

The Results of Development of the Online Instruction with Design-based Thinking for the Construction of Creative Products

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Abstract – This research is the development of the online instruction with design-based thinking for the construction of creative products. The population of this research included experts and the first year undergraduate students from the Department of Educational Innovation and Technology, Suan Sunandha Rajabhat University. According to the results, it is found that (1) the quality of the online lessons with design-based thinking is at a very high level, (2) the scores of learning achievement after learning the said online lessons are higher than those before learning these online lessons with a significance level of .01, (3) the scores of creative products created by the students after learning through the online lessons are at a very good level, and (4) the satisfaction toward the learning through online lessons with design-based thinking for the construction of creative products is at a very high level.

Keywords – online instruction, design-based thinking, creative products, achievement, online lessons

1. Introduction

The world today is in the era of information technology, in which the communication and telecommunication technologies have been

developed in such a way that the information and knowledge resources can be accessed very quickly and a number of computers from other sources can be linked together as a global network [1]. The said advance of network technology results in the changes of instruction models, which have no longer been limited only to the classroom. At the meantime, the positive attitude toward lifelong learning can be promoted by encouraging learners to seek for knowledge, take actions, and develop their skills by themselves. Thereby, it is suggested that the learners have involvement in the establishment of learning management plan and evaluation of learning results. The activities must be organized with an intention to initiate learning motivation, and meanwhile there should be exchange of knowledge among the learners, encouraging them to think, analyse, and criticise what they have experienced. The instructors should design the learning that can facilitate self-learning and correspond to the interest of learners and real-life situations [2].

In reference to the online instruction management in Thailand, the project of Thailand Cyber University [3] has been established with an intention to manage the instruction in a systematic manner corresponding to the digital economy and society development plans. In addition, the project is aimed to create a quality society by means of digital technology, and it is expected to be a system and centre of massive open online courses. So far, the instruction management has been revised and a variety of supporting tools for online courses have been employed, along with the continual development of online instruction models. At present, there are a variety of choices of efficient computer programs that can facilitate interactive teaching like learning in the real class. The said computer programs include Microsoft Teams, Zoom, Google Classroom, Google Meet or other social media. Thanks to these tools, the instructors are able to manage the online courses, in which neither instructors nor learners have to be in the same places, with the same quality and efficiency as those in the real classroom.

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Design-based thinking is a kind of thinking process to find out creative strategies for product development [4]. It is also a thinking process that many scholars from various fields have employed to develop their innovations. The design-based thinking has been developed to promote the learning in terms of thinking and computer-based design. The design-based thinking, which can lead to the understanding of problems and solutions, is divided into 3 sections, i.e., inspiration, ideation, and implementation. Data analysis and synthesis as well as the possibility of problem-solving can lead to the new ideas and new inventions. Innovations and technologies are believed to bring about the new ways of life and practices of thinking in order to find out different solutions [5].

Methods and principles essential for building thinking skills should be promoted as these are considered the foundation of education that can promise the learners with success. There are several elements such as models, procedures, and techniques of teaching that can promote critical thinking and problem-solving skills of the learners. Moreover, it is important that information technology and computer technology be applied and utilized to support and promote learning in an effective manner [6].

The creativity of learners can be promoted by means of practical learning activities, focusing on the development of confidence in creative thinking; by such, the learners will be encouraged to make decisions, take actions, and create their own thinking [7]. This can also promote the instruction in which the learners are able to integrate the knowledge around them and then create and develop innovations that can respond to the society. The creativity development process is said to encourage the learners to think and take action; especially, it can help them to be well prepared and alert to live their life and compete with others in the present society. In the instruction management that integrates the supporting technologies with problem-based thinking and advanced thinking skills for more connection, the learners are allowed to get involved in the creation of imagination and creativity and the media must be capable of triggering the learners' interest in the subjects. Once the learners get interested in something, they shall have endeavor to learn it. This is very beneficial for the learners who seek knowledge to create innovations and products [8].

According to the aforementioned, the researchers had an idea to develop the online instruction with design-based thinking as a tool to promote the learners to have a skill of constructing creative products, which is considered an important learning skill necessary for the learning in the 21st century. A variety of information technologies shall be employed in the instruction management in a style that enables the learners to learn anywhere and

anytime, corresponding to the digital era and the current world situation in which the self-learning is being promoted.

2. Research Objectives and Hypotheses

The objectives of this research include:

1. To synthesise the conceptual framework of the online instruction with design-based thinking for the construction of creative products
2. To develop online lessons with design-based thinking for the construction of creative products
3. To compare the learning achievement before and after learning through the online lessons with design-based thinking for the construction of creative products
4. To evaluate the creative products of students after learning through the lessons with design-based thinking for the construction of creative products
5. To study the satisfaction of students who learned through the online lessons with design-based thinking for the construction of creative products

The hypotheses of this research are related to the study results of the development of the online instruction with design-based thinking for the construction of creative products, which include:

1. The quality of the online lessons with design-based thinking for the construction of creative products is at a high level
2. The scores of learning achievement after learning through the said online lessons are higher than those before learning through these online lessons with a significance level of .01
3. The scores of creative products created by the students after learning through the online lessons are at a good level
4. The satisfaction toward the learning through online lessons with design-based thinking for the construction of creative products is at a high level.

3. Research Methodology

3.1. Population

The population of this research, derived from purposive sampling, is divided into 2 groups, i.e., (1) the experts with experiences in the fields of instruction design, content design, and information and communication technology for education, and (2) the first year undergraduate students in the Department of Educational Innovation and Technology, Faculty of Education, Suan Sunandha Rajabhat University.

3.2. Data Collection and Analysis

In the development of the online instruction with design-based thinking for the construction of creative products, the researchers have developed and employed the following data collecting tools, i.e., (1) online lessons with design-based thinking for the construction of creative products, (2) quality evaluation form of the online lessons with design-based thinking for the construction of creative products, (3) evaluation form of the learning achievement before and after learning through the online lessons with design-based thinking for the construction of creative products, (4) evaluation form of the creative products produced by the students after learning through the online lessons with design-based thinking for the construction of creative products, and (5) evaluation form of the students' satisfaction toward the online lessons with design-based thinking for the construction of creative products. The statistics used to analyse the data consists of mean and standard deviation.

3.3. Methodology

The development of the online instruction with design-based thinking for the construction of creative products is divided into 4 steps as follows:

- Step 1. Study the process of the online instruction with design-based thinking for the construction of creative products
- Step 2. Design the online instruction with design-based thinking for the construction of creative products
- Step 3. Develop the online instruction with design-based thinking for the construction of creative products
- Step 4. Study the results after using the online instruction with design-based thinking for the construction of creative products

4. Findings

The results of the development of the online instruction with design-based thinking for the construction of creative products are summarized into 2 sections as follows.

4.1. The Development of the Online Instruction with Design-based Thinking for the Construction of Creative Products

1) Conceptual framework of the online instruction with design-based thinking for the construction of creative products

The synthesis of the conceptual framework of the online instruction with design-based thinking for the construction of creative products is conducted based on the study of relevant theories, literatures, and researches, i.e., instructional model [9], online teaching [10], design thinking [11], achievement [12], creative products [13], and satisfaction [14], as illustrated in Figure 1.

2) Online lessons with design-based thinking for the construction of creative products

The development of the online instruction with design-based thinking for the construction of creative products is in the form of research and development. The researchers developed the online lessons with design-based thinking for the construction of creative products, which are considered a research tool as to the theory of online teaching. In addition, the design thinking was applied in the management of the online lessons herein with an aim to promote the learners' skills related to the construction of creative products. The said skills can be obtained by means of learning through the digital technology, which can be accessed unlimitedly. Also, the learners were able to interact with one another through the developed social network.

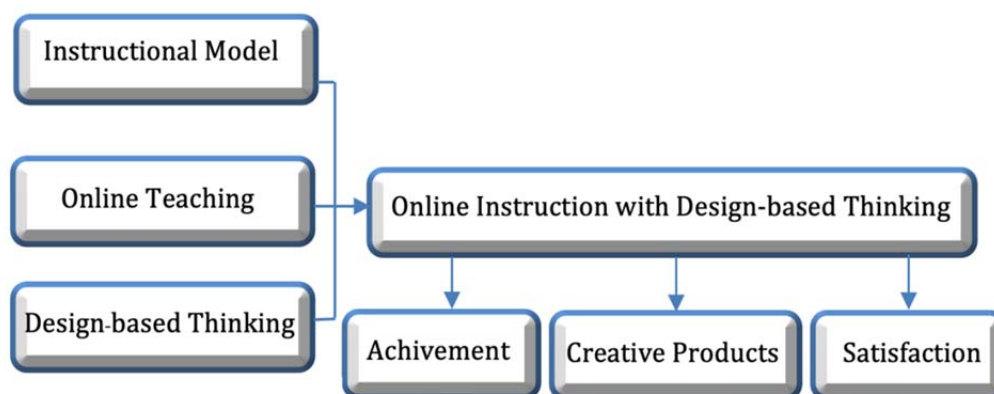


Figure 1. Conceptual framework of the online instruction with design-based thinking for the construction of creative products

4.2. Results of the Development of the Online Instruction with Design-based Thinking for the Construction of Creative Products

In reference to the study of results of the development of the online instruction with design-based thinking for the construction of creative products, the researchers relied on the data analysis and interpretation criteria of Kanasutra [15], as seen in Table 1.

Table 1. Average score range and interpretation of results

Average score range	Interpretation
4.50 – 5.00	Very high level
3.50 – 4.49	High level
2.50 – 3.49	Average level
1.50 – 2.49	Low level
1.00 – 1.49	Very low level

The results of using the online lessons with design-based thinking for the construction of creative products can be summarized into 4 sections as below.

1) Results of evaluation on the online lessons with design-based thinking for the construction of creative products

According to the development of the online lessons with design-based thinking for the construction of creative products, the results can be summarized as shown in Table 2.

Table 2. Results of evaluation on the online lessons with design-based thinking for the construction of creative products

Items for evaluation	Results		Interpretation
	Mean	S.D.	
1. Overview of lessons	4.63	0.48	Very high
2. Overview of contents	4.70	0.47	Very high
3. Overview of design	4.73	0.46	Very high
4. Overview of quizzes	4.70	0.47	Very high
5. Overview of lesson management	4.66	0.50	Very high
6. Overview of quality of lessons	4.70	0.46	Very high

As illustrated in Table 2., it is found that the results of evaluation on all 6 elements of the online lessons with design-based thinking for the construction of creative products are at very high level. Thus, it is evident that the developed online lessons can be employed to manage the instruction in an efficient way, which corresponds to the hypothesis 1.

2) Learning achievement before and after learning through the online lessons with design-based thinking for the construction of creative products

The comparative results of learning achievement before and after learning through the online lessons with design-based thinking for the construction of creative products are shown in Table 3.

Table 3. Comparative results of learning achievement before and after learning through the online lessons with design-based thinking

Learning Achievement	Full score	Mean	S.D.	t-test	Sig.
Before	40	28.80	8.76	15.91	.00**
After	40	38.95	2.24		

**p< .01

As to the comparative results of learning achievement before and after learning through the online lessons with design-based thinking for the construction of creative products in Table 3., it is found that after the sample group had studied through the online lessons with design-based thinking for the construction of creative products, they acquired higher scores of learning achievement. Once considering the mean of learning achievement scores, it is obvious that the mean scores of these students after learning the said lessons (Mean = 38.95, S.D. = 2.24) are higher than the mean scores before learning (Mean = 28.80, S.D = 8.76). This implies that learning through the online lessons with design-based thinking for the construction of creative products enables the learners to have higher learning achievement with a significance level of .01, which is in compliance with the hypothesis 2.

3) Results of evaluation on the creative products of the students after learning through the online lessons with design-based thinking for the construction of creative products

The evaluation on the creative products of the students after learning through the online lessons with design-based thinking for the construction of creative products was conducted by means of evaluation form with authentic assessment based on the criteria of rubric score [16], as presented in Table 4.

Table 4. Score range and interpretation of results

Score range	Interpretation
16.00 - 20.00	The creative quality of products is at very good level
11.00 - 15.00	The creative quality of products is at good level
6.00 - 10.00	The creative quality of products is at average level
0.00 - 5.00	The creative quality of products needs improvement

The results of evaluation on the creative products of the students after learning through the online lessons with design-based thinking for the construction of creative products are illustrated in Table 5.

Table 5. Results of evaluation on the creative products of the students after learning the online lessons with design-based thinking for the construction of creative products

N	Full score	Score of creative products	Percentage	Interpretation
29	20	18.78	93.94	Very good

According to the results of evaluation on the creative products of the students after learning through the online lessons with design-based thinking for the construction of creative products in Table 5., the scores of creative products were given on the basis of authentic assessment performed by the instructors. After taking into account the mean scores of creative products, it is found that the average scores after learning through the said lessons are at very good level (scores = 18.78, percentage = 93.94). This also means the scores of creative products of the students who studied through the online lessons with design-based thinking are at very good level, which is corresponding to the hypothesis 3.

4) Results of the study on the satisfaction of the students who studied through the online lessons with design-based thinking for the construction of creative products

The evaluation on the satisfaction toward the study through the online lessons with design-based thinking for the construction of creative products was performed under the 5 consideration frameworks, i.e., objectives, contents, interaction in lessons, user interface design, and instruction design. The results thereof are presented in Table 6.

Table 6. Results of the evaluation on the satisfaction toward the study through the online lessons with design-based thinking (5 consideration frameworks)

Items for evaluation	Results		Interpretation
	Mean	S.D.	
1. Overview of objectives	4.76	0.43	Very high
2. Overview of contents	4.71	0.46	Very high
3. Overview of interaction in lessons	4.71	0.46	Very high
4. Overview of user interface design	4.62	0.49	Very high
5. Overview of instruction design	4.65	0.49	Very high
Overall mean	4.69	0.55	Very high

In reference to the results of the evaluation on the satisfaction toward the study through the online

lessons with design-based thinking for the construction of creative products in Table 6., the overall mean of all 5 consideration frameworks is at very high level (Mean = 4.69, S.D.= 0.55). When considering separately, the satisfaction toward all of the 5 consideration frameworks (objectives, contents, interaction in lessons, user interface design, and instruction design) is also at very high level. Therefore, it can be said that this is complying to the hypothesis 4.

5. Conclusion and Discussion

The development of the online instruction with design-based thinking for the construction of creative products is a development research, and the research tool used herein is the online lessons with design-based thinking for the construction of creative products, which have been employed to promote the learning out of the classroom. The concepts related to information technology and online instruction are integrated to generate new ideas and innovations, resulting in the online lessons that can promote the learning among the learners of new generation and correspond directly to their experiences. With the aid of online lessons, the learners are able to learn anywhere and anytime with some challenges to learn and construct the creative products. In addition, the learners can communicate and collaborate through the social network by making the ultimate use of existing technology, which is believed to lead to the learning society. The results of this research can be concluded and discussed as follows.

- 1) The results of evaluation on the quality of all 6 elements of the online lessons with design-based thinking for the construction of creative products are at very high level. This indicates that the developed online lessons with design-based thinking can be used to manage the online instruction in an efficient manner. By this way, the learners are encouraged to learn anywhere and anytime by means of various methods. With the assistance of information technology, the learners are also capable of learning and solving any problems independently.
- 2) The comparative results of learning achievement before and after learning through the online lessons with design-based thinking for the construction of creative products show that the mean scores of the sample group after learning the said lessons (Mean = 38.95, S.D. = 2.24) are higher than the mean scores before learning (Mean = 28.80, S.D = 8.76). This implies that learning through the online lessons with design-based thinking for the construction of creative products enables the learners to have higher learning achievement with a significance level of .01.

- 3) The results of evaluation on the creative products of the students after learning through the online lessons with design-based thinking for the construction of creative products indicate that the mean scores of the students in this case are at very good level (scores = 18.78, percentage = 93.94). This is corresponding to Anisimova, Ganeeva & Sharafeeva [17], who said that the digital skills to a variety of digital tools and application of web technologies that can promote the learners to learn by themselves through internet-based communications and gain teamwork skills.
- 4) The results of evaluation on the students' satisfaction toward the study through the online lessons with design-based thinking for the construction of creative products, under 5 consideration frameworks, are at very high level (Mean = 4.69, S.D. = 0.55). This is in accordance with the study of Chatwattana [18], who said the MOOC system can help learners to attain digital literacy skills needed in the 21st century workforce and can promote self-directed learning by optimally utilising the latest digital technology. And this approach to education may lead to the creation of learning society in digital universities.

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