

Flipped Classroom with Gamification to enhance Students' Digital Literacy Skills

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ABSTRACT: *This study aimed to design, implement, and evaluate an instructional model that integrates the Flipped Classroom approach with Gamification to enhance students' digital literacy skills. The research employed a Research and Development (R&D) design involving five experts specializing in flipped learning, gamification, and digital literacy. Data were collected through expert evaluation forms and analyzed using descriptive statistics (Mean and Standard Deviation). The developed model consisted of two components—Out-of-Class and In-Class activities—comprising six steps from planning, creating learning environments, and conducting activities to evaluating and summarizing outcomes.*

The results indicated that all components of the model achieved the highest level of appropriateness ($M = 4.83$, $SD = 0.24$). The study confirmed that the integration of Flipped Classroom and Gamification promotes motivation, engagement, and self-directed learning while developing learners' digital literacy skills in the areas of use, understanding, creation, and access. The model provides practical guidelines for designing technology-driven instruction and serves as a policy framework for advancing digital literacy in education.

Keywords: Gamification, Guidelines, Flipped Classroom Learning, Digital Literacy Skills

1. Introduction

In the digital age, information and communication technology have played a profound role in all aspects of life, particularly in the economic, social, educational, and human resource development fields. As a result, people's learning and lifestyle patterns have been changing rapidly and continuously. Therefore, 21st century skills have become an important tool to prepare learners to face the challenges of the future world. In particular, the 3 Rs (Reading, Writing, Arithmetic) and the 7 Cs (Critical thinking, Creativity, Collaboration, Communication, Cross-cultural understanding, Computing, Career and learning self-reliance) skills are considered an important foundation for promoting lifelong learning and for supporting learners when it comes to continuously improving themselves in the context of an ever-changing digital society (Yuangsoi & Wannakhao, 2023).

One of the skills that is of great importance in the context of modern learning is digital literacy. This is considered the cornerstone of modern information literacy and is in line with the concept of basic literacy, such as relates to reading, writing, and arithmetic (Karpati, 2011). However, it also includes awareness, assessing, creating, and communicating information with responsibility and ethics through the use of digital tools such as computers, smartphones, and other technologies for the purpose of learning, working, creating, and participating in the knowledge society (OCSC, 2019).

Despite the growing body of research on the Flipped Classroom and Gamification, few studies have investigated their integration within the context of Thai vocational education. Existing research tends to focus either on flipped learning or gamified instruction separately, without exploring how their combination could systematically develop digital literacy competencies. Therefore, this study addresses this research gap by developing and evaluating a Flipped Classroom with Gamification model designed to enhance students' digital literacy skills, providing empirical evidence and pedagogical insights for future implementation in vocational and higher education settings.

2. Research Objectives

1. To design and develop an instructional model based on the Flipped Classroom with Gamification to enhance Students' Digital Literacy Skills.
2. To study the effect of using an instructional model based on the Flipped Classroom with Gamification to enhance Students' Digital Literacy Skills.
3. To evaluate the effectiveness and satisfaction of learners with an instructional model based on the Flipped Classroom with Gamification to enhance 1 Students' Digital Literacy Skills.

3. Literature Review

3.1 Flipped Classroom Learning

3.1.1 Meaning of Flipped Classroom Learning

The flipped classroom concept originates from Bergmann and Sams, U.S. teachers who aimed to help students missing class due to sports, activities, or slow learning. Information technology helps teachers create instructional videos more easily and upload them online, enabling absent students to catch up on lessons and slower learners to review at their own pace. Moreover, it reduces in-class instructional time while allowing students to use that time meaningfully for practice and transforming knowledge into deep understanding connected to real-life situations. This approach reduces the need for in-class time for direct instruction, instead fostering self-worth through practice and real-world knowledge application (Panich, 2017).

The Office of the Royal Academy of Sciences explained that the flipped classroom is a teaching method whereby learners study lesson content independently at home, and exchange recorded work or problems with the instructor or peers in class. This approach reverses the classroom structure, shifting the instructor's role from that of a content narrator to that of a learning designer who guides students in self-study and collaborative learning. According to (Limvong & Saengri, 2019) the flipped classroom allows learners to access content at home via the internet, by watching videos, or through other online systems before class, when instructors facilitate learning and answer questions through classroom activities.

3.1.2 Key Concepts for Flipped Classroom Learning Management

The main idea of the flipped classroom is to take what has been done in class at home and then take what has been done at home to do in class. There are four key principles that instructors must take into account when designing a flipped classroom to enhance the effectiveness of learning management. (Alharbi, 2015).

1. Flexible Environment: Instructors design adaptable learning spaces to support group work or independent study, allowing flexibility in learning time, space, and assessment.
2. Learning Culture: This indicates a shift from instructor-centered to learner-centered learning, emphasizing deeper lesson exploration and diverse learning opportunities to enhance student engagement.
3. Curated Content: Instructors determine essential content for direct instruction and self-learning, taking into account subject matter and student grade levels.
4. Professional Instructor: Instructors facilitate learning, observe student behavior, provide feedback, and continuously assess progress while reflecting on teaching practices

The flipped classroom model can be called a reversal of the traditional teaching process because while the traditional understanding is that the teacher lectures in the classroom and then gives homework, the FC Model follows the lectures out-of-class time. It is based on doing the practices which can be homework in the classroom (Abeysekera & Dawson, 2015).

In the flipped classroom model, students come to the classroom by learning the subject before the lesson, through online material (for example, video) containing the simple and theoretical parts of the subject. The teacher makes in-

depth discussions, experiments, and activities such as problem-solving activities with students who come to the classroom knowing the subject to a great extent (Baker, 2000).

3.1.3 Designing Learning Management Using Flipped Classrooms

The following guidelines for managing inverted classroom learning (Plodpai et al., 2021).

1. Pre-class activities: Learners study independently through engaging in tasks such as watching instructional videos, completing exercises, or solving problems requiring critical thinking.
2. In-class activities: Learning review is undertaken through questions or discussions, with instructors providing additional explanations and focusing on peer and small group learning, such as Peer Instruction or Think-Pair-Share
3. After-class activities: Learners are encouraged to review content and reflect on their learning outcomes.

In Thailand, learning management based on the concept of the flipped classroom: 1) Provide learning materials that learners can study on their own. 2) Explain to learners how to operate according to the concept of the flipped classroom, as well as informing parents so that both parents and learners accept and are ready to adapt to the new style of teaching and learning management 3) Organize classroom activities so that learners benefit from hands-on learning and learn how to learn according to their individual learning abilities. The instructor acts as a coach to facilitate and provide guidance on learning 4) Create an appropriate evaluation system and focus on evaluation based on actual conditions (Outamung, 2015).

3.2 Gamification in Education

3.2.1 Definition of game distribution

The meaning of game differentiation is to adopt the basic principles of game design. The concept is a way to increase engagement on the part of participants, an approach which can highly motivate students (Poondej & Lerdpornkulrat, 2018).

Gamification is the use of techniques in the form of games without using the game itself, to help stimulate and motivate learners to learn. This approach engages learners in a fun and interactive way through the use of straightforward game mechanics, promoting appropriate learner behavior in terms of checking, improving, and finding ways to solve problems. Gamification is the application of basic principles in the design of gameplay mechanics such as accumulated points (Points, Tiers (Levels), Receiving awards (Rewards), and Leaderboards (Leaderboards). It is also possible to organize a contest between participants (Competition). It can also be applied in non-gaming contexts by creating an environment that simulates elements of gameplay (Saroj & U-nakarin, 2022).

3.2.2 Concept and Elements of Globalization

The gamification involves using game-like techniques without playing actual games in order to motivate learners and enhance engagement. This approach applies basic gameplay mechanics such as points, levels, rewards, leaderboards, and competition to non-gaming contexts, creating a simulated game environment. According to (Amornrit & Insa-ard, 2020) the key components of gamification in online teaching involve 1) game design, which involves structure, storytelling, and player interactions, and 2) game mechanics, which define how game elements function within each learning context (Rungchareankiat, 2023). In addition, game elements in gamification take the form of 1) Game Mechanics, - The core structure, including rules, rewards, and gameplay, which must be set before play begins. Common mechanics include points, levels, leaderboards, and virtual rewards. 2) Game Dynamics - Player behaviors and reactions are influenced by game mechanics, driven by human needs such as cognition, achievement, competition, and generosity. 3) Player Emotions - Feelings experienced while playing, shaped by game mechanics and dynamics, ranging from joy and excitement to disappointment and boredom (Saroj & U-nakarin, 2022).

3.3 Digital Literacy Skills

Digital literacy in education has become increasingly essential in preparing students for the modern workforce and ensuring they can navigate the digital world effectively. It encompasses a range of competencies, including the ability to find, evaluate, and use information, communicate and collaborate online, and understand digital tools and technologies (Chansa Chanda et al., 2024).

There are standards and indicators that reflect digital knowledge beyond the understanding of the use of digital literacy (ISTE, 2008). These include:

1. Creative and innovation: Learners express their creativity. Knowledge building and development of various innovative products as well as the process of using technology.

2. Communication and collaboration: Learners use digital media and environments to communicate and collaborate remotely. This includes both individual and group learning support.
3. Research and information fluency: Learners apply digital tools to integrate, evaluate, and use information.
4. Critical thinking Problem-solving and decision-making Critical thinking, problem-solving, and decision-making: Students use critical thinking skills in planning, research, and project management. Solve problems and make decisions by using the right digital tools and resources.
5. Digital citizenship: Students understand issues related to people, culture, and society related to technology and compliance with laws and ethics.
6. Technology operations and concepts: Learners express their understanding of concepts. System and operation of technology

4. Concept Framework for the Flipped Classroom with Gamification

This research is based on the study, analysis, and synthesis of documents and research related to the flipped classroom learning model, together with games to strengthen learners' digital literacy skills. The conceptual framework is as shown in Figure 1

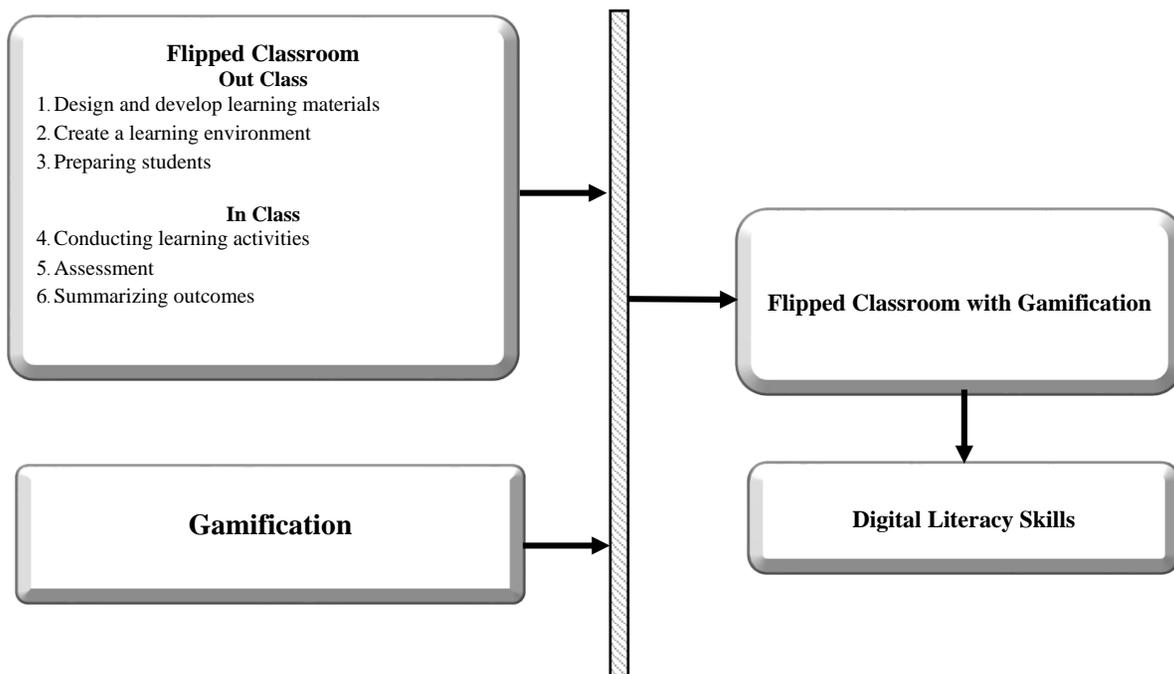


Figure 1. Conceptual framework of the Flipped Classroom with Gamification for Enhancing Students' Digital Literacy Skills.

5. Methodology

This research employed a Research and Development (R&D) approach. The sample consisted of five experts selected through purposive sampling. The expert panel included two specialists in Flipped Classroom pedagogy, two in Gamification design, and one in Digital Literacy education. Research instruments comprised the model evaluation form and expert suitability checklist. Data were collected through document analysis, model validation, and expert evaluation. Descriptive statistics (mean and standard deviation) were used to analyze the data and determine the model's overall appropriateness.

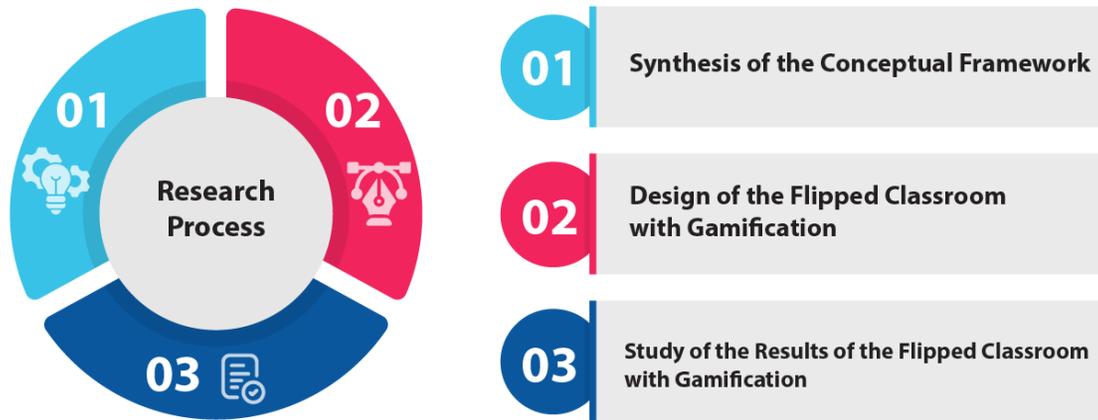


Figure 2. Research Process

5.1 Synthesis of the Conceptual Framework: Study, analyze, and synthesize documents and research related to flipped classroom learning with game distribution. To be used as a guide to formulate a conceptual framework for research, including Flipped Classroom Learning, Gamification, Digital Literacy Skills.

5.2 Design of the Flipped Classroom with Gamification: In this step, the research team adopted the principle of System Approach.

5.3 Study of the Results of the Flipped Classroom with Gamification: Study the results of the flipped classroom.

5.4 Design of the Flipped Classroom with Gamification: In this step, the research team adopted the principle of System Approach, which synthesizes immersive learning with synchronous learning. as follows.

5.4.1 Synthesis of Flipped Classroom Learning Management

Table 1. Results of Synthesis of Flipped Classroom Learning Management

Flipped classroom	(Congress, 2022)	(Bergmann Jonathan & Sams Aaron, 2012)	(Numnual et al., 2024)	(Changkwanyeun, 2017)	(Ma et al., 2024)	(Kongpha et al., 2023)	Selected Format
Out of Class							
1. Plan lessons and prepare materials	✓	✓	✓	✓	✓	✓	✓
2. Introduce learning methods/ guide learning methods		✓	✓	✓	✓	✓	✓
3. Learners study lectures through electronic media.	✓	✓	✓	✓	✓	✓	✓
In Class							
4. Organize classroom activities	✓	✓	✓	✓	✓	✓	✓
5. Assess learners' knowledge and skills.	✓	✓	✓	✓	✓	✓	✓

The results of the analysis reveal that the Flipped classroom is divided into two main components: The Out of Class and In Class, with the first component being Out of Class activities, consisting of (1) Plan lessons and prepare materials. (2) Introduce learning methods/ guide learning methods. Instructors introduce learning methods through online platforms and provide guidance to learners. (3) Learners study lectures through electronic media. Learners study online lessons through an online learning platform provided by the instructor at home. The second element is classroom activities. After the learners have studied the lessons on their own at home. The instructor organized classroom activities, including (4) Organizing classroom activities, by allowing students to integrate the knowledge gained from the materials they have studied through the activities organized by the instructor in class, and (5) Assess learners' knowledge and skills. After the activity, the instructor assessed the learners' knowledge and skills from the activities held in the class.

5.4.2 Synthesis of Learning Management Using Gamification in Education

Table 2. Results of Synthesis of Learning Management Using Gamification in Education

Gamification in Education	(Zainuddin et al., 2020)	(Sailer & Homner, 2020)	(Samantha Adams & Du Preez, 2019)	(Koivisto & Hamari, 2018)	(Dicheva et al., 2015)	Selected Format
1. Choose games that are in line with the purpose of learning management.	✓	✓	✓	✓	✓	✓
2. Optimize the environment	✓	✓	✓	✓	✓	✓
3. Determine the players and explain how to play and play the demo	✓	✓	✓	✓	✓	✓
4. Play the game by involving everyone in the game.	✓	✓	✓	✓	✓	✓
5. Evaluate learning outcomes	✓	✓		✓	✓	✓

The results of the analysis reveal that the synthesis of learning management using gamification in education consists of 6 steps. As follows:

1. Choose games that are in line with the purpose of learning management.
2. Optimize the environment.
3. Determine the players and explain how to play and play the demo.
4. Play the game by involving everyone in the game.
5. Evaluate learning outcomes.

5.4.3 Synthesis of Flipped Classroom with Gamification

Table 3. Results of Flipped Classroom with Gamification

Learning Steps	Flipped Classroom	Gamification in Education	Flipped Classroom with Gamification
Out of Class	1. Plan lessons and prepare materials	1. Choose games that are in line with the purpose and content of the study.	1. Design and develop learning materials
	2. Introduce learning methods/guide learning methods.	2. Optimize the environment	2. Create a learning environment
	3. Learners study through electronic media	3. Determine the players Explain how to play, demo play.	3. Prepare learners
	4. Organize classroom activities	4. Play games by involving everyone in the game.	4. Conduct learning activities
In Class	5. Assess learners' knowledge and skills.	5. Evaluate learning outcomes	5. Assess learning outcomes
		6. Summary of learning outcomes	6. Summarize learning outcomes

The results of the analysis reveal that flipped classroom learning using gamification consists of 6 stages, divided into 2 elements there are Out of Class activities and In Class activities. The first component is Out of Class activities, which consist of 4 steps: (1) Design and develop learning materials by planning and preparing online learning materials and designing games that promote learning. (2) Create a learning environment, Instructors create a learning environment that is conducive to studying the content and playing games. (3) Prepare learner, Learners study the lessons through learning materials and learn the game rules used to accompany the study before participating in class activities. The second component is In Class activities, which consists of 3 steps: (4) Conduct learning activities, the instructor organizes learning activities that allow learners to integrate knowledge using the mechanism of games, and (5) Assess learning outcomes, The instructor evaluates the learning outcomes and skills acquired by the learners from the integration of knowledge using the mechanism of games in organizing activities between learners, and 6) Summarizes learning outcomes, summarizes from the integration of knowledge using the mechanism of games in organizing activities between learners.

5.4.4 Synthesis of Flipped Classroom with Gamification Learning Activities

Table 4. Synthesis of Flipped Classroom with Gamification Learning Activities

Learning Steps	Flipped classroom learning using gamification	Instructor Activities	Learner Activities
Out of Class	1. Plan and prepare online learning materials and design games that promote learning.	- Define content and design online learning materials. - Design games that are consistent with the lessons. - Prepare the platform for use	- Prepare your learning materials - Explore the learning platform - Study how to use learning materials and games
	2. Create a learning environment that is conducive to content education and gameplay.	- Provide the right environment. - Establish rules and guidelines for using games in learning. - Encourage learners to participate	- Understand the learning style - Adapt to the learning environment - Ask questions or comment on media and games.

	3. Learners study the lessons through learning materials and learn the game rules used to accompany the study.	- Explain how to use the learning materials - Introduce the game rules - Answer questions about the content and games	- Study the lessons provided - Understand the rules of the game - Prepare for the game
In Class	4. Organize learning activities that allow learners to integrate knowledge through games.	- Define a game format to review knowledge using Kahoot- for learners to create problems. Kahoot about lessons and set rules together and rank scores in Google Classroom- provide guidance and help during gameplay.	- Participate in game activities - Use the knowledge gained from the lessons to answer questions or solve problems in the game - Exchange ideas
	5. Evaluate the results of the activity.	- Observe learner behavior and engagement - Provide quizzes or assessments - Analyze strengths and areas for improvement.	- Take assessments or quizzes - Reflect on activities - Listen to suggestions and feedback from instructors
	6. Summarize the learning outcomes from the activities using game activities to help learners understand and remember the content.	- Summarize the essence of the activity - Connect the content with real situations - Give learners the opportunity to reflect on their learning.	- Review content through games and discussions - Share learning experiences - Apply knowledge

5.4.5 Digital Literacy Skill

Table 5. Digital Literacy Skill Synthesis Results

Digital Literacy Skill	(UNESCO, 2018)	(MDES, 2019)	(Chanayotha, 2021)	(Saechan & Morsorn, 2016)	(Yaboonwan Patsuda & Autthawuttikul, 2022)	Selected Format
Use	✓	✓	✓	✓	✓	✓
Understand	✓	✓	✓	✓	✓	✓
Create	✓	✓	✓	✓	✓	✓
Access	✓	✓	✓	✓	✓	✓
Collaborate			✓		✓	

Based on the synthesis of digital knowledge mentioned above. The researcher summarized the process of digital literacy into 4 main steps as follows:

1. Use: The ability to use computers and the Internet to cover content, from the use of computer programs and other communication tools to access and use knowledge and collaborative learning through programs.
2. Understand: The user's ability to understand the context and be able to evaluate digital media so that they can make decisions about what they see online.
3. Create: Creation skills are the ability to create content and communicate effectively through a variety of digital media tools and applications. By disseminating media created through social networks and digital technology in a responsible and effective manner.
4. Access: Effective access to digital technology. There is security in access and ethics in access without infringing on the privacy of others.

6. Result

The Results of the Flipped Classroom with Gamification: Study the results of the flipped classroom learning design with the game of differentiation. An instructional model based on the Flipped Classroom with Gamification, which is designed to enhance students' digital literacy skills, as follows

1. An instructional model based on the Flipped Classroom with Gamification

An instructional model based on the Flipped Classroom with Gamification to enhance Students' Digital Literacy Skills, consists of 4 main components, as shown in Figure 3:

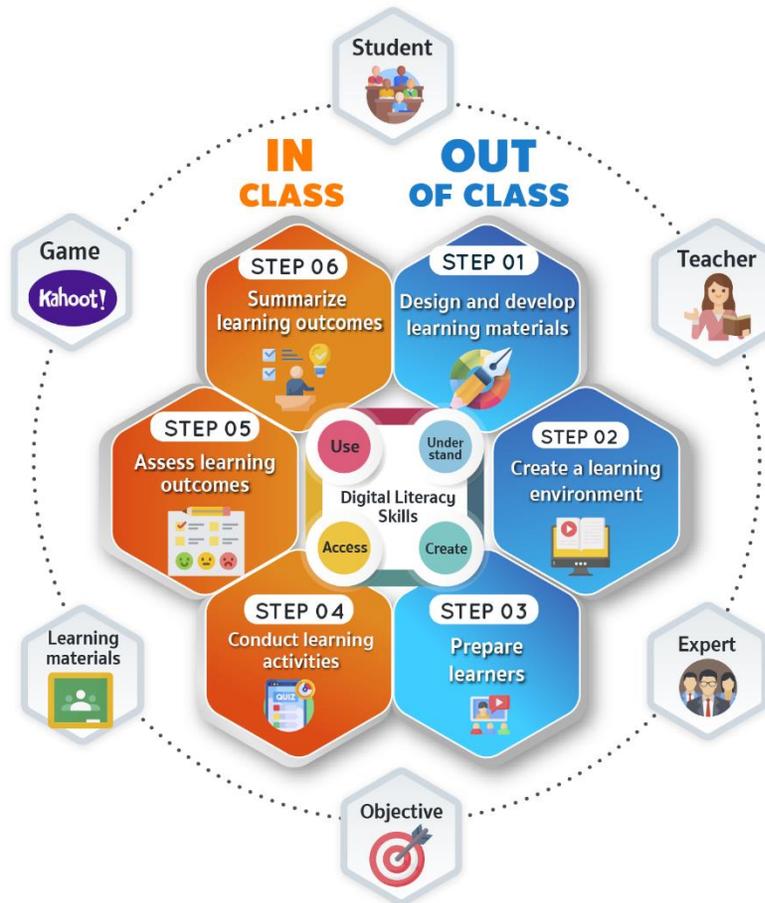


Figure 3. An instructional model based on the Flipped Classroom with Gamification to enhance Students' Digital Literacy Skills

Based on related research studies. The researcher has developed a flipped classroom learning model in combination with gamification to enhance Students' Digital Literacy Skills, consisting of 4 components:

The first component is the Input Factors from the immersive learning model and the learning style through virtual reality to promote creative skills, consisting of 6 factors:

1. Students, Sirindhorn College of Public Health Suphan Buri Province
2. Teachers who have the ability to convey knowledge content to learners and understand the use of the flipped classroom learning model with gamification.
3. Expert: An expert in flipped classroom learning technology with gamification.
4. Objectives Determine the objectives and abilities that the instructor wants to achieve for the learners.
5. Learning Materials: Flipped classroom learning materials with gamification.
6. Game: A game used in classroom activities using a gamification mechanism.

The second component is an instructional model based on the Flipped Classroom with Gamification to enhance Students' Digital Literacy Skills. In order to improve students' digital literacy skills, it can be concluded that inverted classroom learning using gamification consists of 6 stages, divided into 2 elements there are Out of Class activities and In Class activities.

The first component is Out of Class activities, which consist of 4 steps: (1) Design and develop learning materials by planning and preparing online learning materials and designing games that promote learning. (2) Create a learning environment, Instructors create a learning environment that is conducive to studying the content and playing games. (3) Prepare learner, Learners study the lessons through learning materials and learn the game rules used to accompany the study before participating in class activities.

The second component is In Class activities, which consists of 3 steps: (4) Conduct learning activities. The instructor organizes learning activities that allow learners to integrate knowledge using the mechanism of games, and (5) Assess learning outcomes. The instructor evaluates the learning outcomes and skills acquired by the learners from the integration of knowledge using the mechanism of games in organizing activities between learners, and (6) Summarize learning outcomes. The instructor summarizes the learning outcomes from the integration of knowledge using the mechanism of games in organizing activities between learners.

The third component is output. This is the result of inverted classroom learning with gamification, namely the development of digital literacy skills on the part of learners. This is divided into 4 main steps as follows:

1. Use: The ability to use a computer and the internet by covering the chosen content. This ability arises from the use of computer programs and other communication tools to access and use knowledge and to encourage collaborative learning through programs.
2. Understand: This refers to the user's ability to understand the context and be able to evaluate digital media so that they can make decisions about what they see online.
3. Create: Creation skills are the ability to create content and communicate effectively through a variety of digital media tools and applications. This also involves disseminating media created through social networks and digital technology responsibly and effectively.
4. Access: Refers to the ability to access digital technology efficiently, with security and ethical consideration, ensuring that the privacy of others is respected.

The fourth component is feedback. The aim of feedback is to bring the results of reflection and evaluation back into the learning process. This consists of the results of the evaluation of the use of the flipped classroom learning model combined with the game to strengthen the digital literacy skills of the learners.

2. Study on the results of an instructional model based on the Flipped Classroom with Gamification.

The results were organized in accordance with the three research objectives. The findings revealed that the developed Flipped Classroom with Gamification model comprised two major components - Out of Class and In Class activities - consisting of six sequential steps that support active and self-directed learning. Expert evaluation further indicated that the model effectively enhances learner motivation and participation through gamified elements that align with flipped learning principles. Overall, the experts rated the model's appropriateness at the highest level ($M = 4.83, SD = 0.24$), confirming its feasibility and effectiveness in developing students' digital literacy skills, as shown in Table 6 and 7.

Table 6. Results of Feasibility Assessment of Flipped Classroom Learning Design with Gamification to Enhance Learners' Digital Literacy Skills

Evaluation list	Results		Interpretation
	<i>M</i>	<i>SD</i>	
1. Principles and concepts used as the basis for the development of learning design To what extent is it appropriate?	5.00	0.00	Highest
2. To what extent are the elements of learning design appropriate?			
2.1 Determine the input factors.	4.75	0.47	Highest
2.2 Learning Process	4.50	0.47	High
2.3 Yield Assessment	4.50	0.47	High
2.4 Reflexes	4.25	0.47	High
Overview	4.60	0.38	Highest

From Table 6, it can be seen that the results of the evaluation of the appropriateness of the inverted classroom learning design combined with the gamification to strengthen the digital literacy skills of learners indicated that the approach strengthened the learners' digital literacy skills. This indicates that this approach can be used as a guide for the development of learning design by using inverted classroom learning design in combination with games to strengthen learners' digital literacy skills. This can be done by integrating the use of gamification in learning management to motivate learners to achieve effective learning outcomes.

Table 7. Results of Evaluation of Elements of Flipped Classroom Learning with Game Modification

Evaluation list	Results		Interpretation
	<i>M</i>	<i>SD</i>	
1. Input factors			
1.1 Learners	5.00	0.00	Highest
1.2 Instructor	5.00	0.00	Highest
1.3 Specialist	4.75	0.47	Highest
1.4 Purpose	5.00	0.00	Highest
1.5 Learning Materials	4.75	0.47	Highest
1.6 Games	4.50	0.47	High
Overall	4.83	0.24	Highest
2. Flipped classroom learning with game distribution			
2.1 Flipped classroom learning			
2.1.1 Plan lessons and prepare materials	5.00	0.00	Highest
2.1.2 Introduce learning methods/ guide learning methods	5.00	0.00	Highest
2.1.3 Learners study lectures through electronic media.	5.00	0.00	Highest
2.1.4 Organize Class Activities	4.50	0.47	Highest
2.1.5 Assess learners' knowledge and skills.	4.25	0.47	High
Overall	4.75	0.19	Highest
2.2 Gamification			
2.2.1 Choose games in accordance with the purpose of learning management.	4.75	0.00	Highest
2.2.2 Optimize the environment	5.00	0.00	Highest
2.2.3 Determining Players Explain how to play, play demo.	4.75	0.47	Highest
2.2.4 Play the game by involving everyone in the game.	5.00	0.00	Highest
2.2.5 Evaluate learning outcomes	4.50	0.47	Highest
2.2.6 Summary of learning outcomes	4.50	0.47	Highest
Overall	4.75	0.24	Highest
3. Output			
3.1 Digital literacy skills			
3.1.1 Usage	4.75	0.47	Highest
3.1.2 Understanding	4.50	0.47	Highest
3.1.3 Creation	4.75	0.47	Highest
3.1.4 Access	4.75	0.47	Highest
Overall	4.69	0.47	Highest
4. Feedback			
4.1 Feedback on Digital Literacy Skills Assessment	4.50	0.47	Highest
Overall	4.50	0.47	Highest

From Table 7, it was found that the evaluation results regarding the appropriateness of the flipped classroom with gamification showed the highest level of overall suitability ($M = 4.50$, $SD = 0.47$). This indicates that the flipped classroom with gamification possesses all the essential elements that can serve as a guideline for designing practical and applicable learning tools.

7. Discussion

The findings of this study demonstrated that integrating the Flipped Classroom with Gamification substantially enhanced students' digital literacy skills, particularly in promoting self-directed learning, collaboration, and digital problem-solving. This directly fulfills the first research objective and expands prior work that focused solely on either flipped learning or gamification. While Plodpai et al. (2021) emphasized the benefits of flipped learning in fostering active participation, the present study extends this understanding by showing that when combined with gamification, learner engagement becomes more sustained and reflective, as learners experience a sense of progress and achievement through interactive challenges.

In relation to the second research objective, the integration of game-based elements such as points, badges, and leaderboards was found to significantly increase learner motivation and participation. This supports the findings of Zainuddin et al. (2020), who argued that gamified flipped classrooms improve cognitive engagement by transforming passive learning into active inquiry. Likewise, Kongpha et al. (2023) demonstrated that gamification enhances critical thinking and collaboration. However, this study contributes further by empirically validating these theoretical claims within the context of Thai vocational education, where learners often display limited digital confidence. Thus, the model not only reinforces previous findings but contextualizes them within a developing-country educational environment.

For the third research objective, expert evaluation confirmed the model's high appropriateness ($M = 4.83$, $SD = 0.24$), indicating both academic rigor and practical feasibility. This aligns with Sailer and Homner (2020), who reported that gamified instructional designs significantly improve satisfaction and learning performance. The consistency between expert evaluations and theoretical expectations suggests that the model successfully bridges conceptual and applied perspectives, creating a foundation for future empirical testing with students to measure long-term learning outcomes. In summary, this study provides critical insights into how the combination of Flipped Classroom and Gamification can function as a comprehensive framework for developing 21st-century digital literacy skills. Beyond confirming earlier studies, it offers a nuanced understanding of how motivation, self-regulation, and engagement interact within gamified flipped environments. The model's adaptability also indicates its potential for broader application in diverse educational settings, serving as both a practical teaching strategy and a theoretical contribution to digital pedagogy research.

6. Conclusions

In conclusion, this study demonstrated through expert evaluation and model analysis that integrating the Flipped Classroom with Gamification effectively enhances students' digital literacy skills. The evidence supports all three research objectives. First, the design and development phase produced a structured instructional model consisting of two major components—Out-of-Class and In-Class activities—with six sequential steps that foster self-directed and interactive learning. Second, implementation results indicated that the model successfully increased learner motivation, participation, and responsibility through gamified mechanisms such as points, badges, and collaborative challenges, aligning with prior evidence of improved engagement in flipped environments. Third, the evaluation revealed that experts rated the model's overall appropriateness at the highest level (Mean = 4.83, $SD = 0.24$), confirming its feasibility and effectiveness for developing digital literacy competencies. Collectively, these findings substantiate the model's theoretical and practical value as a pedagogical framework for promoting 21st-century digital literacy. It offers actionable guidance for educators in designing technology-enhanced, learner-centered instruction and provides policy implications for integrating innovative, gamified learning strategies into educational systems to foster lifelong learning and digital citizenship in the digital era.

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References

- Abeysekera, L., & Dawson, P. (2014). Motivation and cognitive load in the flipped classroom: Definition, rationale and a call for research. *Higher Education Research & Development, 34*(1), 1–14. <https://doi.org/10.1080/07294360.2014.934336>
- Alharbi, A. (2015). A flipped learning approach using social media in health informatics education. *Creative Education, 6*(13), 1466–1475. <https://doi.org/10.4236/ce.2015.613147>
- Amornrit, P., & Insa-ard, S. (2020). Gamification in distance learning system design. *ECT Education and Communication Technology Journal, 15*(18), 34–44. <https://so01.tci-thaijo.org/index.php/ectstou/article/view/225066>
- Baker, J. W. (2000). The “classroom flip”: Using web course management tools to become the guide by the side. *Paper presented at the 11th International Conference on College Teaching and Learning*, Jacksonville, FL, United States.
- Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day*. ISTE Press / ASCD.
- Chanayotha, P. (2021). *Development of digital literacy using think-pair-share technique for the students of Mahamakut Buddhist University, Roi-Et Campus*. Mahamakut Buddhist University. <https://yri.mbu.ac.th/wp-content/uploads/2024/07/รวม-พรทิว-1-2564-20.pdf>
- Changkwanyeeun, A. (2017). *The effects of flipped classroom and project-based learning in the introduction to computer information science for undergraduate students* [Unpublished master's thesis].
- Chansa Chanda, T., Hassan Sain, Z., Shogbesan, Y., Akpan, W. M., Chansa Thelma, C., Olayinka Shogbesan, Y., & Vinandi Phiri, E. (2024). Digital literacy in education: Preparing students for the future workforce. *International Journal of Research (IJR), 6*(1), 30–38. <https://doi.org/10.5281/zenodo.13347718>
- Dicheva, D., Dichev, C., Agre, G., & Angelova, G. (2015). Gamification in education: A systematic mapping study. *Journal of Educational Technology & Society, 18*(3), 75–88. <http://www.jstor.org/stable/jeductechsoci.18.3.75>
- International Society for Technology in Education. (2008). ISTE standards for teachers. <https://www.iste.org/standards/standards-for-teachers>
- Karpati, A. (2011). *Digital literacy in education*. UNESCO Institute for Information Technologies in Education. <http://www.sciencedirect.com/science/article/pii/S2452315116301254>
- Koivisto, J., & Hamari, J. (2018). Gamification of education and learning: A review of empirical literature. *Educational Technology Research and Development, 66*(4), 1195–1215. <https://www.researchgate.net/publication/327438074>
- Kongpha, R., Cheerapakorn, P., & Chanda, K. (2023). Designing flipped classroom with imagineering: A case study in digital literacy. *International Journal of Educational Communications and Technology (IJECT), 3*(1), 43–53. <https://ph01.tci-thaijo.org/index.php/IJECT/article/view/252474>
- Kongrat, C. (2022). Flipped classroom: Thai language learning management to develop learners in the next normal era. *Journal of Language and Education, 10*(2). <https://doi.org/10.14456>
- Limvong, T., & Saengri, Y. (2019). Flipped classroom: New learning for 21st century skills. *Mahidol R2R E-Journal, 6*(2), July–December. <https://www.ocsc.go.th/DLProject/mean-dlp>
- Ma, Y., Wei, C., & Huang, F. (2024). A full-flipped classroom mode from the perspective of junior high school English teachers. *Heliyon, 10*(2), e24864. <https://doi.org/10.1016/j.heliyon.2024.e24864>
- Ministry of Digital Economy and Society. (2019). *Digital literacy for Thai citizens*. <https://itm.eg.mahidol.ac.th/itm/wp-content/uploads/2020/04/MDES-ONDE-Digital-Literacy.pdf>
- Numnual, N., Nawakitpaiboon, N., & Lertgrai, P. (2024). The classroom learning management style is reversed: Using a research-based project academic career for junior high school students, Phrapariyattithamma School. *Journal of Pariyattithamma Studies, 4*(3), 40–61. <https://so02.tci-thaijo.org/index.php/jpsmbu/article/view/268400>
- Office of the Civil Service Commission. (2019). *What is digital literacy?* <https://www.ocsc.go.th/DLProject/mean-dlp>
- Outamung, S. (2015). Flipped classroom: A dream come true in teaching Thai language. *Srinakharinwirot Academic Journal of Education, 16*(1). <https://ejournals.swu.ac.th/index.php/jedu/article/view/6667>
- Plodpai, Y., Atchariyasathian, V., & Vannapong, S. (2021). Technology-enhanced active learning with flipped classroom on otolaryngology education. *Journal of the Medical Association of Thailand, 104*(7), 1159–1165. <https://doi.org/10.35755/jmedassocthai.2021.07.12604>
- Poondej, C., & Lerdpornkulrat, T. (2018). A study of gamification concept of innovative learning. *Journal of Education, Naresuan University, 22*(2), 34–44.

- https://so06.tci-thaijo.org/index.php/edujournal_nu/article/view/104390
- Rungchareankiat, D. (2023). The development of online learning management model based on the concept of gamification for elementary school teachers. *Rajapark Journal*, 17(2), 1–12.
<https://dept.npru.ac.th/jssr/data/files/14.2jssr6.pdf>
- Saechan, T., & Morsorn, T. (2016). Digital literacy: Definition, component and current situation. *Journal of Educational Studies*, 14(1), 15–27.
- Sailer, M., & Homner, L. (2020). The gamification of learning: A meta-analysis. *Educational Psychology Review*, 32(1), 77–112. <https://doi.org/10.1007/s10648-019-09498-w>
- Samantha Adams, & Du Preez, R. (2019). *The role of gamification in the facilitation of student engagement: An exploratory industrial psychology application*. Stellenbosch University Repository. <https://scholar.sun.ac.za>
- Saroj, N., & U-nakarin, T. (2022). *The learning by using gamification technique to enhance English reading comprehension for Grade 8 students at Uthaiwitthayakhom School in Uthai Thani* [Independent study, Naresuan University]. <http://nuir.lib.nu.ac.th/dspace/handle/123456789/5522>
- UNESCO. (2018). *A global framework of reference on digital literacy skills for indicator 4.4.2*. <http://uis.unesco.org>
- Yaboonwan, P., & Autthawuttikul, S. (2022). *The development of learning activities using digital technology with infographics that affect digital literacy of student teachers, Faculty of Education, Silpakorn University* [Master's thesis, Silpakorn University]. <http://ithesis-ir.su.ac.th/dspace/handle/123456789/3879>
- Yuangsoi, P., & Wannakhao, C. (2023). Digital literacy skills for learning in the new normal. *Songkhla Rajabhat Social Science Journal*, 20(2), 45–58. <https://so02.tci-thaijo.org/index.php/SNGSJ/article/view/248416>
- Zainuddin, Z., Chu, S. K. W., Shujahat, M., & Perera, C. J. (2020). The impact of gamification on learning and instruction: A systematic review of empirical evidence. *Educational Research Review*, 30, 100326.
<https://doi.org/10.1016/j.edurev.2020.100326>