# The Development of Blended Leaning by Using the Design Thinking Method to Enhance Information, Media, and Technology Skills for Computer Education Students at Rajabhat University in Thailand: A Systematic Literature Review

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**Abstract:** The purpose of this research was to do a systematic literature review (SLR) on the development of blended learning by using the design thinking method to enhance information, media, and technology skills for computer education students at Rajabhat University in Thailand. The study included 68 topics from related books, research, articles, and documents both in and outside Thailand. The SLA started from the blended method including 50% face-to-face learning and 50% online learning whereas the design thinking method consisted of 5 steps of the BDL-DTM Model developed through the assessment of 9 experts. The 5 steps of the BDL-DTM Model were 1) empathize, 2) define, 3) ideate, 4) prototype, and 5) test. The resulting model supported the computer education at Rajabhat University in Thailand for promoting their information, media, and technology skills. The students who studied with the BDL-DTM Model can further develop the method in their research and classroom teaching.

**Keywords:**Blended Learning, Design Thinking Method, Information Media and Technology Skills, Computer Education Students at Rajabhat University inThailand

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## 1. Introduction

Education in the current society focuses on developing the 21st century skills in accordance with (**the Thai National Education Plan B.E. 2560 – 2579, (2017 – 2036)); (Office of the National Economic and Social Development Council, 2017).** According to the Thai National Education Plan, one of the 21st century skills is communication, information and media literacy, regarded as an important skill for the future education in developing advanced occupational skills including information, media, and technology skills (**Panich, 2012).** The 21st century skills emphasize life and occupational skills, learning and innovative skills, and information, media, and technology skills (**Partnership for the 21st Century Learning, 2009; UNESCO, 2008; Ministry of Education, 2016; 2017; Aumgri&Petsangsri, 2018; Aumgri, 2021).** In addition, the information, media, and technology skills are necessary for students in the educational system in the digital age. The 21st century skills can be guidelines for learning and teaching development and graduate production for Thai society in a digital world which uses information skills in daily life and in the future living. It is urgently necessary for the government to consider and ensure that the current students can gain these skills sufficiently for this era. The Office of (**the Higher Education Commission, 2013)** sets the Thai Qualifications Framework for Higher Education (TQF for HEd) as a clear guideline for graduate production by setting standards for curriculum development and adjustment of teaching strategies, learning methods, and testing and evaluation according to the learning performance standards.

Blended learning is a learning model with a mixture of face-to-face learning and online learning (**Thummanond et al., 2021; Petsangsri, 2012; Wanapiroon, 2011; Khanthakhet et al., 2015; Suwannatthachote&Theeraroungchaisri, 2018; Allen & Seaman, 2005; Latchem& Jung, 2010; Thorne, 2003: 18).** Blended learning can be applied at all levels and it is helpful for encouraging students' interaction during lessons. It is interesting for teachers due to its variety of methods with the support of current technology, particularly in the current COVID-19 pandemic situations in which face-to-face learning has to be changed. It is also useful for supporting students to gain skills with learning achievement and competencies according to the requirements of the 21st century skills and the TQF for HEd.

A design thinking method is used in research by many educators (**Plattner, 2019; Standford D. School, 2016; BINN, 2016; Simon, 1968; Lohsomboon, 2020; Kwunsakul, 2020).** This method focuses on various learning methods in terms of science, cognition, and collaboration by applying various thinking methods with quality. It can be well integrated in learning with the inclusion of innovation in information, media, and

technology, and it can be applied for changing situations or environments at present an in the situations which we expect for the future. According to **(UK Design Council,2016;Banjong, 2018;Wongphairin and Chaisuwan, 2018)** the design thinking method is a learning model which is helpful for students to learn novel matters with creative thinking, and it can be used in various disciplines in congruence with 21$^{st}$ century skills.

According to the above background and problems, the researchers considered that blended learning by using the design thinking method to enhance information, media, and technology skills for computer education students at Rajabhat University in Thailand can be a learning model for the students to be teachers in the future. Accordingly, **(Aumgri and Petsangsri, 2018;Rianthong.N et al., 2020**; **Aumgri.C andApirating.K, 2022;Phaupan et al.,2015; Network P21, 2013)** state that teachers have to gain the skills and abilities to manage teaching and learning to enhance the 21$^{st}$ century skills in Thailand 4.0. The teachers need to have a background in information and communication technology for educational management to promote students' learning in a more effective way. The national policy and master plan on the digital development for the economy and society in 20 years B.E. 2561 – 2580, (2018 – 2037) sets the direction for driving the country's development with sustainability by using digital technology in accordance with the national strategies, the national economy and society development plan, and strategies for driving Thailand Education Eco-System: TE2S. The emphasis is on changing students, teachers, classrooms, learning media, and schools to be developed together in the whole system **(The National Policy and Plan on the Digital Development for Economy and Societies B.E. 2561 – 2580 (2018 – 2037); Regional Education Office No. 17, 2019).** The TQF for HEd is used for promoting graduate specialization in their disciplines in the future in an effective way with skills and competencies necessary for their future occupations. Learning should involve information technology to support students to gain and apply their life skills, occupational skills, learning and innovative skills, and information, media, and technology skills in occupations **(Aumgri, 2021; Partnership for the 21$^{st}$ Century Learning, 2019; UNESCO, 2008; Ministry of Education, 2016; Teachers and Basic Education, 2010; Personnel Development Ministry of Education, 2016; Ministry of Education, 2017;** Aumgri.C., et.al, 2018**).** Therefore, information technology literacy is really necessary for the students at present and in the future. According to **(Yuhyun, 2016; UNESCO,2008; Teacher and Basic Education Personnel Development Bureau, 2010)** in the next decade, 90% of the world population will need to access the internet to live properly in the global society by using these future skills, and the computer teachers will be more flexible in learning and teaching management. It is necessary to promote students' knowledge, skills, and competencies for their occupations. Knowledge of information, media, and technology should be transferred in a more effective way in accordance with the needs in the future world with more learning achievement.

## 2.Literature reviews

### 2.1 Blended learning

Blended learning is a learning model with a mixture of 50% face-to-face learning and 50% online learning **(Thummanond et al., 2021; Petsangsri, 2012; Wanapiroon, 2011; Khanthakhet et al., 2015; Suwannatthachote&Theeraroungchaisri, 2018; Allen & Seaman, 2005; Latchem& Jung, 2010; Thorne, 2003: 18).**

### 2.2 Design thinking method

A design thinking method is a thinking process to design and create innovation in a systematic way to solve problems and to find ways for creating innovation or new workpieces **(Plattner, 2019; Miller, 2017; Standford D. School, 2016; BINN, 2016; Simon, 1968; Lohsomboon, 2020; Kwunsakul, 2020; Asanok, 2018).** It plays an important role in preparing thinkers and innovation creators in a student-centered classroom in the 21st century.

### 2.3 Information, media, and technology skills

Information, media, and technology skills refer to abilities for information uses, retrieval, analysis, application, evaluation, reflection, and sharing according to the objectives **(California Emerging Technology Fund: CETF, 2008: 3; Cheryl Lemke, 2003; Thongeiam, 2018: 294-295; UNESCO, 2011: Gilster, 1997; Leenaraj, 2017; Aumgri, 2021).**

**3.Objectives of the Study**

- 3.1 To study and analyze the components of the blended learning model development by using the design thinking method to enhance information, media, and technology skills for computer education students at Rajabhat University
- 3.2 To assess the appropriateness of the blended learning model development by using the design thinking method to enhance information, media, and technology skills for computer education students at Rajabhat University

**4. Methodology**

The study was conducted on the basis of a documentary research method by examining documents, books, textbooks, research papers. The study was divided into two levels as (1) studying books by considering keywords from the titles associated with the issue of the study consistent with the research objectives. There was a total of 23 titles composed of 13 Thai language documents and 20 foreign language documents, and (2) studying from research papers and articles by considering keywords from the titles associated with the issue of the study consistent with the research objectives. There was a total of 35 titles comprising 15 in Thai language and 20 in foreign languages. Those documents were prepared during 2004-2022. The details are shown in Table 1.

Table 1 . Details of the source of information used in the study.

| Sources of Information | Type of Information Sources | Title | Total/ Title |
|---|---|---|---|
| Domestic | 1. Books | 13 | 28 |
| | 2. Research papers/articles | 15 | |
| International | 1. Books | 20 | 40 |
| | 2. Research papers/articles | 20 | |
| Total | | | 68 |

**5.Research Methods**

5.1 Collected and studied various documents in the form of books, research papers, and articles related to the theoretical concept being studied.

5.2 Conducted a content analysis from the various documents collected in a systematic manner (systematic analysis) to obtain a body of knowledge that the researchers could manage blended learning model development by using the design thinking method to enhance information, media, and technology skills.

5.3 Conducted content synthesis and integrated the body of knowledge obtained from the previous procedure to develop the expected learning model.

**6.Research Results**

**6.1 Blended learning process**

The synthesis of Blended learning processis shown in table 2.

Table 2 . Details of the synthesis of Blended learning process.

| Blended Learning Process | 1. Live Lecture | 2. Self-study from learning media | 3. Collaborative Learning | 4. Evaluation | 5. Teacher as a facilitator |
|---|---|---|---|---|---|
| Carman, 2005 | ✓ | ✓ | ✓ | ✓ | |
| Allen et al., 2007 | ✓ | ✓ | ✓ | ✓ | |
| Henrieet al., 2015 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Suwannatthachote&Theeraroungchaisri, 2018 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Alvunger, 2018 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Thummanond.C.,et.al, 2020 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Chachiyo.W. et.al, 2021 | ✓ | ✓ | ✓ | ✓ | ✓ |
| F. PambudiWidiatmaka. Et.al, 2021 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sirisakpanich.D,2021 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Claude Müller ,ThoralfMildenberger, 2021 | ✓ | ✓ | ✓ | ✓ | ✓ |
| Mitchell J. Finlay , Daniel J. Tinnion, Thomas Simpson. 2022 | ✓ | ✓ | ✓ | ✓ | ✓ |

The components of Blended learning processcomprise 5 steps, which are 1) Live Lecture, 2)Self-study from learning media, 3) Collaborative Learning, 4) Evaluation, and 5) Teacher as a facilitator, as shown in Figure 1.
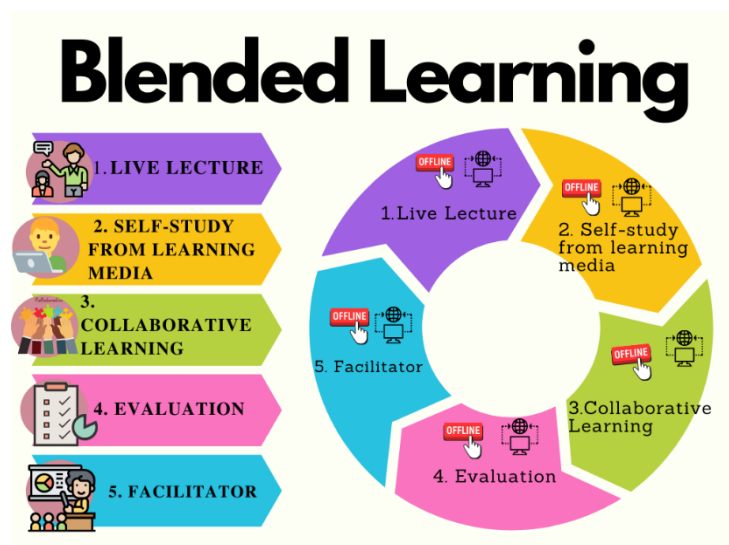


Figure 1: Blended learning process

From Figure 1, the Blended learning process started from lesson planning. The teacher analysed and synthesized the course's objectives, standards, descriptions, and competency of teacher profession qualifications, then created Blended learning process for lesson content done by implementing 5 steps, i.e.1) Live Lecture, 2)Self-study from learning media, 3) Collaborative Learning, 4) Evaluation, and 5) Teacher as a facilitator. The lesson plans were made and their appropriateness evaluated by the experts.

### 6.2 Components of the blended learning process

Blended learning management consisted of 4 components: 1) online learning, 2) offline learning, 3) users, and 4) technology, as shown in Figure 2.
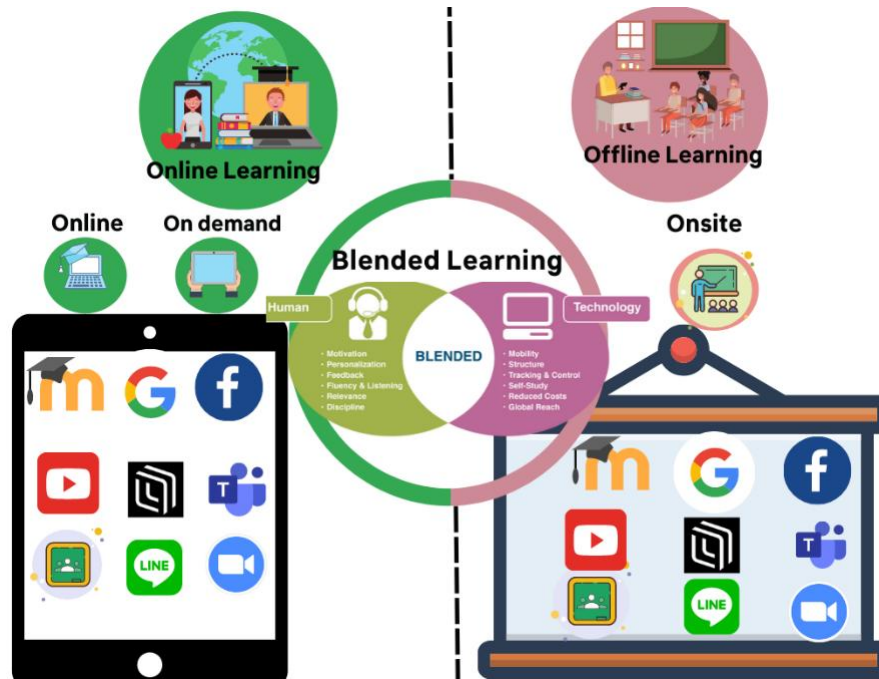
Figure 2: Components of the blended learning process

From Figure 2, the teacher analysed and synthesized the course's objectives, standards, description, and competency of teacher profession qualifications. Then, class activities were determined using the components of the Blended learning process for students to review lessons by implementing 4 steps. Firstly is online learningwere are 1.1) online learning and 1.2) on demand from the application learning media. Secondly is offline learningconsisted of 2.1) onsitefrom the application learning media. Thirdly is users from human, user aspect consisted of 3.1) Motivation 3.2) personalization 3.3) Feedback 3.4) Fluency & Listening 3.5) Relevance 3.6) Discipline. And lastly Technologyconsisted of 4.1) Mobility 4.2)Structure 4.3) Tracking & control 4.4) Self-Study 4.5) Reduced costs 4.6 Global reach, which is involvement in the quiz games where students give their answers in each lesson.This is a blended learning management method that is applied in each lesson.

**6.3Blended learning by using the design thinking method to enhance  information, media, and technology skills**

The components of Blended Leaning by using Design Thinking Method to enhance  Information, Media and Technology Skills comprise 5 steps, which are 1) Empathize, 2) Define, 3) Ideate, 4) Prottotype, and 5) Test, as shown in Figure 3.
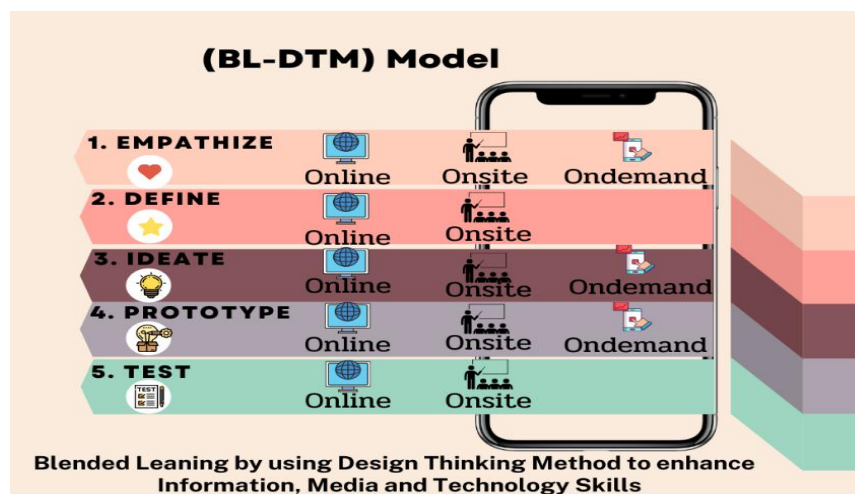


Figure 3: BL-DTM Model to enhance information, media, and technology skills

According to Figure 3, the use of the BL-DTM Model to enhance information, media, and technology skills is divided into 5 steps as follows.

Step 1 Empathize: This step is to make understanding about a problem. The researcher taught online on demand and also with onsite teaching methods together with information search and analysis to develop understanding about a problem from observation, interview, or information search to create a workpiece with enhancement of information, media, and technology skills.

Step 2 Define: This step is to determine and frame a problem. The researcher taught with the online and onsite methods for analysing information to determine the problem scope and framework before concluding the ways to solve a problem by creating a workpiece with enhancement of information, media, and technology skills.

Step 3 Ideate: This step involves brainstorming. The researcher taught online on demand and also via the onsite teaching method. The group members brainstormed to evaluate the group information before expanding the concepts used in creating a workpiece with enhancement of information, media, and technology skills.

Step 4 Prototype: This step is concerned with building a prototype. The researcher taught online on demand and also via the onsite teaching method. The prototype was created from brainstorming to create a workpiece with accuracy according to the user contexts such as a primary story board design, before designing the real workpiece with enhancement of information, media, and technology skills.

Step 5 Test: This step is to test the design concepts and the workpiece. The researcher taught using the online and onsite teaching methods. The test was on accuracy, beauty, creativity, operation, uses, or experimentation from experience in creating the workpiece with enhancement of information, media, and technology skills.

### 6.4 Appropriateness assessment

The appropriateness of the BL-DTM Model to enhance information, media, and technology skills was assessed by 9 experts and the results are shown in Figure 4.

The criteria for the appropriateness assessment were on a 5-point rating scale (Leekitchwatana, 2015: 173) as follows.

| Score range | 4.50 – 5.00 | refers to the most appropriateness |
| Score range | 3.50 – 4.49 | refers to much appropriateness |
| Score range | 2.50 – 3.49 | refers to moderate appropriateness |
| Score range | 1.50 – 2.49 | refers to little appropriateness |
| Score range | 1.00 – 1.49 | refers to the least appropriateness |

Table 2. The appropriateness assessment of the BL-DTM Model to enhance information, media, and technology skills.

| Description | Result | | Rate of appropriateness |
|---|---|---|---|
| | $\bar{x}$ | S.D. | |
| **1. Utility Standards** | | | |
| 1.1. The developed learning model can build theoretical knowledge about blended learning by using the design thinking method to enhance information, media, and technology skills for the students. | 4.67 | 0.47 | Most |
| 1.2 The developed learning model can fulfil knowledge and build practical skills in information, media, and technology for the students. | 4.89 | 0.31 | Most |
| 1.3 With the developed learning model, the students can apply theoretical knowledge and practice in the blended learning model by using the design thinking method. | 5.00 | 0.00 | Most |
| 1.4 The developed learning model can be used for studying the development and results of problem-solving with information, media, and technology skills according to the students' expectation. | 4.44 | 0.68 | Much |
| 1.5 The developed learning model can be used for learning management to enhance information, media, and technology skills for the students. | 4.67 | 0.47 | Most |
| 2. Feasibility Standards | | | |
| 2.1 The developed learning model provides a learning model suitable for the students' contexts. | 4.22 | 0.79 | Most |

| Description | Result | | Rate of appropriateness |
|---|---|---|---|
| | $\bar{x}$ | S. D. | |
| 2.2 The developed learning model can enhance the students' ability to create a workpiece and can develop their information, media, and technology skills. | 4.78 | 0.42 | Most |
| 2.3 The developed learning model can solve the problem of lack of information, media, and technology skills for the students. | 4.78 | 0.42 | Most |
| 2.4 The developed learning model results in the students' understanding about the problem of lack of information, media, and technology skills for the students. | 4.78 | 0.42 | Most |
| 2.5 The developed learning model can be arranged for the students to be able to develop workpieces with better information, media, and technology skills. | 4.44 | 0.50 | Most |
| 3. Propriety Standards | | | |
| 3.1 Each step of learning management is appropriate for creating results according to the objectives or the goals. | 5.00 | 0.00 | Most |
| 3.2 The learning model is appropriate for the students to apply theoretical knowledge and practical skills in creating workpieces. | 4.11 | 0.74 | Most |
| 3.3 The learning model is appropriate for developing blended learning by using the design thinking method to enhance information, media, and technology skills as the LMS module. | 4.56 | 0.50 | Most |
| 3.4 The development of learning media with blended learning by using the design thinking method to enhance information, media, and technology skills as the LMS module is appropriate for building blended learning activities by using the design thinking method. | 4.33 | 0.47 | Most |
| 3.5 Blended learning by using the design thinking method is appropriate for content/activity storage according to the LMS learning model. | 4.56 | 0.50 | Most |
| 3.6 The media development is in accordance with the activities for enhancing information, media, and technology skills in the course of the 21st century skills for the lives and occupations of the computer education students. | 5.00 | 0.00 | Most |
| 3.7 The evaluation is appropriate for assessing the practice in creating workpieces with the criteria in the scoring rubric. | 4.44 | 0.68 | Most |
| 4. Accuracy Standards | | | |
| 4.1 The blended learning concept by using the design thinking method can be used for developing a learning model to enhance information, media, and technology skills for the students. | 4.67 | 0.47 | Most |
| 4.2 The development of the blended learning model by using the design thinking method to enhance information, media, and technology skills conforms to the objectives. | 4.78 | 0.42 | Most |
| 4.3 The development of the blended learning model by using the design thinking method to enhance information, media, and technology skills is obtained from knowledge synthesis and integration in each step. | 4.44 | 0.50 | Most |
| 4.4 The development of the blended learning model by using the design thinking method to enhance information, media, and technology skills uses valid techniques and instruments with systematic data collection, analysis, and reports. | 5.00 | 0.00 | Most |
| Total | 4.65 | 0.23 | Most |

According to Table 4, the overall appropriateness of the BL-DTM Model to enhance information, media, and technology skills is at the "most" level ($\bar{x}$ = 4.65, S=0.52). In each aspect, the most appropriateness is on "with the developed learning model, the students can apply theoretical knowledge and practice in the blended learning model by using the design thinking method"; "each step of learning management is appropriate for creating results according to the objectives or the goals"; "the media development is in accordance with the activities for enhancing information, media, and technology skills in the course of the 21st century skills for life and occupation for the computer education students", and "the development of the blended learning model by using the design thinking method to enhance information, media and technology skills uses valid techniques and instruments with systematic data collection, analysis, and reports" ($\bar{x}$ = 5.00, S=0.00). In conclusion, the BL-DTM Model to enhance information, media, and technology skills is assessed at the "most appropriate" level.

### 7. Conclusion

The study results on the model development are helpful for the researchers to develop the BL-DTM Model and the learning activities to enhance information, media, and technology skills. The model can develop the students' 21st century skills in accordance with the framework of teaching professional development in Thailand at present and in the future. The information, media, and technology skills are trained with the focus on additional study for the students to learn from the online environment and face-to-face learning in order to enhance their ability to apply knowledge and skills in real practice and daily life as well as to enhance their ability to transfer experience into their real teaching.

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