# Empowering Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management

Supansa Thammasarot[1,*], Wirot Sanrattana[1] & Phrasrivajiravati[2]

[1]Mahamakut Buddhist University, Isan Campus, Khon Kaen Province, Thailand

[2]Mahamakut Buddhist University, Nakhon Pathom Province, Thailand

*Correspondence: Mahamakut Buddhist University, Isan Campus, Khon Kaen Province, Thailand. Tel: 66-643-539-297

Received: March 12, 2024 Accepted: April 25, 2024 Online Published: June 15, 2024

doi:10.5430/wje.v14n2p66 URL: https://doi.org/10.5430/wje.v14n2p66

**Abstract**

This research aimed to conduct a study to develop an educational innovation called "Online Self-Training Program to Empower Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management," efficiently using the Research and Development (R&D) methodology. This online self-training program consists of two projects: 1) A Teacher Development Project: It includes self-training modules for teacher learning, comprising 10 modules. 2) A Teacher Implementation Project: It involves a self-training module for teachers to use as a practical guideline, consisting of 1 module. The results of the experimental research in the first project revealed that among the experimental group of 16 teachers, their post-test scores met the standardized criteria of 90/90, and they had statistically significantly higher scores compared to their pretest scores. In the second project's experimental research, it was found that the post-test scores of 640 students showed a statistically significant increase in their perception of flipped classroom learning management when compared to their pre-test scores. The research results were consistent with the predefined research hypotheses, indicating that the educational innovation produced by this research has been confirmed to be effective. It can be beneficially applied to teachers and students in schools that are the target population for disseminating the research findings in the future.

**Keywords:** online program, self-training, flipped classroom learning management

## 1. Introduction

One of the most exciting advancements in the modern classroom is flipped learning. It is based on the concept that students learn more effectively by utilizing class time for small group activities and individual attention. In this approach, teachers assign lecture materials and presentations to be viewed by students at home or outside of regular classroom hours, with a focus on active learning (Lesley University, n.d.). The Flipped Classroom has benefits for both teachers and students, including 1) Teachers spend less time introducing new topics; 2) Students develop independent learning skills; 3) Teachers can create more engaging lessons; 4) absent Students do not fall behind; 5) Teachers can reuse the content they create; 6) Students can build a deeper understanding; 7) Teachers can provide a more tailored approach; and 7) Students find classroom time more interesting (ViewSonic Education, 2022).

Some proponents have presented ideas on flipped classroom learning management, such as Adnyani and Ratnadi (2020), who stated in their research: “In a Flipped classroom, the sequence of the learning process is inverted. The activity that is traditionally conducted in the classroom is done at home, while the activity that is traditionally completed at home is done in class. This qualitative research aimed to introduce how the implementation of the flipped classroom into an English language class affected the learning experience of pre-service English teachers based on the Self-Determination Theory framework. In this study, a flipped classroom was implemented in the Classroom Management course. A total of 28 prospective English teachers learned the material from an e-book and articles, watched videos, and reviewed their friends' PowerPoint presentations online at home. In-class time was dedicated to group presentations, question-and-answer sessions, discussions, role-play, problem-solving, or project completion. The study participants were given open-ended questions to gain insight into their responses to the implementation of the flipped classroom.”

According to the research titled “The Flipped Classroom: For Active, Effective, and Enhanced Learning – Particularly for Low Achievers” by Nouri (2016), it was observed that a significant majority of students held a favorable outlook regarding the flipped classroom approach, the utilization of video materials, and Moodle. Furthermore, it was noted that having a positive attitude toward the flipped classroom was closely associated with increased motivation, heightened engagement, improved learning outcomes, and effective learning perceptions.

The foregoing discussion highlights the significance and benefits of flipped classroom learning and illustrates that there are various recommendations and proposals regarding flipped classroom learning management. Particularly, when conducting internet research, one will encounter diverse perspectives from experts hailing from different regions of the world. These perspectives cover a wide array of topics, such as origins, definitions, advantages and disadvantages, challenges and how to overcome them, characteristics, case studies, learning management strategies, procedures, and assessment methods.

Regarding the various perspectives on flipped classroom learning management, the research team perceives them as a valuable resource to guide the implementation of flipped classroom learning management for teachers in secondary schools under the jurisdiction of the Basic Education Commission in Thailand. In this research endeavor, the research team employed the Research and Development (R&D) methodology to develop an educational innovation referred to as the “Online Self-Training Program to Empower Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management.”

This research is conducted with the guiding principle that “knowledge and action is power.” It aims to leverage the various perspectives on flipped classroom learning management mentioned earlier as a foundation for developing teachers. The goal is to empower teachers to prioritize their learning first, and then encourage and promote them to apply that learning in their teaching, in alignment with the specified indicators.

The research team believes that following the R&D methodology, as outlined in the research methodology section, will lead to the development of an efficient educational innovation, by the established research hypotheses. This innovation can be disseminated and utilized for the benefit of the target population, nationwide, following the principles of R&D methodology in which any innovation developed is tested in representative experimental settings. When the results of these experiments demonstrate that the innovation meets the predefined criteria for effectiveness, it can then be disseminated for practical use among the target population in the research study.

### *1.1 The Purpose of Research*

This research aimed to conduct a study using R&D methodology to develop an “Online Self-Training Program to Empower Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management” that is efficient according to the research hypotheses. This program will be disseminated for the benefit of the target population in the future. This online self-training program consists of 2 projects: 1) A Project for teacher learning development, and 2) A Project for teachers to apply their learning to teaching effectively. The first project includes ten online self-training modules, and the second project includes one online self-training module (see the program structure and other details in Figure 1).

### *1.2 Research Hypothesis*

From studying other research that aims to develop educational innovations with the concept of "Developing Teachers and Then Allowing Teachers to Develop Students" and with the concept of "Knowledge and Action is Power", it was found that the results from these studies are under the research hypotheses. For example, research works such as "Developing Teachers to Enhance Students' Effective Teamwork Skills" by Saysin and Dhammapissamai (2023), "Empowering Teachers' Learning to Develop Innovative Skills for Students" by Hatsanmuang and Sanrattana (2023), and "Empowering Teachers' Learning to Develop Students' Inspirational Skills" by Kromthamma and Supakicco (2023) have shown results consistent with the research hypotheses. Therefore, it was believed that this research would yield an "Online Self-Training Program to Empower Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management" that was similarly effective. The research hypotheses were as follows:

- For the Teacher Learning Development project, it was hypothesized that teachers in the experimental group would achieve post-test scores meeting the standard of 90/90 and significantly higher than pre-test scores, based on statistical analysis.
- For the Teacher Implementation project where teachers apply their learning to teaching, it was hypothesized that post-test scores of students in the target group would show a significant increase in their perception of flipped classroom learning management by teachers compared to their pre-test scores, based on statistical analysis.

### *1.3 Literature Review*

It was noted that there are various experts providing recommendations on the development of flipped classroom learning management, especially on Internet research. It was a diverse body of knowledge that the research team found valuable to incorporate into the creation of a more extensive set of online self-training modules. Therefore, the research team delved deeper into the literature related to flipped classroom learning management, supplementing what had been initially studied with an additional ten focal points, as follows: 1. The background from the perspectives of Bouchrika (2020), Ridgley (2014), Sams et al (2014), and Wikipedia, The Free Encyclopedia (2021). 2. The definition from the perspectives of Karanicolas (2018), Iowa State University of Science and Technology (n.d.), Office of Information Technology (2020), Panopto Academic Technology Faculty/Instructor (2021), and Teach Thought (n.d.). 3. The advantages and disadvantages from the perspectives of CPS Manufacturing Co LLP (2020), Kenney (2019), and Rivera (2016). 4. The obstacles and ways to overcome obstacles from the perspectives of Promethean (2018), Rice (2019), and Wang (2017). 5. The characteristics from the perspectives of Ferriman (2020a), Honeycutt (n.d.), Song (2016), and Subramaniam and Muniandy (2016). 6. The case studies from the perspectives of Kenney (2019), Miller (2012), and Trach (2021). 7. The management approach from the perspectives of Gonzalez (2021), Milman (2014), Mumper (2013), Thakare (2018), and The Editorial Team Resilient Educator (n.d.). 8. The management procedures from the perspectives of Corbat (n.d.), Ferriman (2020b), The University of Texas at Austin Faculty Innovation Center (n.d.), and Waddell (2017). 9. The evaluation from the perspectives of Jaster (2017), Johnson (2013), Leola (n.d.), and Raine and Gretton (n.d.). 10. Compare flipped classroom learning management with other educational methods, namely: peer instruction, adaptive learning, gamification, flipped, cooperative learning, and inclusive classroom from the perspectives of Chatzidamianos and Nerantzi (2020), Gündüz and Akkoyunlu (2020), Leporati and Tilton (2017), Nerantzi (2020), Noonoo. (2019), Pratas (n.d.), State (2017), Turner and Carlson (2012), and Vick (n.d.)

Based on the study of the aforementioned ten focal points, it is considered that perspectives related to "management procedures" are of paramount importance. This is because they provide recommendations that showcase the "principles/concepts/techniques/methods/activities" to be utilized in developing teacher learning as the first step and then having teachers apply that learning as a means of furthering student development. The research team therefore synthesized the issues of "management procedures" from the viewpoints of various reference sources as mentioned above, there are 30 approaches as follows: 1) rotation model, 2) flex model, 3) enriched virtual model, 4) standard inverted classroom, 5) micro-flipped classroom, 6) discussion-oriented flipped classroom, 7) demonstration-based flipped classroom, 8) faux-flipped classroom, 9) group-based flipped classroom, 10) virtual flipped classroom, 11) set clear goals and expectations, 12) set the right pace, 13) identify resources, 14) allow all student voices to be heard, 15) celebrate student progress, 16) make the video content short, 17) it takes more time and thought, 18) record 25 lectures with the echo 360, each just 35 minutes long, 19) students watch videos the night before class, 20) active learning students arrive in the classroom ready to participate, 21) inside/outside circle, 22) group quizzes, 23) gameshow, 24) oxford-style debate, 25) human bingo, 26) create an active learning environment that works everywhere, 27) use lectures as student homework, 28) tools for screen-casting, 29), tools for videos, and 30) some miscellaneous tools.

## 2. Research Methods

### *2.1 Concepts and Process*

This research employed the Research and Development (R&D) methodology as per the perspective outlined by Sanrattana (2023). Sanrattana asserted that educational innovations developed through this research methodology aimed to enhance individuals' knowledge with the expectation that they would apply this knowledge to actions that empowered them in their work, aligning with the concept that "knowledge and action are power." This concept has led to the research framework for this study, which was to "start by developing teacher learning and then have teachers apply that learning to continue fostering student development." The research was conducted in four stages as follows:

*Stage 1* Review literature related to flipped classroom learning management in ten focal points (as mentioned in the "Literature Review" section). This literature was used to create online self-training modules for teacher learning. The ten modules include: 1) Background, 2) Definition, 3) Advantages and disadvantages, 4) Obstacles and ways to overcome obstacles, 5) Characteristics, 6) Case studies, 7) Management approach, 8) Management procedures, 9) Evaluation, and 10) Comparing flipped classroom learning management with other educational methods.

*Step 2* involves assessing the quality of the online self-training modules developed in two stages: 1) The first stage is

the Preliminary Field Testing and Revision, which involves five teachers from a school not involved in the experimental research. 2) The second stage is the Main Field Testing and Revision, which involved ten teachers from another school not part of the experimental research. In both stages, the assessment was conducted using the Focus Group Discussion method.

*Step 3* involves the creation of two sets of research tools for use in the experimental research: 1) A test to assess teachers' learning outcomes, and 2) An assessment questionnaire to measure students' perception of flipped classroom learning management by their teachers. (The "Research Tools" section will discuss details regarding these research tools.)

*Step 4* involves testing the effectiveness of the "Online Self-Training Program to Empower Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management" based on the research hypotheses. This will be carried out through an experimental research design using a one-group pretest-post-test format in schools selected through targeted random sampling. The research will be conducted during the second semester of the 2023 academic year, involving a group of 16 teachers and 640 students.

The research will be divided into two phases: 1) Experimental research phase for the teacher learning development program, which will last for one month. 2) Experimental research phase for the program where teachers apply their learning to teaching, which will last for two months.

*2.2 Research Tools*

The teacher learning outcomes assessment questionnaire is a multiple-choice questionnaire consisting of 4 options. Its purpose is to assess the learning outcomes of teachers before and after the experimental research phase in the teacher learning development program.

The research team developed this questionnaire based on the content specified in the six focal points: Definition, Obstacles and Ways to Overcome Obstacles, Characteristics, Management Approach, Management Procedures, and Evaluation. Each focal point has corresponding questions designed to assess cognitive skills ranging from lower-order thinking skills to higher-order thinking skills, namely remembering, understanding, applying, analyzing, evaluating, and creating, following The Revised Taxonomy 2001 by Benjamin S. Bloom (Armstrong, 2010).

The quality of this assessment questionnaire has been verified through two phases:

*In the first phase:* content validity was assessed using the Indexes of Item-Objective Congruence (IOC) method developed by Rovinelli and Hambleton (1977). This involved seeking the input of five qualified experts from the fields of Curriculum and Instruction and Educational Measurement and Evaluation. The analysis of the data revealed that all the questionnaire items had IOC values exceeding the criterion of 0.50, as specified by Chaichanawirote and Vantum (2017).

*The second phase:* involves reliability assessment by testing the assessment questionnaire with a sample group of 30 teachers in a non-experimental school setting. The data analysis results revealed that:

1. All test items had an index of difficulty within the range of 0.20 to 0.80, and they possessed a power of discrimination ranging from 0.20 to 1.00, meeting the criteria.
2. The KR-20 value, which indicated the reliability coefficient, was equal to 0.77 which was higher than the standard of 0.70.
3. The difficulty level of the assessment questionnaire was equal to 68.24.

Student Perception Assessment of Flipped Classroom Learning Management by Teachers is a rating scale with 5 levels: Very High, High, Moderate, Low, and Very Low.

The research team developed this assessment based on the characteristics of flipped classroom learning management as described by Ferriman (2020), Honeycutt (n.d.), Song (2016), and Subramaniam and Muniandy (2016). Additionally, it was influenced by the assessment concept of flipped classroom learning management from the perspectives of Jaster (2017), Johnson (2013), Leola (n.d.), and Raine and Gretton (n.d.). This assessment was used to evaluate quality in two phases, as follows:

*In the first phase:* content validity was examined using the method proposed by Rovinelli and Hambleton. This analysis was conducted by five experts who are highly qualified in the fields of Educational Administration and Educational Measurement and Evaluation. The results of the data analysis revealed that all questions had an IOC (Item-Objective Congruence) value higher than the standard of 0.50 for each question. This indicates that the questions in this assessment can be effectively used to measure the intended objectives (Chaichanawirote & Vantum, 2017).

*In the second phase:* the reliability or internal consistency of the assessment was checked by administering it to a sample group of 30 students in a non-experimental school setting. The analysis aimed to determine the alpha coefficient of reliability using Cronbach's method. The results of the data analysis indicated that the alpha coefficient of reliability for the entire assessment was equal to 0.77. When analyzed by dimension, the learning management process, teacher's role, students' roles, teaching and learning management system, learning materials, assessment and evaluation, and learning perception had values of 0.78, 0.75, 0.77, 0.79, 0.77, 0.76, and 0.74 respectively. When comparing the reliability coefficient to the established criterion of being equal to or greater than 0.70 (UCLA: Statistical Consulting Group, 2016), it was found that the items exhibited higher internal consistency, indicating that the items have relatively high internal consistency.

### *2.3 Data Analysis*

The data analysis was conducted in two scenarios: 1) Analysis of scores from the post-test of teacher's learning outcomes after the experiment compared to the 90/90 standard. In this context, "90" in 90/90 signifies the percentage of the average scores of teachers in the entire group obtained from the knowledge test, and "90" in the second part represents the percentage of teachers who were able to pass the test according to all objectives (Yamkasikorn, 2008). 2) Analysis and comparison of pre-test and post-test results using a dependent t-test statistic.

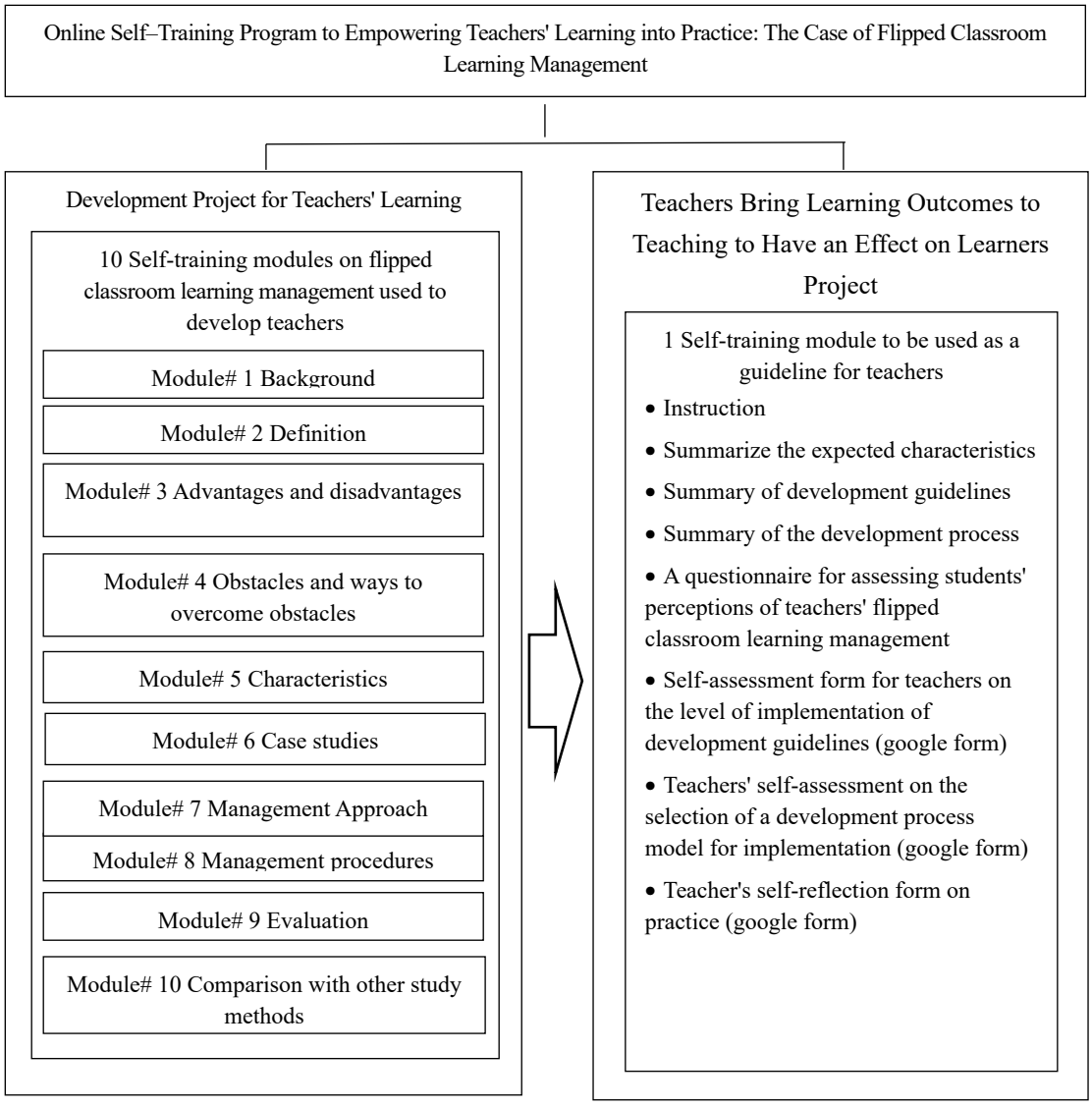


**Figure 1.** Online Self–Training Program to Empowering Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management. (See the characteristics of the program in the original Thai language from https://shorturl.at/qszP6)

## 3. Results

### *3.1 Educational Innovation Outcomes*

The results of this research have led to an educational innovation known as the "Online Self-Training Program to Empower Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management." This innovation consists of two consecutive projects. *The teacher development project*: this project utilizes self-training modules to facilitate teacher learning about flipped classroom learning management, comprising 10 modules as follows: 1) background, 2) definition, 3) advantages and disadvantages, 4) obstacles and ways to overcome obstacles, 5) characteristics, 6) case studies, 7) management approach, 8) management procedures, 9) evaluation, and 10) comparison with other study methods. *Teacher Implementation Project*: This project focuses on teachers implementing their learning into teaching to benefit students. It includes a self-training module for teachers to use as a practical guide, consisting of 1 module. It consists of the following issues: 1) instruction, 2) summarize the expected characteristics, 3) summary of development guidelines, 4) summary of the development process, 5) a questionnaire for assessing students' perceptions of teachers' flipped classroom learning management, 6) self-assessment form for teachers on the level of implementation of development guidelines (google form), 7) teachers' self-assessment on the selection of a development process model for implementation (google form), and 8) teacher's self-reflection form on practice (google form). Additional details are illustrated in the above diagram.

### *3.2 Evaluation of the Effectiveness of the Online Self-Training Program*

#### 3.2.1 Experimental Research Results in the Teacher Development Project

The results of the experimental research in the teacher development project aligned with the research hypotheses as follows: 1) Teachers in the experimental group achieved an average post-test score of 33.50, which represents 93.06 percent of the maximum score. They also demonstrated learning outcomes aligned with 100.00 percent of the specified objectives, meeting the 90/90 standard. 2) The average post-test scores were significantly higher than the pre-test scores at a statistically significant level of 0.05, as indicated by the data analysis in Table 1.

**Table 1.** Mean of Teachers' Pre-test and Post-test Scores Using Dependent t-test

| Testing | Sample size | Mean | Standard Deviation | t |
|---|---|---|---|---|
| Pre-test | 16 | 22.81 | 2.01 | 31.61* |
| Post-test | 16 | 33.50 | 2.34 | |

* $p < 0.05$

#### 3.2.2 Experimental Research Results in the Teacher Implementation Project

The results of the experimental research in the teacher implementation project align with the research hypotheses as follows. This alignment is evident from the analysis of the means and standard deviations from the assessment of student perceptions regarding Flipped Classroom Learning Management before and after the experiment, as presented in Table 2, and the comparative analysis using the dependent t-test, as shown in Table 3.

**Table 2.** Means and Standard Deviations from Student Perception Assessment Regarding Flipped Classroom Learning Management Before and After the Experiment

| The characteristics that exemplify the flipped classroom learning management by teachers | Assessment results | | | |
|---|---|---|---|---|
| | Pre-test | | Post-test | |
| | $\bar{\chi}$ | S.D. | $\bar{\chi}$ | S.D. |
| **Learning management process** | | | | |
| • My teacher organized a learning process that changed the pattern of activities from a lecture model to students learning by doing actual work. | 2.49 | 0.55 | 4.68 | 0.52 |
| • My teacher assigns homework to do outside of class or at home after school and then puts the knowledge into practice at school. | 2.53 | 0.54 | 4.59 | 0.55 |
| • My teacher prepares learning materials for students to study before class, such as multimedia content videos. | 2.63 | 0.53 | 4.62 | 0.57 |
| • My teacher encourages independent learning. | 2.49 | 0.55 | 4.66 | 0.50 |

| The characteristics that exemplify the flipped classroom learning management by teachers | Assessment results | | | |
|---|---|---|---|---|
| | Pre-test | | Post-test | |
| | $\bar{\chi}$ | S.D. | $\bar{\chi}$ | S.D. |
| • My teacher uses a variety of teaching methods. Emphasizes hands-on activities such as project-based teaching, discussions, and problem-based operations. | 2.66 | 0.52 | 4.60 | 0.52 |
| **Teacher's role** | | | | |
| • My teacher provided clear instructions for various activities that students must carry out. | 2.64 | 0.52 | 4.70 | 0.49 |
| • My teacher prepared videos or other learning materials for us to study before coming to class. | 2.75 | 0.60 | 4.52 | 0.53 |
| • My teacher assisted me in understanding the lesson content better. | 2.86 | 0.51 | 4.53 | 0.56 |
| • My teacher has shifted from lecturing to stimulating and promoting active learning among students. | 2.82 | 0.46 | 4.50 | 0.58 |
| • My teacher provided opportunities for students to actively participate in the learning process. | 2.96 | 0.50 | 4.53 | 0.58 |
| • My teacher organized activities that allowed students to exchange and discuss lesson content together. | 2.79 | 0.68 | 4.54 | 0.58 |
| **Students' roles** | | | | |
| • I watched videos or study lesson materials in advance before coming to class. | 3.43 | 0.54 | 4.58 | 0.60 |
| • I collaborated and exchanged ideas with my classmates during classroom discussions. | 2.87 | 0.63 | 4.55 | 0.55 |
| • I could ask questions, engage in discussions, seek guidance from the teacher, and interact with my peers. | 3.00 | 0.71 | 4.49 | 0.61 |
| • I consistently did self-study and researched to gain knowledge. | 2.60 | 0.52 | 4.53 | 0.58 |
| • I practiced formulating questions and finding answers to deepen my understanding of the content. | 2.71 | 0.59 | 4.56 | 0.55 |
| • I took responsibility for my learning. | 2.95 | 0.56 | 4.56 | 0.53 |
| **Teaching and learning management system** | | | | |
| • My teacher created an appropriate learning environment in the classroom. | 2.87 | 0.50 | 4.48 | 0.53 |
| • My teacher prepared equipment to facilitate the learning process. | 3.01 | 0.63 | 4.44 | 0.50 |
| • My teacher allowed students to learn through activities and hands-on practical experiences. | 2.89 | 0.47 | 4.59 | 0.52 |
| • I have increased interaction with the teacher in the learning process. | 3.30 | 0.68 | 4.51 | 0.53 |
| • I have increased interaction with my peers in the learning process. | 2.81 | 0.53 | 4.54 | 0.57 |
| **Learning resources** | | | | |
| • My teacher prepared videos or learning materials that were suitable for the lesson content. | 2.71 | 0.49 | 4.54 | 0.53 |
| • My teacher created a repository of learning materials in both online and offline formats. | 3.00 | 0.64 | 4.55 | 0.55 |
| • My teacher utilized modern learning materials and technology in teaching and learning management. | 2.63 | 0.58 | 4.62 | 0.54 |
| • Learning was diverse and catered to the individual differences among students. | 2.79 | 0.55 | 4.58 | 0.60 |
| • Learning materials were engaging and motivated students to learn. | 3.01 | 0.56 | 4.60 | 0.57 |
| **Assessment and evaluation** | | | | |
| • My teacher assessed students' knowledge before starting teaching activities. | 3.09 | 0.53 | 4.48 | 0.58 |
| • My teacher used a variety of assessment and evaluation methods that were | 2.50 | 0.53 | 4.53 | 0.58 |

| The characteristics that exemplify the flipped classroom learning management by teachers | Assessment results | | | |
|---|---|---|---|---|
| | Pre-test | | Post-test | |
| | $\bar{\chi}$ | S.D. | $\bar{\chi}$ | S.D. |
| suitable for the content and individual differences among students. | | | | |
| • My teacher assessed students' knowledge to monitor their progress. | 2.95 | 0.52 | 4.57 | 0.52 |
| • My teacher utilized assessment results to tailor individualized learning experiences for students. | 2.68 | 0.51 | 4.47 | 0.55 |
| • My teacher employed assessment tools that aligned with the objectives and content. | 2.93 | 0.51 | 4.53 | 0.55 |
| **Learning Perception** | | | | |
| • I have a better understanding of the lesson content. | 2.98 | 0.44 | 4.49 | 0.50 |
| • I am more motivated to learn. | 2.97 | 0.47 | 4.47 | 0.50 |
| • I have more time for activities to review and expand my knowledge. | 2.70 | 0.48 | 4.44 | 0.50 |
| • I can learn anytime, anywhere. | 2.63 | 0.50 | 4.54 | 0.55 |
| • Flipped classroom learning benefits my learning. | 2.65 | 0.52 | 4.49 | 0.61 |
| • Students with varying learning abilities can progress according to their potential. | 3.04 | 0.58 | 4.63 | 0.59 |
| **Total** | **2.83** | **0.21** | **4.55** | **0.33** |

According to Table 2, it is evident that the average scores from the assessment of students' perception of flipped classroom learning management by the teacher after the experiment are higher than before the experiment, that is, the average score after the experiment was 4.55 (standard deviation was 0.33). the average score before the experiment was 2.83 (standard deviation was 0.21). When analyzed and compared using the Dependent t-test, a statistically significant difference was found at the 0.05 level, as shown in Table 3.

**Table 3.** The Results of Data Analysis Comparing the Mean Scores of the Pre-test and Post-test of the Students Using a Dependent t-test

| Evaluating | Sample size | Mean | Standard Deviation | t |
|---|---|---|---|---|
| Pre-test | 640 | 2.83 | 0.21 | 110.07 |
| Post-test | 640 | 4.55 | 0.33 | |

* $p < 0.05$

## 4. Discussion and Conclusion

The results from the R&D methodology research, with the final step being a one-group pre-test and post-test experimental research in a randomly selected school area for the study, involved 16 teachers, who were the experimental group, and 640 students, who were the target group that received the outcomes of the development. The study aimed to test the effectiveness of the "Online Self-Training Program to Empower Teachers' Learning into Practice: The Case of Flipped Classroom Learning Management," which was considered the educational innovation that was expected to be obtained from this research.

It was found that this educational innovation had been effective according to the outlined research hypotheses. This was evident in both the experimental research cases: in the development project for the teachers' learning and in the case, in which the teachers applied their learning outcomes to the students' practices. It was found that the teachers in the experimental group had scored above the standard criteria (90/90) in the post-test, which had been significantly higher than their pre-test scores. Similarly, the students in the target group had shown significantly higher scores on the post-test compared to their pre-test scores. This research aligned with similar R&D methodologies used in other studies, such as "Developing Teachers to Enhance Students' Effective Teamwork Skills" by Saysin and Dhammapissamai (2023), "Empowering Teachers' Learning to Develop Innovative Skills for Students" by Hatsanmuang and Sanrattana (2023), and "Empowering Teachers' Learning to Develop Students' Inspirational Skills" by Kromthamma and Supakicco (2023), “Developing Teachers to Enhance Project Management Skills for Students” by Nukoonkan and

Dhammapissamai (2023), and “Empowering Teachers' Learning to Enhance Students' Change Leadership Skills” by Praneetpolkrung and Supakicco (2023). It demonstrated the concept of "Developing Teachers and Then Allowing Teachers to Develop Students" and with the concept of "Knowledge and Action is Power" used in the research methodology, including the online self-training program that consists of two consecutive projects. *The Teacher Development Project* which utilizes self-training modules to facilitate teacher learning about flipped classroom learning management, comprising 10 modules, and the *Teacher Implementation Project* which focuses on teachers implementing their learning into teaching to benefit students resulted in an effective educational innovation that can be disseminated and applied in other schools within the broader target groups.

In conducting the research, apart from aiming to test the effectiveness of the educational innovation created as the primary objective, the research team also sought to acquire additional knowledge from teachers in the experimental group. Specifically, they looked into knowledge that had been derived from real-world learning and reflections, which are highlighted in the following interesting points:

1. Learning about the Challenges that Teachers face when Moving Forward: Teachers were familiar with traditional teaching methods but were less acquainted with the Flipped Classroom approach due to its significant deviation from the conventional format. Additionally, teachers lacked confidence in utilizing this approach and required further development in Flipped Classroom Learning Management skills that were beyond what this research provided. This aligns with the perspective of Promethean (2018), who highlighted the following: "The layout of the traditional classrooms is an obstacle to flipped learning. Collaboration, communication, and creativity are at the heart of this method, but fostering these skills is almost impossible with pupils inactive in rows of desks all day." This also corresponds with research results from Wang (2017), who discovered the following: “Lack of confidence was also a reported barrier that would prevent teachers from using the flipped classroom in their teaching. On the one hand, many teachers, who do not consider themselves to be well-skilled in using ICTs, reported that they would feel anxious due to their fear of failure and further asserted that ‘losing face’ in front of a class of teenagers, who perhaps know more ICT knowledge than they do, could be culturally embarrassing”.

2. Learning about the Problems Concerning Students (including Teachers): Possessing differing skills and access to technology for flipped learning creates challenges in implementing this teaching method in the current context. This aligns with research conducted by Wang (2017), who noted the following: "Students’ limited ability to access the technology required for successful flipped classroom teaching was found as a potentially inhibiting factor. Some aided schoolteachers expressed that not all of their students have the necessary digital devices (e.g., a laptop or tablet) or a dependable network connection to view course content outside the classroom." This also corresponds to the perspective of Promethean (2018), whose statement was as follows: "Video conferencing technologies, screencasting tools, and cloud-based platforms that let teachers create and deliver lessons all help to create the flipped classroom. However, with poor quality, faulty, and out-of-date ICT equipment as the main reasons for teachers not using technology in the classroom, this can be a barrier to success." Additionally, this aligns with the perspective of Rice (2019), who is an experienced educator with 10 years of experience in flipping the classroom. Rice highlighted the issue of having and using technology tools for flipped learning by stating the following: "It is one that I feel passionate about because as soon as we as educators (especially public educators) rely too heavily on devices and the internet, we are excluding students, who don't have access, from having equal education opportunities as the next student, who does have access."

However, despite encountering obstacles and some challenges, the research findings that are mentioned above revealed that the outcomes or educational innovations derived from this research had been effective in the outlined research hypotheses. Both in the case of developing the teachers' learning and, in the instances, in which teachers apply their learning outcomes to their students, these innovations can be beneficially utilized for teachers and students so that in the future, the research outcomes can be disseminated in those schools within the targeted population.

## 5. Recommendations

To leverage these benefits, teachers must be aware of the problems and challenges that could arise, particularly those problems concerning their familiarity with traditional teaching methods and their lack of confidence. Additionally, students (including teachers) have different levels of technological skills and varying degrees of access to the technology that is required for flipped learning.

Moreover, teachers must be aware that Flipped Classroom Learning Management has both advantages and disadvantages. Understanding these pros and cons will enhance its effective utilization as the research team has

synthesized recommendations from the views of CPS Manufacturing Co., LLP (2020), Kenney (2019), and Rivera (2016), the following benefits were outlined: 1) Flipped Classrooms help teachers to shift from lecture-based teaching to activities that promote Active Learning by allowing more time for individual student skill development and by fostering teacher-student relationships; 2) they enable self-paced learning, adapting to individual needs, and promoting flexible learning; 3)they encourage greater student participation in class through communication, discussion, research, or self-directed activities; 4) Flipped Classrooms deepen the students' understanding of the lesson content through pre-class study and self-preparation, thereby fostering responsibility and a learning-oriented attitude; 5) they improve learning outcomes, especially for slower learners; 6) they enhance parent-learner interaction by enabling parents to engage in the students' learning development; 7) they facilitate learning for absent or sick students; 8) they boost student motivation and independent learning by providing advanced access to lessons, and can, thereby, facilitate learning at any time and at any location; 9) they strengthen the relationships between the parents and the school, allowing for the direct monitoring of the attendance, behaviors, and learning progress of the students, and 10) the lessons that are recorded can be re-used for teaching other groups or years of students.

The disadvantages were as follows: 1) learning success depends on the student's readiness, therefore, a lack of responsibility and pre-study may impact learning effectiveness; 2) socio-economically disadvantaged students might face difficulties accessing online lessons, which could potentially exacerbate educational inequalities and digital divides; 3) increased screen time may affect health, eyesight, and interpersonal interactions; 4) Flipped Classrooms require more preparation time for teachers; 5) due to time constraints, the lessons might not cover all the topics; 6) Flipped Classrooms limit the ability to give immediate feedback or assistance to those students, who do not comprehend the pre-studied content; and 7) the content of the lesson may lack quality and interest, which could impact effectiveness of student learning.

## References


Adnyani, L. D. S., & Ratnadi, N. (2020). The implementation of the flipped classroom on a classroom management course. *Journal of Physics: Conference Series*, 1516, 012035. https://doi.org/10.1088/1742-6596/1516/1/012035

Armstrong, P. (2010). *Bloom's Taxonomy*. Retrieved from https://rb.gy/l9jj5

Bouchrika, I. (2020, January 01). *A beginner's guide to the flipped classroom*. Retrieved from https://shorturl.at/qCGT2

Chaichanawirote U., & Vantum, C. (2017). Evaluation of content validity for research instrument. *Journal of Nursing and Health Sciences*, *11*(2), 105-111.

Chatzidamianos and Nerantzi. (2020). *The Use of Peer Instruction and Flipped Learning to Support Flexible Blended Learning During and After the COVID-19 Pandemic.* Retrieved August 8, 2021 from https://shorturl.at/cekmq

Corbat, J. (n.d.). *What are the 7 steps to flipping your classroom?* Retrieved from https://shorturl.at/astOU

CPS Manufacturing Co LLP. (2020, January 17). *Advantages and disadvantages of flipped Classrooms.* Retrieved from https://shorturl.at/CIJRY

Ferriman, J. (2020a, January 14). *Characteristics of a flipped classroom*. Retrieved from https://t.ly/moopK

Ferriman, J. (2020b, January 14). *4-Step flipped classroom strategy*. Retrieved from https://shorturl.at/cmPWY

Gonzalez, D. (2021, February 8). *5 Ways to create an effective flipped classroom for your students.* Retrieved from https://t.ly/KAZZ

Gündüz, A. Y., & Akkoyunlu, A. (2020). *Effectiveness of gamification in flipped learning*. Retrieved August 29, 2021 from https://journals.sagepub.com/doi/full/10.1177/2158244020979837

Hatsanmuang, N., & Sanrattana, W. (2023). Empowering Teachers' Learning to Develop Innovative Skills for Students. *World Journal of Education*, *13*(2), 56-67. https://doi.org/10.5430/wje.v13n2p56

Honeycutt, B. (n.d.). *The characteristics of successful flipped learning experiences.* Retrieved from https://t.ly/HCY97

Iowa State University of Science and Technology. (n.d.). *The flipped classroom.* Retrieved from https://t.ly/HGKC

Jaster, R. W. (2017). Student and instructor perceptions of a flipped college algebra classroom. *International Journal*

*of Teaching and Learning in Higher Education, 29*(1), 1-16. Retrieved from https://t.ly/RoDZ

Johnson, G.B. (2013). *Student perceptions of the flipped classroom*. Master's thesis, The College of Graduate Studies Educational Technology, The University of British Columbia (Okanagan).

Karanicolas, S., Snelling, C., & Winning, T. (2018, March 27). *Flipped learning in Adelaide*. Retrieved from https://t.ly/3mEm

Kenney, J. (2019, November 10). *Flipped classroom: A framework for in-class activities.* Retrieved from https://t.ly/5KoNF

Kromthamma, M., & Supakicco, P. S. (2023). Empowering teachers' learning to develop students' inspirational skills. *World Journal of Education*, *13*(2), 31-40. https://doi.org/10.5430/wje.v13n2p31

Leola. (n.d.). *Student feedback on the flipped classroom*. Retrieved from https://t.ly/VHlA

Leporati, R., & Tilton, K. (2017). *A flipped classroom is an inclusive classroom: Making the most of class time for the most learners*. 9th International Conference on Education and New Learning Technologies, 10372-10376. https://library.iated.org/view/LEPORATI2017AFL

Lesley University. (n.d.). *An introduction to flipped learning*. Retrieved from https://rb.gy/zvpoi

Miller, A. (2012, February 24). *5 Best practices for the flipped classroom.* Retrieved August 8, 2021 from https://www.edutopia.org/blog/flipped-classroom-best-practices-andrew-miller

Milman, N. B. (2014). *The flipped classroom strategy: What is it and how can it best be used*? Retrieved from https://t.ly/5bTwF

Mumper, R. (2013). *Teachers practical guide to a flipped classroom.* Retrieved from https://t.ly/B2k9

Nerantzi, C. (2020). The use of peer instruction and flipped learning to support flexible blended learning during and after the COVID-19 pandemic. *International Journal of Management and Applied Research, 7*(2), 184-195. https://doi.org/10.18646/2056.72.20-013

Noonoo, S. (2019, July 30). *How to bring 'mastery learning' to the classroom*. Retrieved August 29, 2021 from https://shorturl.at/epwW3

Nouri, J. (2016). The flipped classroom: For active, effective, and increased learning – especially for low achievers. *International Journal of Educational Technology in Higher Education, 13*(33). https://doi.org/10.1186/s41239-016-0032-z

Nukoonkan, C., & Dhammapissamai, P. (2023). Developing teachers to enhance project management skills for students. *World Journal of Education, 13*(1), 58-67. https://doi.org/10.5430/wje.v13n1p58

Office of Information Technology. (2020). *Flipped classrooms what is it?* Retrieved from https://t.ly/a6r5q

Panopto Academic Technology Faculty/Instructor. (2021, July 16). *What is a flipped classroom?* Retrieved from https://t.ly/rriR

Praneetpolkrung, K., & Supakicco, P. S. (2023). Empowering teachers' learning to enhance students' change leadership skills. *World Journal of Education, 13*(3), 1-12. https://doi.org/10.5430/wje.v13n3p1

Pratas, A. C. (n.d.). *Empower students with flipped, cooperative learning*. Retrieved August 30, 2021 from https://shorturl.at/fkm15

Promethean. (2018). *How to overcome flipped learning obstacles*. Retrieved from https://t.ly/N8t_

Raine, D., & Gretton, S. (n.d.). *The flipped classroom a teaching enhancement fund report*. Retrieved from https://t.ly/1uGBK

Rice, M. (2019, May 20). *5 Obstacles of the flipped classroom and how to overcome them*. Retrieved from https://t.ly/2EGe

Ridgley, S. (2014, *September 18). History of the inverted classroom: Founders, inspiration and other origins of flipped learning*. Retrieved from https://t.ly/Imvf

Rivera, V. M. (2016). *Flipped classrooms: Advantages and disadvantages from the perspective of a practicing art teacher.* Master's thesis, Department of Art Education, SUNY New Paltz.

Rovinelli, R. J., & Hambleton, R. K. (1977). On the use of content specialists in the assessment of criterion-referenced test item validity. *Dutch Journal of Educational Research*, *2,* 49-60.

Sams, A., Bergmann, J., Daniels, K., Bennett, B., Marshall, H. W., & Arfstrom, K. M. (2014, March 12). *Definition of flipped learning.* Retrieved from https://t.ly/SjG5h

Sanrattana, W. (2023). *Research in educational administration: Concepts, practices and case studies* (5th ed.). Thiphawisut.

Saysin, S., & Dhammapissamai, P. (2023). Developing teachers to enhance students' effective teamwork skills. *World Journal of Education*, *13*(2), 1-11. https://doi.org/10.5430/wje.v13n2p1

Song, Y. M. (2016). *Characteristics and advantages of the flipped class*. In 2nd Annual International Conference on Social Science and Contemporary Humanity Development. (pp.226-229). Atlantis Press.

State, P. (2017, January 23). *flipped teaching*. Retrieved August 31, 2021 from https://shorturl.at/rvNX6

Subramaniam, S. R., & Muniandy, B. (2016). Concept and characteristics of the flipped classroom. *International Journal of Emerging Trends in Science and Technology, 3*(10), 4668-4670. https://doi.org/10.18535/ijetst/v3i10.01.

Teach Thought. (n.d.). *The Definition of the Flipped Classroom.* Retrieved from https://t.ly/6y1H

Thakare, R. (2018, July 25). *8 Types of flipped learning classrooms and tools to build them.* Retrieved from https://t.ly/lT7RJ

The Editorial Team, Resilient Educator. (n.d.). *Tips for teachers and classroom resources.* Retrieved from https://t.ly/yStfd

The University of Texas at Austin Faculty Innovation Center. (n.d.). *How do you flip a class?* Retrieved from https://t.ly/kX1ll

Trach. (2021, October 28). *A Beginner's Guide to the Flipped Classroom*. Retrieved August 15, 2021 from https://shorturl.at/IPVXZ

Turner, R., & Carlson, L. A. (2012). Indexes of item-objective congruence for multidimensional items. *International Journal of Testing, 3*(2),163-171. https://doi.org/10.1207/S15327574IJT0302_5

UCLA: Statistical Consulting Group. (August 22, 2016). *What does Cronbach's Alpha mean?* Retrieved from https://bit.ly/3O1ySxK

Vick, M. (n.d.). *How to build a better-flipped classroom*. Retrieved August 29, 2021, from https://rb.gy/rv4wm

ViewSonic Education. (2022, October 3). *8 Benefits of a flipped classroom.* Retrieved from https://rb.gy/5zku4

Waddell, R. (2017, July 11). *Flip your classroom in 6 simple steps*. Retrieved from https://t.ly/h3u7w

Wang, T. (2017). *Overcoming barriers to 'flip': Building teacher's capacity for the adoption of flipped classroom in Hong Kong secondary schools*. Research and Practice, Department of Technology Enhanced Learning, Faculty of Education, The Chinese University of Hong Kong.

Wikipedia, the Free Encyclopedia (2021, June 28). *Flipped classroom*. Retrieved from https://t.ly/-vTF

Yamkasikorn, M. (2008). How to use efficiency criterion in media research and development: The difference between 90/90 standard and E1/E2. *Education Journal Burapha University, 19*(1), 1-16.

**Acknowledgments**

We would like to thank the teachers who participated in the group discussion to review the accuracy and usefulness of the learning modules used in the online self-training program and the teachers and students who were the experimental group to try out the program. We would also like to thank the measurement and evaluation experts who examined the tools used in the research and the teachers and students to try out the tools.

**Authors contributions**

Supansa Thammasarot was responsible for conducting every step of the research. Starting with studying research problems, designing research methods, creating innovations for use in research, conducting field research, summarizing results and reporting research results. Associate Professor Dr. Wirot Sanrattana and Assistant Professor Dr. Phrasrivajiravati provided advice and consultation. in the research process. Watthikorn Phochaito drafted the manuscript and revised it. Associate Professor Dr. Wirot Sanrattana and Assistant Professor Dr. Phrasrivajiravati

approved the final manuscript.

**Funding**

Not applicable.

**Competing interests**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

**Informed consent**

Obtained.

**Ethics approval**

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

**Provenance and peer review**

Not commissioned; externally double-blind peer reviewed.

**Data availability statement**

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

**Data sharing statement**

No additional data are available.

**Open access**

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

**Copyrights**

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.