

On-line instruction with design thinking for creative skills development

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ABSTRACT: The on-line instruction model based on design thinking (OLI-DT model) has been developed as a tool for promoting on-line instruction for learners in the digital age. Thereby, a communication network between learners and instructors has been created that keeps up with advances in communication network technology. The model aims to challenge the learners to: seek knowledge and access learning sources; train their skills in information analysis and synthesis; question and find direct answers or problem-solving approaches by utilising several methods; and also to allow them to practise in real-life scenarios. The development of the model has been guided by modern learning principles, ideas, theories and skills requirement for the 21st Century. The model allows to respond to real-life situations and it supports learning from any place and time by utilising an instructional mode to create self-directed learning experience and space for skills development. It enables self-planning of learning plans and self-evaluation by learners with the support of instructional activities, and creates positive relationships between learners and instructors via an on-line social network.

Keywords: On-line learning, design-based thinking, learning in the 21st Century

INTRODUCTION

According to the National Education Act, B.E. 2562, in Thailand, educational management supports the principle that all learners should have the possibility to learn and self-develop, and that this approach is of the utmost importance. As such, the educational management process must support learners in their self-development, so that they develop to their full potential by prioritising the learners and considering what is most suitable and beneficial for them. In order to do that, educators have to create opportunities for learners to engage in learning, to join in instructional activities with full enthusiasm and allow the learners to implement learning processes that lead to the authentic learning by the learners themselves [1].

The information technology era imposes constant changes to communication and telecommunication technology. Therefore, information can be easily accessed and learning from various sources accomplished at a high speed, as computers are capable of connecting to other sources, creating a vast area network throughout the world [2]. The advancement of network technology changes the way of delivering instruction from class-based to hybrid or fully on-line as can be seen from the application of network technology in current instructional activities, especially through the Internet which creates a connection linking learners, instructors and parents. This new learning system is not bound by time, place and is individual; it reduces the distance and gaps between the central education sector and regional areas. Also, the application encourages learners to enjoy more informal learning and to engage in life-long education [3].

Design thinking is a set of processes for solving problems based on communication, collaboration and presentation. The design thinking process consists of the following phases: *empathise*, *define*, *ideate*, *prototype* and *test*. To elucidate:

- *empathise* (empathy) means an in-depth understanding of a target group by being thoughtful, empathy is crucial as engaging creativity for improvement needs the full understanding of the target group;
- *define* refers to data synthesis and open-end questioning stimulating creativity without the limitation of structured problem-solving approaches [4], after learning and understanding of the target group; it is a time of problem analysis in order to identify the real problem, then choose and find possible solutions;
- *ideate* is about brainstorming new ideas without any boundaries and forming ideas by embracing multiple diverse problem-solving concepts and approaches [5];

- *prototype* is the phase when the new ideas and approaches are brought to life for the first time; this is when the model, i.e. realised idea or approach is ready to be tested against any problems, thus allowing users to voice criticism leading to a better understanding of what is actually needed [6]. The faster ideas and approaches are formed, the faster the identification of mistakes and learning from the occurring problems.
- *test* is about testing the created model with the users or target group to observe how effective it is, then feedback, suggestions and advice are noted for further development and improvement.

In the 21st Century, learning skills focus on the learner’s creative thinking rather than crammed knowledge due to rapid and constant changes in society that require creative and innovative thinking to solve new problems and issues. Humanity inherently possesses these cognitive abilities; however, learning and training help honing the abilities to be sharper, quicker and more inclusive. A person with more creative thinking abilities will have a better career, will advance in life and serve the world better [7]. Also, learners have to be more self-sufficient, creative, curious and engage in self-directed learning. Additionally, new educational approaches encourage learners to think more comprehensively, to face certain situations and apply the learned knowledge to prevent and solve problems. Moreover, such an education promotes the development of desirable characteristics and cognitive abilities - students who solve problems and engage in creative thinking at school become capable of solving real problems in various circumstances in their every-day life.

Based on the above considerations, an on-line instruction model with design thinking (OLI-DT model) has been conceptualised as a guideline for developing on-line lessons that promote creative skills. The on-line lessons include a set of instructional activities that learners can access anywhere and anytime on mobile devices. These instructional activities focus on the learner, and this form of instruction contributes to the development and improvement of the critical skills urgently needed in the 21st Century.

RESEARCH QUESTIONS

The following research questions have been formulated:

- Q1: What are the elements of a conceptual framework for on-line instruction based on design thinking; what should such a framework consist of?
- Q2: Is it possible that the on-line instruction based on design thinking will promote creative skills development and enable learners to produce a creative piece of work?
- Q3: What elements and processes enabling learners to create a creative piece of work should be included in the on-line instruction based on design thinking?
- Q4: What results can be achieved through the development of on-line instruction based on design thinking?

RESEARCH METHODOLOGY

The model has been developed considering the systematic approach of the ADDIE (analysis, design, development, implementation and evaluation) framework [8]. In addition, design thinking [4-6] and creative thinking [9-11] have been applied in developing and designing the model. The research has been conducted according to the above four research questions with the following details:

- Q1: What are the elements of a conceptual framework for on-line instruction based on design thinking; what should such a framework consist of?

Literature review has been conducted, including relevant theories. The researchers reviewed instructional models [12-14], on-line teaching [15][16] and design thinking [4-6]. Then, all related theories have been analysed and synthesised to conceptualise a design thinking-based on-line instruction framework.

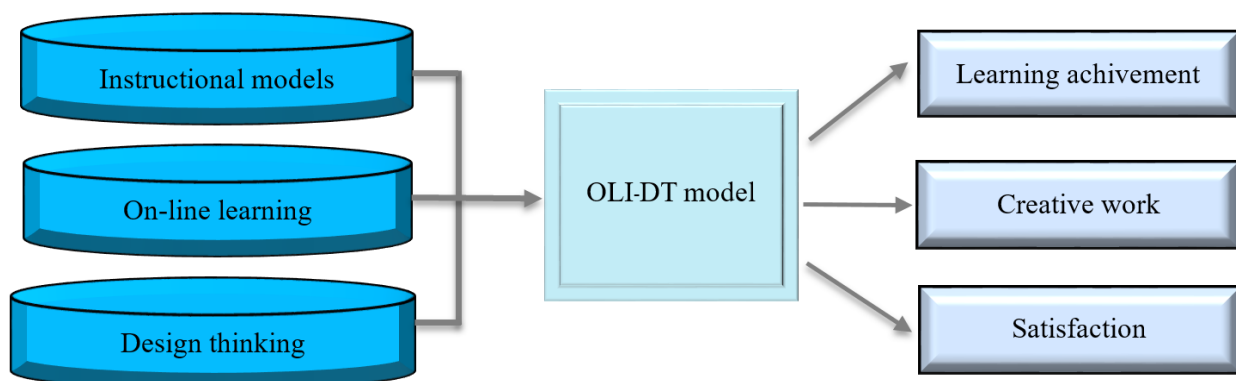


Figure 1: The design thinking-based on-line instruction framework.

Figure 1 shows the on-line instruction model based on design thinking which has been developed considering relevant theories on instruction models, on-line teaching and design thinking. The model's outcomes include: learning achievement, creative works and satisfaction.

Q2: Is it possible that the on-line instruction based on design thinking will promote creative skills development and enable learners to produce a creative piece of work?

In regard to this question, the researchers synthesised information on instruction with design thinking [4-6] and creative thinking [9-11] to come up with five steps for the model under development. The five steps are: raising awareness, idea brainstorming, creation, presentation and evaluation and distribution as can be seen in Table 1:

Table 1: Synthesis of elements for the design thinking process.

Design thinking process [4-6]	Creative thinking process [9-11]	Design thinking for on-line instruction
Empathise	Mess finding (clarify what needs to be fixed)	Raising awareness
Define	Data finding	Idea brainstorming
	Problem finding	
Ideate	Idea finding	Creation
Prototype		
Test	Solution finding	Presentation and evaluation
	Acceptance finding	Distribution

The five steps of the design thinking process for on-line instruction can be outlined as follows:

Step 1: *Raising awareness* is a step to get the maximum understanding of a target group which may involve adjusting certain issues to gain a better, ideally full, understanding of the target group.

Step 2: *Idea brainstorming* is a step to synthesise the collected data to encourage creative thinking and identify the real problem, then choose and find possible solutions.

Step 3: *Creation* is a step to create a piece of work, to model or create a prototype in order to enable user testing, find answers, accept criticism and learn to come up with new ideas.

Step 4: *Presentation and evaluation* is a step to present the results of new idea brainstorming and to identify as much as possible diverse problem-solving concepts and approaches, and to observe their effectiveness, then gather feedback, suggestions and advice for further development and improvement.

Step 5: *Distribution* is a step to apply the created work in the controlled real-life environment with flexibility and realistic expectations as to its performance and constant updates with new knowledge to achieve the set objective.

Q3: What elements and processes enabling learners to create a creative piece of work should be included in the on-line instruction based on design thinking?

As mentioned earlier, the model presented in this article has been based on the ADDIE framework [8]. Also, design thinking [4-6] and creative thinking [9-11] have been incorporated into the model as illustrated in Figure 2:

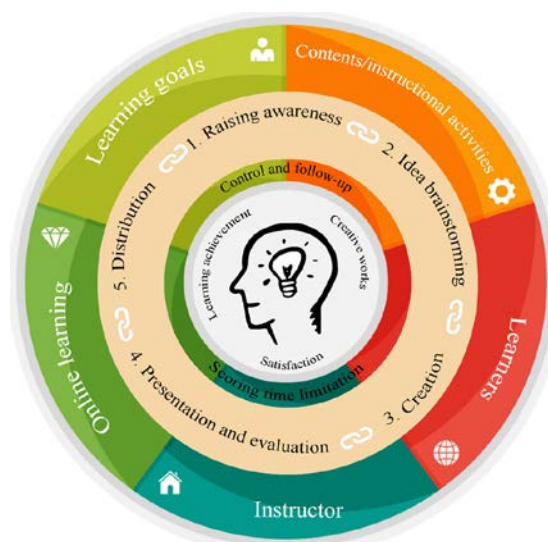


Figure 2: Model of on-line instruction with design thinking.

The on-line instruction with design thinking model consists of:

1. Element 1: input:
 - 1.1. Learning objectives define what is essential for learners or what goal has to be achieved, which can be knowledge, skill or attitude;
 - 1.2. Suitable content and well thought out instructional activities are prepared by the instructor to allow learners to understand and apply the gained knowledge for solving problems;
 - 1.3. Learners: students to learn the content of the course;
 - 1.4. Teachers: instructors to deliver the content of the course to students;
 - 1.5. On-line learning: instructional activity and assignments are designed and implemented in a variety of ways, but all of them including communication and evaluation are accessible in digital form via a computer network.
2. Element 2: OLI-DT process:
 - 2.1 Raising awareness: it is an important step to allow the instructor to utilise various techniques for guiding learners and introducing things to be learned;
 - 2.2 Idea brainstorming: a step to realise the full potential of learners in finding answers, which requires learner participation with each attempt to be facilitated by the instructor;
 - 2.3 Creation: it is a step after the completion of the learning process to help learners in finding answers, in this step, they will learn how to be creative and will create works in several forms;
 - 2.4 Presentation and evaluation: it is a very important step for learners by giving them the opportunity to present, criticise, provide opinions on their works and what they have learned - it is also a step for the actual evaluation;
 - 2.5 Distribution: it is a step for distributing works created by learners through several channels, including social media or more formal on-line media and publications.
3. Element 3: output:
 - 3.1 A creative work refers to a work created together by learners after participating in the on-line instruction with design thinking course; the learners will devise an action plan, design and develop a creative piece of work;
 - 3.2 Learning achievement refers to the levels, knowledge and skills acquired and developed by learners, and evaluated after the learning process is completed;
 - 3.3 Satisfaction refers to positive feelings and thoughts experienced by learners and inspired by the instruction.
4. Element 4: control:
 - 4.1. Learning achievement control and follow-up: it is for following up several aspects, such as learners' interest in learning and participation in activities, their enthusiasm in solving problems and finding answers, resolution and responsibility to continue with creation; it is also about monitoring learners and gaining feedback;
 - 4.2 Engagement, timeliness: it is for controlling learners to participate in the lessons and join in the learning activities, and complete them systematically and punctually.
5. Element 5: feedback is an element to monitor whether the procedure proceeds as directed by the instructor or not; feedback should be used for improvements in the instruction for the next semester. This element refers also to learning achievement, creative work and satisfaction.

Q4: What results can be achieved through the development of on-line instruction based on design thinking?

A feasibility study of the OLI-DT model has been conducted, including multifaceted design analysis and opinions of educational communication experts. Analysis and interpretation criteria created by Kanasutra [17] were applied:

Table 2: Score range and interpretation.

Score range (average)	Interpretation
4.50 - 5.00	Fully suitable
3.50 - 4.49	Highly suitable
2.50 - 3.49	Moderately suitable
1.50 - 2.49	Less suitable
1.00 - 1.49	Least suitable

Based on the results of the OLI-DT model, three aspects have been considered: section 1: suitability evaluation - overview; section 2: suitability - individual elements; and section 3: suitability evaluation - real-life application.

Table 3: Suitability evaluation of the OLI-DT model - overview.

Evaluation	Outcome		Suitability (interpretation)
	Mean	SD	
1. The developed on-line instruction conformed to the research objectives	4.79	0.41	Full
2. On-line instruction elements: 2.1 Input 2.2 Process 2.3 Control 2.4 Output 2.5 Feedback	4.74	0.45	Full
3. Classification of interactive on-line instruction elements was clear and well carried out	4.70	0.47	Full
4. Individual elements of on-line instruction were related	4.65	0.49	Full
5. Arrangement of interactive on-line instruction elements was suitable and could be easily understood	4.68	0.47	Full
6. Overview of on-line instruction elements was complete and covered all the requirements	4.79	0.41	Full
Overall average suitability	4.72	0.45	Full

As indicated in Table 3, the OLI-DT model's overview had the full suitability score (mean = 4.72, SD = 0.45), potentially signifying that the model could be recommended for developing on-line lessons to encourage on-line learning and creative skills development needed for the 21st Century.

Section 2 - Suitability Evaluation of the OLI-DT Model - Individual Elements

Table 4: Suitability evaluation of the OLI-DT model - individual elements.

Evaluation		Outcome		Suitability (interpretation)
Element	Sub-element	Mean	SD	
Input	Learning goals	4.71	0.46	Full
	Content/instructional activities	4.62	0.49	Full
	Learners	4.56	0.50	Full
	On-line learning	4.59	0.50	Full
	Instructors	4.71	0.46	Full
Overall average suitability		4.62	0.48	Full
Process	Raising awareness (setting up a frame of idea)	4.76	0.43	Full
	Idea brainstorming (writing down ideas)	4.71	0.46	Full
	Creation (creating work)	4.71	0.46	Full
	Presentation and evaluation (application of finished works and evaluation)	4.62	0.49	Full
	Distribution (knowledge exchange)	4.65	0.49	Full
Overall average suitability		4.69	0.55	Full
Control	Control and follow-up of learners	4.82	0.39	Full
	Engagement, timeliness	4.74	0.45	Full
Overall average suitability		4.74	0.43	Full
Output	Learning achievement	4.65	0.49	Full
	Creative work	4.71	0.46	Full
Overall average suitability		4.71	0.43	Full
Feedback	Learning achievement	4.85	0.46	Full
	Creative work	4.71	0.46	Full
	Satisfaction	4.74	0.45	Full
Overall average suitability		4.78	0.44	Full

As indicated in Table 4, the OLI-DT model's individual elements have the full suitability score (mean = 4.72, SD = 0.45) across the whole range. In regard to each element, the input has full suitability (mean = 4.62, SD = 0.48), as well as other elements: process (mean = 4.69, SD = 0.55); control (mean = 4.74, SD = 0.43); output (mean = 4.71, SD = 0.43); and feedback (mean = 4.78, SD = 0.44). These results, similar to the overall evaluation, potentially signify that the five elements of OLI-DT model could be recommended for developing on-line lessons to enable creative skills development.

Table 5: Suitability evaluation of the OLI-DT model - real-life application.

Evaluation	Outcome		Suitability (interpretation)
	Mean	SD	
1. How can the developed on-line instruction based on design thinking meet the demands of on-line learning? To what extent?	4.76	0.43	Full
2. Is the OLI-DT model suitable for the development of on-line learning? To what extent?	4.71	0.46	Full
3. Is the OLI-DT model suitable for the promotion of on-line learning? To what extent?	4.74	0.45	Full
4. How can the OLI-DT support the promotion of on-line learning? To what extent?	4.74	0.45	Full
5. Is it possible to apply the OLI-DT in the real-life scenario?	4.76	0.43	Full
Overall average suitability	4.74	0.44	Full

As indicated in Table 5, the real-life application of the OLI-DT model has the full suitability score (mean = 4.74, SD = 0.44), potentially signifying that it has the elements and instructional processes suitable for effective application in on-line learning.

DISCUSSION AND CONCLUSIONS

The on-line instruction based on design thinking model is a tool for promoting learning outside the classroom in the digital age by combining ideas and technology to create a new concept and innovation to encourage on-line learning by new generation learners. This concept and innovation can successfully engage learners and directly respond to their learning experience.

The model consists of five elements:

- 1) input with learning goals content/instructional activities, learners, on-line learning, instructors;
- 2) on-line learning process with five steps: raising awareness, idea brainstorming, creation, presentation and evaluation, and distribution;
- 3) output with learning achievement, creative work and satisfaction;
- 4) control follow-up of learners, and their engagement and timeliness;
- 5) feedback to consider improvements in various aspects. The conducted evaluation indicates the model's full suitability for real-life application.

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