

FLIPPED CLASSROOM ACTIVITIES DEVELOPMENT VIA ONLINE MEDIA TO THE INFLUENCE OF SELF-DIRECTED FOR GRADE 12 IN TECHNOLOGY SUBJECT AT GUIYANG CITY SECOND EXPERIMENTAL HIGH SCHOOL, CHINA

Jiashu FU¹ and Chalong THAPSRI¹

¹ Faculty of Education, Pathumthani University Thanyaburi, Thailand;
sjjashu.f@ptu.ac.th (J. F.); chalong.t@ptu.ac.th (C. T.)

ARTICLE HISTORY

Received: 30 June 2025

Revised: 7 July 2025

Published: 19 July 2025

ABSTRACT

The purposes of this research were 1) to develop flipped classroom teaching activities via online media that affect self-directed learning, 2) to study learning achievement of Grade 12 with flipped classroom activities via how online media affects self-directed learning, 3) To compare the pretest and posttest self-directed learning ability of Grade 12 learning with flipped classroom activities via online media affects self-directed learning and, 4) to study Grade 12' opinions on learning with flipped classroom activities via online media affect self-directed learning. The population consisted of 120 Grade 12 in the first semester of the academic year, 2024. The samples were 92 students determined by Krejcie & Morgan table. The instruments in this research were 1) online media for use in flipped classroom activities, 2) self-directed learning ability test, 3) the achievement test and 4) a questionnaire form on student's opinions. The data analysis used mean, standard deviation, and t-test. The results of research were as follows 1) The result of the development of flipped classroom teaching activities via online media that affect self-directed learning, it was a very good level. 2) The results of learning achievement of flipped classroom teaching activities via online media that affect self-directed learning, it was very good level. 3) The self-directed learning ability of flipped classroom teaching activities via online media of Grade 12 was higher than pretest at .05 level of significance. 4) The results of student's opinions towards flipped classroom activities via online media affect self-directed learning was very good level.

Keywords: Flipped Classroom Activities, Online Media, Self-Directed, Grade 12

CITATION INFORMATION: Fu, J., & Thapsri, C. (2025). Flipped Classroom Activities Development Via Online Media to the Influence of Self-Directed for Grade 12 in Technology Subject at Guiyang City Second Experimental High School, China. *Procedia of Multidisciplinary Research*, 3(7), 130.

INTRODUCTION

Global In the 21st century, education systems around the world are undergoing significant transformation due to technological advancements and the growing demand for learner-centered instruction. The traditional teacher-centered model, which primarily involves passive learning through lectures, is gradually giving way to innovative pedagogical approaches that promote active participation, collaboration, and independent learning. One such approach is the flipped classroom model, which has gained popularity as an effective instructional strategy that supports both academic achievement and the development of self-directed learning skills. The flipped classroom is a teaching methodology that inverts the conventional teaching structure by moving the delivery of content outside the classroom and using in-class time for deeper engagement through activities such as discussion, collaboration, and problem-solving. In this model, students typically access lectures and course materials through online platforms before attending class, allowing them to absorb foundational knowledge at their own pace. Class time is then utilized for interactive learning activities that enhance comprehension and critical thinking. This approach not only supports differentiated instruction but also fosters learners' autonomy, responsibility, and lifelong learning competencies.

Self-directed learning (SDL) is a crucial skill for learners in the digital age, where access to information is abundant but the ability to synthesize and apply that information effectively is essential. Self-directed learners take initiative in their learning process, set goals, manage time efficiently, seek resources independently, and assess their own progress. Research has shown that flipped classroom models are well aligned with the development of SDL skills, particularly when integrated with online media, which provides flexible and personalized learning experiences.

In the context of technology education, the need for student-centered, inquiry-based instruction is even more critical. Technology subjects require not only theoretical understanding but also practical application, innovation, and problem-solving abilities. Integrating the flipped classroom model with online media tools in teaching technology can provide students with engaging, real-world learning experiences while fostering independent learning behaviors.

Despite the potential benefits, limited research has been conducted in Chinese secondary schools on the integration of flipped classrooms and online media specifically aimed at promoting self-directed learning in technology subjects. This study seeks to address this gap by developing and implementing flipped classroom teaching activities through online media to examine their influence on the self-directed learning abilities and academic achievement of Grade 12 students at Guiyang City Second Experimental High School in China.

Research Rationale The growing necessity for digital literacy, independent thinking, and adaptable learning skills highlights the importance of innovative educational methods. The flipped classroom model, supported by well-designed online media, has been identified as a promising strategy to meet these educational demands. Therefore, understanding how such a model can be effectively implemented in high school technology classes, and evaluating its impact on self-directed learning, can contribute significantly to curriculum development, teaching practices, and educational policy.

This research aims to develop flipped-classroom teaching activities delivered through online media to enhance self-directed learning among Grade 12 students. It further investigates the learning achievement of students who engage in such activities, compares their self-directed learning abilities before and after participating in the flipped-classroom model, and explores their opinions toward the learning experience provided through this approach.

LITERATURE REVIEWS

Concept and Theoretical Foundations of the Flipped Classroom

A relationship-oriented culture is critical, particularly in China's impact nations, including the flipped classroom represents a paradigm shift in instructional design, relocating the initial exposure to content from the classroom to an online, asynchronous environment and transforming face-to-face sessions into venues for higher-order learning activities (Bergmann & Sams, 2012). By inverting this sequence, the model affords learners the opportunity to engage with core materials—video lectures, readings, or interactive tutorials—at a self-selected pace, thereby facilitating differentiated instruction and repeated review of challenging concepts. Bishop and Verleger (2013) contend that the efficacy of the model hinges on the synergistic integration of (a) individual online study, which cultivates foundational understanding, and (b) collaborative, activity-based learning during class, which promotes analysis, evaluation, and creation on Bloom's revised taxonomy. Grounded in constructivist epistemology, the flipped classroom fosters active knowledge construction, metacognition, and learner autonomy while simultaneously providing instructors with richer opportunities for formative feedback and targeted scaffolding.

Self-Directed Learning: Models and Metrics

Self-directed learning (SDL) is defined as a process in which learners assume primary responsibility for diagnosing their learning needs, formulating goals, identifying and mobilizing resources, selecting and implementing strategies, and evaluating outcomes (Knowles, 1975). Tough (1971) posits that SDL nurtures intrinsic motivation and personal agency, while Guglielmino (1977) operationalizes SDL readiness through the Self-Directed Learning Readiness Scale (SDLRS), which evaluates dispositions such as initiative, self-discipline, and inquisitiveness. Extending these conceptualizations, Grow (1991) proposes the Staged Self-Directed Learning (SSDL) model, delineating a developmental trajectory across four learner profiles—Dependent, Interested, Involved, and Self-Directed. This staged model offers pedagogical guidance on calibrating instructional support to the learner's evolving autonomy, thereby informing the design of scaffolded flipped-classroom interventions.

Technology Education within the Thai Curriculum Context

The Thai Basic Education Core Curriculum B.E. 2551 (2008) positions the Technology learning strand as a pivotal mechanism for cultivating twenty-first-century competencies among school-aged learners. Within this strand, three interlocking domains are prescribed. The first domain, Information and Communication Technology (ICT), addresses the technical and cognitive skills required for learners to locate, evaluate, create, and communicate information via digital platforms. Beyond basic computer literacy, the curriculum emphasises data ethics, cyber-security awareness, and responsible digital citizenship—all indispensable in an era of ubiquitous connectivity. The second domain, Design and Technology, invites learners to engage in iterative design thinking, prototyping, and systems analysis. Here the curriculum intentionally links abstract scientific or mathematical concepts to tangible artefacts—bridging “knowing” and “making”—and thereby nurtures creativity, resilience, and an engineering mindset. The third domain, Life and Career Skills, foregrounds transferable competences such as collaboration, project management, entrepreneurial initiative, and adaptability. These skills are framed not merely as ancillary attributes but as integral outcomes that enable learners to navigate an innovation-driven economy and an increasingly complex social landscape.

Collectively, the three domains articulate learning outcomes centred on digital literacy, creative problem-solving, and ethical technology use. They obligate schools to enact pedagogies that are learner-centred, inquiry-oriented, and authentically contextualised. Traditional lecture-based delivery, which positions students as passive recipients, is therefore insufficient to meet the curriculum's intent. Instead, instructional models must afford students sustained

opportunities to investigate open-ended problems, design solutions, and reflect upon both process and product.

Within this policy context, the flipped-classroom approach—amplified by rich online media—offers a particularly cogent pedagogical response. By relocating expository content (e.g., conceptual explanations, software tutorials, safety guidelines) to an asynchronous online environment, classroom time can be reallocated to experiential learning episodes such as hands-on fabrication, coding sprints, design-studio critiques, and peer-review cycles. These activities directly mirror professional practice in contemporary technology fields and align with constructivist principles that situate knowledge in meaningful, social contexts. Moreover, the asynchronous component enables learners to revisit complex material at their own pace, thereby accommodating diverse prior knowledge and learning styles. Simultaneously, the synchronous, in-class component provides a structured venue for formative feedback, collaborative troubleshooting, and real-time coaching—all of which have been shown to deepen conceptual understanding and promote self-directed learning behaviors. In this way, the flipped-classroom model not only “maps neatly” onto the Thai curriculum’s stated imperatives but also operationalizes them through a balanced integration of individual digital engagement and collective, practice-based inquiry.

Conceptual Framework Guiding the Present Study

Acceptance Drawing upon the foregoing theories and empirical insights, the study advances an integrative conceptual framework positing that flipped-classroom activities delivered via online media (independent variable) exert a direct influence on three primary outcomes:

Academic achievement in the Grade 12 Technology course;

Self-directed learning ability, operationalized through validated SDL metrics; and

Student perceptions of the learning experience, capturing affective and behavioural engagement.

The framework predicts that the self-paced, media-rich preparatory phase will activate SDL processes (e.g., goal definition, resource management), while the collaborative in-class phase will consolidate knowledge through authentic application and peer interaction, thus yielding measurable gains in both performance and autonomy.

From the literature review, the conceptual framework can be drawn as shown in Figure 1.

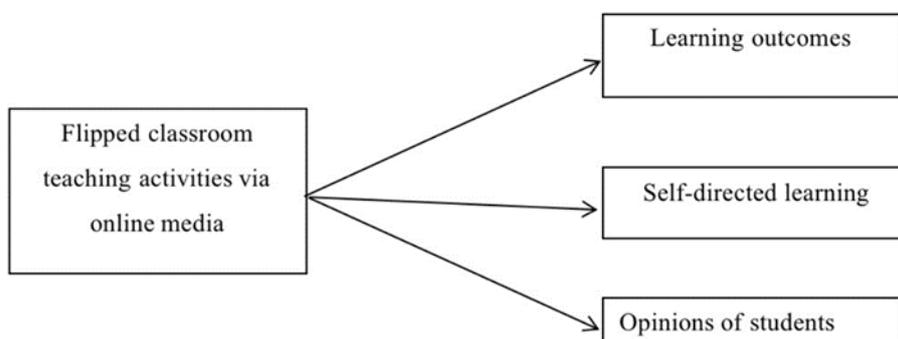


Figure 1 Conceptual Framework

RESEARCH METHODOLOGY

In response to examining the effect of methods and procedures used in conducting the study, including research design, population and sample, research instruments, data collection, and data analysis. The purpose is to investigate how flipped classroom activities via online media influence the self-directed learning of Grade 12 students in the subject of Technology.

This study employed a quasi-experimental research design using the One-Group Pretest-Posttest Design. The research process involved:

Assessing students' self-directed learning ability before the intervention (Pretest)

Implementing flipped classroom activities via online media

Assessing students' learning outcomes and self-directed learning ability after the intervention (Posttest)

Population and Sample

The target population consisted of 393 Grade 12 students enrolled in the Technology subject at Guiyang City Second Experimental High School, China.

A sample of 92 students was selected through simple random sampling using classrooms as sampling units in the first semester of the 2024 academic year.

Research Instrument

This study utilized the following tools:

Structured Interview Form:

For consulting with content experts and instructional designers.

Teaching Plans:

Developed based on the Flipped Classroom and Self-Directed Learning models.

Online Learning Media:

A dedicated website and media content accessible on various devices.

Self-Directed Learning Ability Test:

Measuring 8 dimensions based on Guglielmine's SDL framework.

Academic Achievement Test:

Comprising 30 items (post-test) measuring content knowledge after intervention.

Student Opinion Questionnaire:

5-point Likert scale evaluating students' satisfaction and perceptions.

RESEARCH RESULTS

This chapter presents the results of the study "Flipped Classroom Activities Development via Online Media to the Influence of Self-Directed Learning for Grade 12 in Technology Subject at Guiyang City Second Experimental High School, China". The data analysis is presented in three main parts:

Part 1: Academic Achievement Results

The academic performance of 92 Grade 12 students was measured through post-tests, performance tasks, and behavior assessments. The results showed that:

The average post-test score was 45.00 out of 50 (90%).

The average performance score was 25.5 out of 30 (85%).

The average behavior score was 18.86 out of 20 (94.3%).

The overall average percentage was 89.19%, interpreted as "Very Good."

This demonstrates that students taught via flipped classroom activities using online media had high academic achievement.

Part 2: Comparison of Self-Directed Learning Ability (Pre- and Post-Test)

Students' self-directed learning abilities were measured before and after the intervention, across 8 dimensions.

Aspect	Pre-Test Mean	Post-Test Mean	Interpretation
1) Opportunity for Learning	2.95	3.73	Improved to High
2) Self-Concept as Effective Learner	3.40	4.34	Improved to High
3) Initiative and Independence	3.25	3.93	Improved to High
4) Responsibility	3.39	4.37	Improved to High
5) Love of Learning	3.42	4.10	Improved to High
6) Creativity	3.40	4.21	Improved to High
7) Optimism toward the Future	3.32	4.33	Improved to High
8) Problem-Solving Ability	3.45	4.17	Improved to High

Overall Pre-Test Mean = 3.30 (Moderate)

Overall Post-Test Mean = 4.20 (High)

t-test value = 7.86, $p < 0.05$, indicating a statistically significant improvement in self-directed learning ability.

Part 3: Students' Opinions on Flipped Classroom Learning

A questionnaire measured students' perceptions across 3 dimensions:

Dimension	Mean Score	S.D.	Interpretation
1) Content of Technology	4.62	0.46	Very Good
2) Teaching Activities	4.45	0.66	Very Good
3) Online Media Support	4.50	0.64	Very Good
Overall	4.50	0.60	Very Good

These results suggest students were **highly satisfied** with the flipped classroom model, especially with content relevance, technology access, and the engaging format of online learning.

DISCUSSION & CONCLUSION

This study investigated the effects of flipped classroom teaching activities via online media on self-directed learning and academic performance of Grade 12 students in a Technology subject at Guiyang City Second Experimental High School, China. The results are discussed in three key areas:

1) Effectiveness of Flipped Classroom Activities on Academic Achievement

The study revealed that students taught through flipped classroom activities achieved a high level of academic performance, with an overall average score of 89.19%, categorized as "Very Good."

This finding aligns with the research of Gilboy, Heinerichs, & Pazzaglia (2015) and Eichler and Peeples (2016), who noted that flipped classroom strategies enhance active learning, engagement, and achievement in science-related subjects. It supports the idea that learning outside the classroom—especially when reinforced by in-class active tasks—enhances knowledge retention and comprehension.

Possible reasons for high achievement include:

Flexibility of learning at students' own pace.

Interactive content and media that captured attention.

Opportunities for review, repetition, and self-reflection before class discussions.

2) Improvement in Self-Directed Learning Ability

The comparison between pre-test and post-test scores indicated a statistically significant improvement in students' self-directed learning ability (from a mean of 3.30 to 4.20, $p < 0.05$). All 8 dimensions of self-directed learning, including initiative, responsibility, creativity, and problem-solving, showed improvement.

This aligns with the theories of Knowles (1975) and Grow (1991), who emphasized the importance of learner autonomy, responsibility, and readiness in adult and higher-level

learning. The structured stages of Grow's Self-Directed Learning Model (SSDL) were reflected in the flipped classroom strategy, guiding learners from dependent to independent stages.

The improvement may be attributed to:

Learners' exposure to independent online study materials before class.

Emphasis on learner responsibility and self-reflection.

Motivation through engaging digital tools and peer interaction.

3) Positive Student Perception toward Flipped Learning

Students reported very high satisfaction (Mean = 4.50, SD = 0.60) with the flipped classroom model, particularly with:

The relevance and clarity of content.

The structure and accessibility of online materials.

The support provided by interactive learning tools and peer communication.

This is consistent with Rachel Christine (2016) and Roslina Othman (2016), who highlighted that flipped learning not only increases content comprehension but also supports learner satisfaction, autonomy, and collaboration, especially in online settings.

Key contributing factors include:

A well-designed web interface that supports self-learning.

Use of digital media (videos, chatrooms, discussion boards).

Teacher support as a facilitator rather than a lecturer.

Integration of Instructional Design

The instructional design of the flipped classroom in this study followed the Flipped Mastery Approach and used web-based learning principles. The integration of: Clear learning objectives, Interactive content, Teacher guidance, and reflective activities created a comprehensive and motivating learning environment.

The implementation of online tools and media aligns with Burnett & Marshall (2003) and Khan (2011), who emphasize the importance of multimedia, interactivity, and learner-centered design in digital pedagogy.

Conclusion of the Discussion

The flipped classroom approach via online media significantly enhanced students' academic performance, self-directed learning, and learning satisfaction. It also confirmed the applicability of flipped learning in the context of Chinese senior high school education, specifically in Technology and technology subjects.

The findings validate previous international research and provide strong evidence that flipped learning—when effectively designed and implemented—can lead to sustainable, learner-driven outcomes in digital education environments.

REFERENCES

- Ahlquist, S. (2019). Motivating teens to speak English through group work in Storyline. *ELT Journal*, 73(4), 387-395.
- Emma, B. (1997). *Once upon a time... A collaborative study of the storybook experience of three deaf preschoolers*. Doctoral dissertation, Dissertation Abstracts International, 58(5), 1640-A.
- Hu, J., Liu, J., & Zhang, Y. (2019). The obstacle and breakthrough of cultivating students' creativity in China's colleges and universities. *Education and Psychology Research*, 9(1), 16-22.
- Ingersoll, R., & Strong, M. (2011). The impact of induction and mentoring programs for beginning teachers: A critical review of the research. *Review of Educational Research*, 81(2), 201-233.

- Johnson, S., Kraft, M., & Papay, J. (2012). How context matters in high-need schools: The effects of teachers' working conditions on their professional satisfaction and their students' achievement. *Teachers College Record*, 114(10), 1-39.
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.
- Kuh, G. (2003). What we're learning about student engagement from NSSE. *Change: The Magazine of Higher Learning*, 35(2), 24-32.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 140, 1-55.
- Muramatsu, C. (2018). A case study of the flipped classroom in a Japanese EFL context. *Asian EFL Journal*, 20(2), 136-156.
- Nechkina, M. (1984). Increasing the effectiveness of a lesson. *Communist*, 2(51), 157-168.
- Romanowski, M. H. (2006). A changing nation: Issue facing Chinese teachers. *Kappa Delta Pi Record*, 42(4), 178-183.
- Rovinelli, R. J., & Hambleton, R. K. (1976, April). *On the use of content specialists in the assessment of criterion-referenced test item validity. Paper presented at the Annual Meeting of the American Educational Research Association, San Francisco, CA.* Retrieved from <https://files.eric.ed.gov/fulltext/ED121845.pdf>.
- Sipe, L. R. (1993). Using transformations of traditional stories: Making the reading-writing connection. *The Reading Teacher*, 47(1), 18-26.
- Smith, E., & Vallerga, C. (1997). *The Scottish Storyline Method at Buckingham Elementary School, Bend, Oregon.* Retrieved from <http://www.bestpraceduc.org/DiscoveryGrants1997/Storyline.html>.
- Tanner, K., & Allen, D. (2007). Cultural competence in the college biology classroom. *CBE—Life Sciences Education*, 6, 251-258.
- Wang, Q., Chen, L., & Liang, Y. (2020). The impact of technology infrastructure on student engagement: Evidence from a large public university. *Computers & Education*, 31(2), 152.
- Wilhelm Hughes, K., & Tom, H. W. (1999). Oh, the tales you'll tell. *English Teaching Forum*, 37(2), 27-28.
- Yuan, J. Q., Lin, C. L., Zhao, Q., Yu, S. W., & Su, Y. S. (2021, March 11). A study on traditional teaching method transferring to e-learning under the Covid-19 pandemic: From Chinese students' perspective. *Frontiers in Psychology*, 12, 1-14.
- Zhang, Q. (2020). Narrative inquiry into online teaching of Chinese characters during the pandemic. *International Journal of Chinese Language Teaching*, 1(1), 20-34.
- Zheng, B., Zhang, X., Liu, Y., & Wu, L. (2018). Reforms of college English teaching and learning in China: A literature review. *English Language Teaching*, 11(8), 74-84.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Conflicts of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.



Copyright: © 2025 by the authors. This is a fully open-access article distributed under the terms of the Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).