity creation for students to have opportunities to present or verify the accuracy of findings by experts after the finding process.

For ease of understanding, the author likes to present the steps of the IBL technique from the synthesis as in Figure 2.

Figure 2. Steps of inquiry-based learning

Therefore, it can be concluded that inquiry-based learning is learning management which provides opportunities for students to think, practise, and apply knowledge systematically to find knowledge by themselves. Therefore, obtained knowledge will be durable and can be transferred or applied to new situations.

System analysis and design

System analysis and design is a cycle showing the steps of the development in the computer system. The synthesis is a step to collect data according to requirements as much as possible. The design is an application of the outcome from the synthesis to develop as requirements of the new system by developing as a model. The development of computer systems in the past and present is usually done by the Systems Development Life Cycle (SDLC) to analyse and
design the new system (Kazim Ali, 2017; Amninder Singh et al., 2017; Mohit Kumar Sharma, 2017; S. Shanmuga Priya et al., 2016).

From the study, the author synthesises the Systems Development Life Cycle (SDLC) to be used to evaluate the system analysis and design skills of students after they use the learning management according to self-reliance with inquiry-based learning in this study. The results from the synthesis provide desirable system analysis and design skills to students in two skill areas: 1) Problem Analysis Skills, and 2) Summarising Skills.

For ease of understanding, the author likes to present system analysis and design skills synthesised from the Systems Development Life Cycle (SDLC) as in Figure 3.

**Figure 3.** System analysis and design skills

From Figure 3, the desirable system analysis and design skills in students from the synthesis of the Systems Development Life Cycle (SDLC) consist of Skill 1: Problem Analysis Skills comprising 1) Problem definition of the old system demonstrated by students being able to identify the background and importance of problems, fishbone diagram of the old system, and work flow chart of the old system, and 2) Requirement analysis skills of the new system demonstrated by students being able to identify the scope of the requirements of the new system, and Skill 2: Summarising Skills comprising 1) New System Conceptual Design Skills demonstrated by students being able to identify data stream diagrams, process explanation, dictionary, and the data relationship chart of the new system, 2) Logical System Design skills demonstrated by students being able to design import sections, display sections, and user interface sections of the new system, and 3) Physical System Design Skills of the new system.
demonstrated by students being able to define the specifications of hardware and software to support the new system.

Therefore, it can be concluded that the results from the synthesis provide system analysis and design skills in students covering two skills: 1) Problem Analysis Skills, and 2) Summarising Skills. The author can use this as a tool to evaluate system analysis and design skills after students learn by using learning management according to self-reliance with inquiry-based learning.

**Methodology**

For this study, the author uses a systematic review for related documents, books, research studies, and articles both domestically and internationally. They are selected by purposive sampling for 58 topics by selecting studies developed during 2007-2019. This study is a qualitative study and uses content analysis by using keywords to discover three issues as follows: Self-Reliance, Inquiry-Based Learning (IBL), and System Development Life Cycle (SDLC). This knowledge is integrated to create the learning management model enhancing system analysis and design skills to students. Information resources used in the study are shown in the following table.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Types of resources</th>
<th>Quantity/Topic</th>
<th>Total/Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic</td>
<td>1. Books</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>2. Research studies/Articles</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>International</td>
<td>1. Research: 1967 (Model of self-reliance)</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2. Research studies/Articles</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td><strong>Grand total</strong></td>
<td></td>
<td></td>
<td><strong>58</strong></td>
</tr>
</tbody>
</table>

The author uses the following methodologies to conduct this study.

1. The author collects and studies related documentation in the form of books, journals, articles, and research studies by selecting them by purposive sampling. Then, they are studied by using Screening context.
2. The author analyses the collected documentation systematically to generate knowledge which can be used to develop the learning management model according to self-reliance with the IBL technique to enhance system analysis and design skills.
3. The author synthesises and integrates knowledge from the analysis in the previous step to develop the expected learning management model.
Result

Results from the analysis and synthesis of related knowledge allow the author to use the knowledge to synthesise the learning management model according to self-reliance with IBL for enhancing system analysis and design skills for students. Self-reliance will be used as the main process and inquiry-based learning will be used as the supplementary activity supporting self-reliance. As a result, three steps of the learning management supporting system analysis and design skills in students can be shown in Figure 4.

**Figure 4.** the learning management model according to self-reliance with IBL technique to enhance system analysis and design skills
From Figure 4, details of the learning management are shown in Table 2.

**Table 2.** Details of the learning management according to self-reliance with inquiry-based learning to enhance system analysis and design skills

<table>
<thead>
<tr>
<th>Self-reliance</th>
<th>Meaning</th>
<th>Steps of inquiry-based learning</th>
<th>Activities</th>
<th>Teachers</th>
<th>Students</th>
</tr>
</thead>
</table>
| Step 1: Delivery of Knowledge Phase | Organising of activities to investigate and deliver knowledge both in theory and in practice to students consisting of two steps of knowledge finding, 1) Knowledge Management Stage to manage theoretical and practical knowledge for students, and 2) Quest Design Stage to design activities affecting students leading to better system analysis and design skills. | Step 1: Knowledge Management Stage | 1. Introduce targets and importance of activities  
2. Deliver scopes of system analysis and design skills  
3. Deliver detail of activities  
4. Organise activities  
5. Develop tools to evaluate students  
6. Deliver results of participation | 1. Prepare knowledge according to scopes of system analysis and design skills  
2. Participate in activities  
3. Acknowledge results of participation | 1. Analyse and review the required fundamental knowledge to participate in activities successfully  
2. Brainstorm to design IBL activities consisting of expected system analysis and design skills  
3. Brainstorm to design questions  
4. Brainstorm to design formats of discussion and conclusion of |
<table>
<thead>
<tr>
<th>Self-reliance</th>
<th>Meaning</th>
<th>Steps of inquiry-based learning</th>
<th>Activities</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>6. Assign students to brainstorm to design formats of discussion and conclusion of each activity suitably 7. Assign students to brainstorm to design the discovery delivery stage for each activity 8. Provide feedback from brainstorming to students for the improvement or rectification (if any) 9. Observe, suggest, and facilitate students.</td>
<td><strong>Teachers</strong>&lt;br&gt;1. Define activity plans 2. Monitor activities according to plans</td>
<td><strong>findings suitably for each activity</strong>&lt;br&gt;5. Brainstorm to design discovery delivery stage for each activity 6. Acknowledge feedback from each activity design 7. Use feedback to improve designed activities</td>
</tr>
</tbody>
</table>

**Step 2: Creating Knowledge Phase**

A step of using the design from step 1 for real practice. This step consists of three steps of knowledge finding which are Step 3 Action Investigations Stage is the use of the design to organise real activities, Step 4 Discussion and Conclusions Stage is providing opportunities to students to evaluate their skills from self-reliance, and Step 5 Discovery Delivery Stage is providing opportunities to students to

**Step 3: Action Investigations Stage**

Assign students to discuss and conclude results from participation

**Step 4: Discussion and Conclusions Stage**

1. Provide at least three experts to provide suggestions or feedback 2. Deliver results of actions or work creations of students to experts 3. Conclude results of students' participation

**Step 5: Discovery Delivery Stage**

1. Participate in activities according to plans 2. Act or create works of each activity 3. Submit results from each activity

Discuss and conclude results from participation

1. Deliver findings 2. Receive suggestions or feedback from experts 3. Use suggestions or feedback to improve skills before the next participation
<table>
<thead>
<tr>
<th>Self-reliance</th>
<th>Meaning</th>
<th>Steps of inquiry-based learning</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>present findings after participation</td>
<td></td>
<td>Teachers</td>
</tr>
</tbody>
</table>

**Step 3: Applied Knowledge Phase**

Assigning students to apply knowledge from the learning management to the real practice to enable students to solve problems in real situations or virtual situations by self-reliance

- 1. Introduce targets and importance of activities
  2. Define the delivery of actions or work creations
  3. Design tools for marking and measuring practical skills in system analysis and design skills such as scoring rubrics
  4. Assign students to deliver results from actions or work creations
  5. Provide at least three experts to evaluate system analysis and design skills of students
  6. Deliver results of actions or work creations to experts
  7. Define presentations to experts
  8. Deliver evaluation results of system analysis and design skills to students
  9. Observe, suggest, and facilitate

1. Analyse and review fundamental knowledge on their own to act or create works successfully
2. Act or create works by self-reliance
3. Submit results of actions or work creations to teachers
4. Deliver findings according to due dates
5. Receive suggestions or feedback from experts
6. Acknowledge evaluation results of system analysis and design skills through self-reliance
Discussion

The development of the learning management model according to self-reliance with IBL to enhance system analysis and design skills is conducted by studying books, research studies, articles, and other related documents for 58 topics. Therefore, the author is sure that it is possible to integrate this concept and technique in the learning management model which can enhance system analysis and design skills for students by self-reliance. From the integration, the learning management model has three steps of learning management. Step 1 and Step 2 are inserted with techniques of suitable IBL learning management. Step 1 Delivery of Knowledge Phase is the organising of activities to investigate and deliver theoretical and practical knowledge related to system analysis and design skills for students to be ready for self-reliance by using inquiry-based learning for organising activities. This consists of two steps:

1) Knowledge Management Stage is organised activities to manage theoretical and practical knowledge for students. At the same time, feedback is provided after activities are finished to design activities for solving problems in the next step, and
2) Quest Design Stage is an activity for brainstorming to design activities to fulfill system analysis and design skills.

Step 2 Creating Knowledge Phase is a step to practise designed activities from step 1. This step consists of three steps of inquiry-based learning which are: Step 3 Action Investigations Stage using the design to organise activities, Step 4 Discussion and Conclusions Stage assigning students to discuss and conclude results from participation in the previous steps, and Step 5 Discovery Delivery Stage presenting the discussion and conclusions stage of participation to the public, while the last step is the Applied Knowledge Phase which is assigning students to use knowledge from the two previous steps for real practice, to enable students to apply knowledge for problem solving in the real situations or virtual situations by self-reliance. This learning management model is synthesised from the study by Fred W. Kolkhorst et al. (2018), Hasibuan, P. E. et al. (2018), Babatimehn Muyiwa et al. (2017), B. Ablodun et al. (2017), Stella N. Lemchi et al. (2016), Innocent Sanga (2016), Margus Pedaste et al. (2015), Kulli Kori et al. (2015), Msuya C. P. et al. (2014), Athman Kyraruzi Ahmad et al. (2014), Ali Abdi (2014), Stanislav Avsec et al. (2014), and Siu Cheung Kong et al. (2014). From the development of the learning management model in this study, students can create system analysis and design skills by self-reliance in two skills: 1) Problem Analysis Skills which consists of problem definition of the old system and Requirement Analysis skills of the new system, and 2) Summarising Skills which consist of Concept Design Skills for the new system, Logical Design Skills for the new system, and Physical Design Skills for the new system. System analysis and design skills are synthesised from the study by Amninder Singh et al. (2017), Mohit Kumar Sharma (2017), Kazim Ali (2017), S. Shanmuga Priya et al. (2016), Munish Saini et al. (2014), and Naresh Kumar et al. (2013).
Conclusion

Results from the research and development allow the author to develop the learning management model according to self-reliance with IBL learning management to enhance system analysis and design skills from the integration of self-reliance focusing on practice to give students the practical skills by self-reliance and IBL techniques to provide opportunities to students to think, practice, and apply their knowledge systematically to find knowledge by themselves. Therefore, the knowledge or skills will be durable and transferable, or applicable in new situations for the learning management focusing on students having practical skills.

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REFERENCES


