

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).

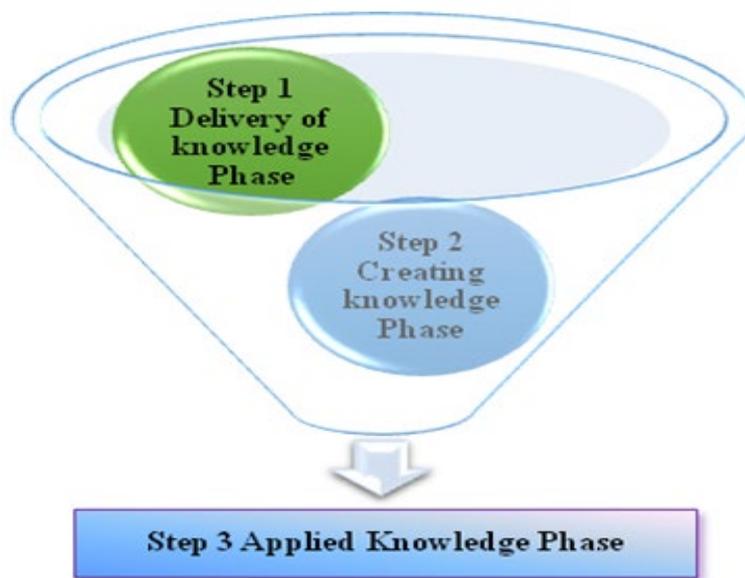
From the study, self-reliance is a concept which has the objective to make students rely on themselves by focusing on the creation of practical skills in their fields. From the study of this concept, the author found that it is a concept which educators have applied in learning management for a long 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.

Figure 1. Learning management steps according to the self-reliance concept



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

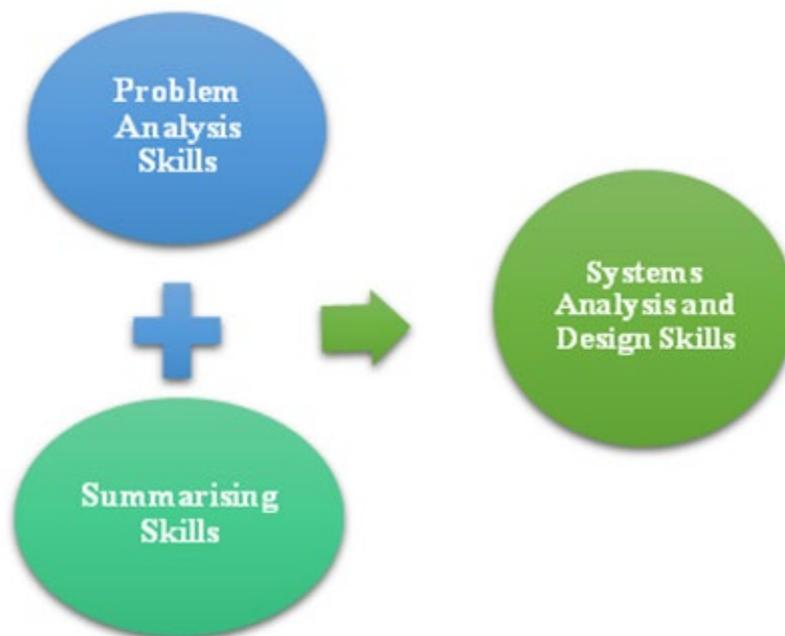
System analysis and design is a cycle showing the steps of the development in the computer system. The synthesis is a step to collect data according to requirements as much as possible. The design is an application of the outcome from the synthesis to develop as requirements of the new system by developing 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 1. Information resources used in the study

Resources	Types of resources	Quantity/ Topic	Total/Topic
Domestic	1. Books	7	7
	2. Research studies/Articles	19	19
International	1. Research: 1967 (Model of self-reliance)	1	1
	2. Research studies/Articles	31	31
Grand total			58

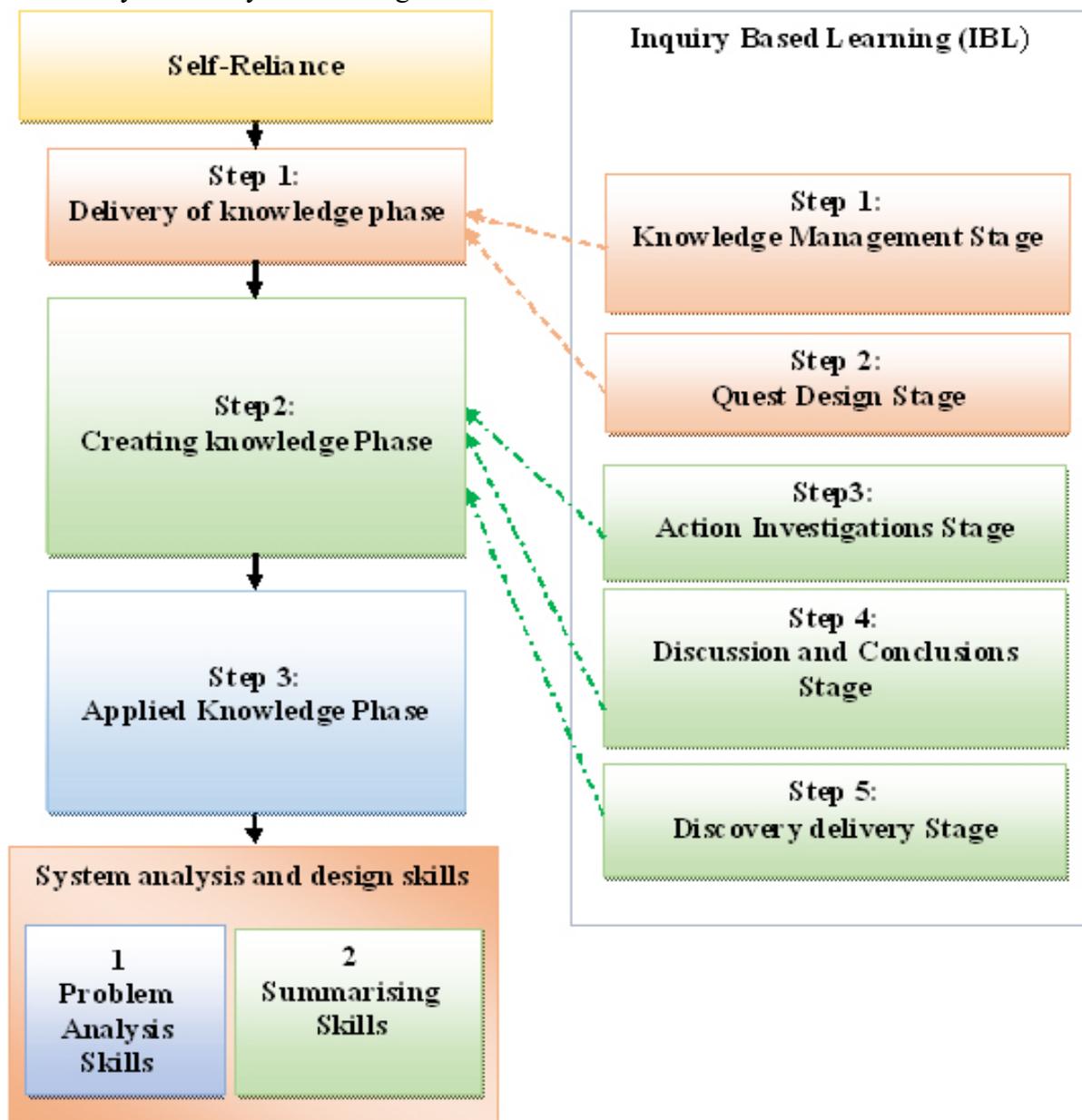
The author uses the following methodologies to conduct this study.

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

Self-reliance	Meaning	Steps of inquiry-based learning	Activities	
			Teachers	Students
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	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 1. Prepare knowledge according to scopes of system analysis and design skills 2. Participate in activities 3. Acknowledge results of participation
		Step 2: Quest Design Stage	<ol style="list-style-type: none"> 1. Introduce targets and importance of activities 2. Deliver knowledge supporting quest design stage such as IBL and questioning techniques 3. Deliver scopes of system analysis and design skills 4. Design evaluation criteria for participation appropriately for each activity 5. Assign students to brainstorm/ design activities and questions /select suitable case study 	<ol style="list-style-type: none"> 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

Self-reliance	Meaning	Steps of inquiry-based learning	Activities	
			Teachers	Students
			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.	findings suitably for each activity 5. Brainstorm to design discovery delivery stage for each activity 6. Acknowledge feedback from each activity design 7. Use feedback to improve designed activities
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	1. Define activity plans 2. Monitor activities according to plans	1. Participate in activities according to plans 2. Act or create works of each activity 3. Submit results from each activity
		Step 4: Discussion and Conclusions Stage	Assign students to discuss and conclude results from participation	Discuss and conclude results from participation
		Step 5: Discovery Delivery 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	1. Deliver findings 2. Receive suggestions or feedback from experts 3. Use suggestions or feedback to improve skills before the next participation

Self-reliance	Meaning	Steps of inquiry-based learning	Activities	
			Teachers	Students
	present findings after participation			
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	-	<ol style="list-style-type: none"> 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 	<ol style="list-style-type: none"> 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 Muiyiwa 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 Kyaruzi 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

- Ali Abdi.(2014). “The Effect of Inquiry-based Learning Method on Students ‘Academic Achievement in Science Course.” *Universal Journal of Educational Research*.14:37.
- Amninder Singh and Puneet Jai Kaur.(2017). “A Simulation Model for Incremental Software Development Life Cycle Model.”*International Journal of Advanced Research in computer science*.8 :126.
- Anthony M. Pellegrino & Jessica Kilday.(2013).“Hidden in Plain Sight :Preservice Teachers’ Orientations toward Inquiry-Based Learning in History.” *Journal of Social Studies Education Research*.13 (4):1-26.
- Athman Kyaruzi Ahmad. Erling Krogh and Sigrid Marie Gjotterud.(2014). “Reconsidering The philosophy of Education for Self-Reliance (ESR) from an experiential Learning Perspective in contemporary education in Tanzania.” *Educational Research for Social Change (ERSC)*.14(3): 3-19.
- Aumgri Charinthorn and Petsangsri Sirirat.(2019).”Computational thinking for preservice Teachers in Thailand: A confirmatory factor analysis.” *Revista ESPACIOS*.40(29):12.
- Babatimehn Muyiwa &Emeka Paul Okeke.(2017). “Sustainable Development and Self-Reliance: The Role of Technical and Vocational Education and Training.” *Journal of Educational Review*.10:53-56.
- B.Ablodun and W.L.Akintayo.(2017). “Vocational Education: An Instrument of Self- Reliance for the Nigerian Youths in a Depressed Economy.”*Journal of Youth Studies*.20:189.
- Fred W.Kolkhorst,Chery L. Mason, et al.(2018). “An Inquiry-based Learning Model for an Exercise Physiology Laboratory Course.”*Innovations and ideas*.25:45.
- Haneen Hijazi, Msc.(2014). “Risk Factors In Software Development Phases.”*European Scientific Journal*.10:215-228.
- Hasibuan, P.E., Akbar, M., & Suyanto, T. (2018). The Effect of Leadership, Employee Engagement,employee Self- Learning on Effectiveness of Employee’s Work. *International Journal of Scientific Researchemployee Management*, 6. <https://doi.org/10.18535/ijssrm/v6i7.em03>
- Innocent Sanga.(2016). “Education for Self-Reliance: Nyerer’s Policy Recommendations in The context of Tanzania.” *African Research Journal of Education and SocialSciences*.16 (3):1-6.



- Ivanova, N.L., & Ippolitova, N.V. (2019). Methodological approach as a strategy for Professional employees' training in small and medium sized enterprises in Russia. *Journal of Technology and Science Education*, 9(3), 239-244. <https://doi.org/10.3926/jotse.659>
- Julaluk Watthananon.(2015). "A Comparison of the Effectiveness of STEM Learning and Imagining Learning by Undergraduate Student in Computer Science." *International Journal of the Computer, the Internet and Management*.23(1):45-52.
- Julius Nyerere. "Education for Self-Reliance" *The Ecumenical Review*. 1967.67(19):382- 403.
- Kazim Ali.(2017). "A Study of Software Development life Cycle Process Models." *International Journal Of Advanced Research in Computer Science*. 17(8): 15.
- Kulli Kori, Margus Pedaste, Mario Maeots, et al.(2015). "Phases of Inquiry-based Learning: Definitions and the inquiry Cycle." *Education Research Review*.14:47.
- Lapteva, S.V., Kozlov A.V., & Tamer, O.S. (2019). The role of self-learning in promotion of skills in small employee medium sized of Russian enterprises. *Journal of Technology and Science Education*, 9(3), 245-256.
- Margus Pedaste Mario Maeots, et al.(2015). "Phases of inquiry-based Learning: Definitions and the inquiry cycle." *Education Research Review*.15 (14): 47.
- Mohit Kumar Sharma.(2017). "A study of SDLC to Develop well engineered software." *International Journal of Advanced Research in Computer Science*.8:521.
- Msuya C.P. Ahmand A.K, et al.(2014). "Revitalization of education for Self-reliance in Education for enhancing youth involvement in agriculture in Tanzania." *South African Journal of Agricultural Extension*.14 (42): :103-114.
- Munish Saini and Kuljit Kaur.(2014). "A Review of Open Source Software Development Life cycle Models." *International Journal of Software Engineering and Its Applications*. 14(8):418.
- Nathathai Gall , James E. Gall, and Sunchai Pattanasith, (2019)."The Blended Training Design model: an Example of Instructional Model Adaptation." *International Journal of the computer, the Internet and Management*.27 (1):1-7.
- Naresh Kumar, A.SZadgaonkar and Abhinav Shukla.(2013). "Evolving an New Software Development Life Cycle Model SDLC-2013 with Client Satisfaction." *International Journal of Soft Computing and Engineering (IJSCE)*.13(3): 216.



- Nwoqu, Prince Oporum and Nwanoruo Christopher, C. (2011). "Vocational Technical Education and Training for Self-Reliance: Towards National Development." *Mediterranean Journal of Social Sciences*. 11 (2):55.
- Pensri Srisawat, Naiyana Buppawong and Yuthana Wongwirat. (2015). "Model for Development of Professional Competencies of Physical Education Teacher in 21st Century in Education Innovation and Information Technology." *International Journal of The Computer, the Internet and Management*. 23 (3) 75-80.
- Siu Cheung Kong and Yanjie Song. (2014). "The Impact of a Principle-based Pedagogical Design on Inquiry-based Learning in a Seamless Learning Environment in Hong Kong." *Educational Technology & Society*. 14 (17):127-141.
- S. ShanmugaPriya and S.S. Arya. (2016). "Threat Modeling for a Secured Software Development." *International Journal of Advanced Research in Computer Science*. 16 (7):42.
- Stanislav Avsec and Slavko Kocijancic. (2014). "A Path Model of Effective Technology-Intensive Inquiry-Based Learning." *Technology & Society*. 19:308-320.
- Stella N. Lemchi, Priscilla N. Ezema & Catherine I. Iloje. (2016). "Promoting self-reliance Through the Enhancement of Creativity in Home Economics Students in Higher Education Institutions for Sustainable Development." *International Journal of Home Economics*. 9: 56-59.
- Siu Cheung Kong and Yanjie Song. (2014). "The Impact of a Principle-based Pedagogical Design on Inquiry-based Learning in a Seamless Learning Environment in Hong Kong." *Educational Technology & Society*. 14 (17):127-141.
- Wong, T.L., Xie, H., Wang, F.L., Tang, K.T., Kong, A., & Kwan, R. (2018). "Promoting Self-Regulated Learning by Online Educational Resources". Paper presented at the 2018 International Symposium on Educational Technology (ISET):254. <https://doi.org/10.1109/ISET.2018.00053>.
- Youngjin Song and Richard Schwenz. (2013). "An Inquiry-based Approach to Teaching the Spherical Earth Model to Preservice Teachers Using the Global Positioning System." *Journal of College Science Teaching*. 13 (42):51.