Project-Based Learning based on Flipped Classroom to Enhance Self-Regulated Learning and Critical Thinking of Students at NTTU

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Abstract

This research aimed to investigate students' perceptions of self-regulated learning and critical thinking in project-based learning based on flipped classrooms in general English classes. This survey research comprised 98 non-English-major students from Nguyen Tat Thanh University who participated in project-based learning based on flipped classrooms in general English classes – Level 2 to complete the 5-point Likert Scale survey. Ten of them were randomly selected to attend semi-structured interviews to provide further explanations of their experiences and recommendations on flipped classrooms. The findings revealed that the participants had highly positive attitudes towards this type of classroom in terms of self-regulated learning and critical thinking and shared some techniques to be involved in, along with some concerns when attending flipped classrooms. Hence, this research suggests solutions to improve students' interactions and provide ideas for English instructors teaching project-based learning in EFL.

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Từ khóa

project-based learning, flipped classroom, self-regulated learning, critical thinking, EFL

1 Introduction

1.1. Rational to the Study

Non-English majors at Nguyen Tat Thanh University (NTTU) have implemented project-based learning based on a blended classroom for the past two years. The academic performance metrics illustrated acceptable results; however, the students demonstrated weak self-regulated learning and critical thinking abilities. This study aims to bridge these gaps through the implementation of flipped learning principles within project-based learning. This research investigates students' perceptions of self-regulated learning and critical thinking abilities in project-based learning based on flipped classrooms, with the aim of providing practical educational improvements for NTTU.

1.2. Definitions of Key Terms

1.2.1. Project-based Learning

Project-based learning delivers content that directly relates to students' cultural and social environments [1]. It aligns with experiential learning theory that learning is most optimal when being involved a cycle of concrete experience, reflective observation, abstract conceptualization, and active experimentation [2]. The PBL structure demands that teachers and students follow research and interaction phases before product development and presentation, followed by feedback.

1.2.2 Flipped Classroom

The model functions as an educational framework in which teachers act as facilitators and moderators to support student learning while moving away from conventional

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teacher-led instruction [3]. Students are requested to interact with instructional materials before class to actively participate in classroom activities [4]. Flipped learning includes two main phases: pre-class exposure to presentation slides and instructional videos and assigned reading materials outside the classroom with detailed instruction and in-class activities, including sharing, discussion, collaboration, and evaluation [5]. This type of classroom is rooted in constructivist theory from which learner fitting new information together [6].

1.2.3. Self-regulated Learning (SRL)

The learning process follows Three-Phase Model of self-regulated learning based on Zimmerman's model as applied by Cheikh et al. [7], which includes three stages: (1) forethought, which enables learners to establish learning goals and form motivational beliefs; (2) performance, which requires learners to use cognitive and metacognitive strategies; and (3) self-reflection, which enables learners to assess their progress while interpreting feedback to modify their strategies for better future results.

1.2.4. Critical Thinking

Critical thinking is conceptualized as a cognitive process in which learners engage in reasoning to form judgments and make informed decisions [8]. To assess critical thinking, the Engagement, Maturity, and Innovativeness (EMI) scale is able to evaluate critical thinking abilities in three relatively named aspects [9]. The engagement dimension provides information about students' dedication and commitment. Maturity describes the capacity to solve problems through logical and objective thinking. Innovativeness indicates creative approaches to handle complex challenges.

2 Methodology

2.1. Research Site

General English classes from Level 1 to Level 6, provided by NTTU's Foreign Language Center, are mandatory for all non-English major students. The 3-credit level structure includes 90 periods of instruction. Of these, 20 online periods were allocated to project-based learning such as making posters, recording videos, and delivering presentations.

2.2. Sampling Techniques and Participants

This study employs convenience sampling owing to its ease of data collection, cost-effectiveness, and time efficiency [10]. More importantly, it was the only feasible option, as only a limited number of classes were selected to implement flipped learning as an alternative approach. The research participants included 98 A2 students who were non-English majors in General English Level 2 class.

2.3 Flipped Classroom and Project-based Learning Model

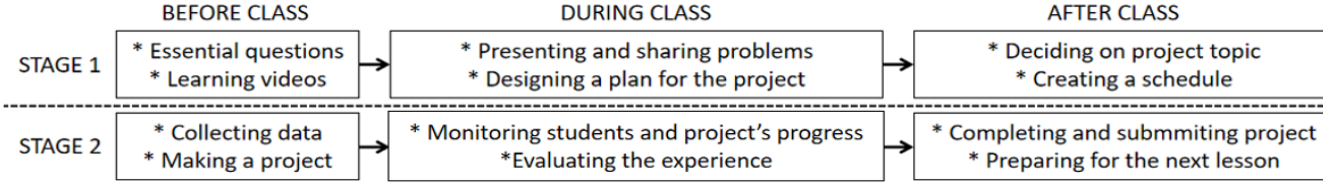

Figure 1 The Flipped Classroom and Project Based Learning Model

The research adopted an instructional model that successfully integrated the flipped classroom and project-based learning through a two-stage approach [11]. Each stage comprised three phases: (1) before class, during which students engage in self-directed learning at home; (2) during class, which emphasizes collaboration and discussion; and (3) after class, which focuses on students' reflection and revision. The two stages resonated with the modified F-L-I-P structure which demanded flipped instruction, formative benefits for students, student accountability and a private EFL platform [12].

2.4. Data Collection Procedure

This study employed a mixed-methods approach that combined both quantitative and qualitative data collection through an explanatory sequential design. The collected data were analyzed to investigate participants' perceptions of flipped learning. The questionnaire was delivered to 98 students at the end of the course via Google Forms. From this group, ten students were randomly selected for individual semi-structured interviews to gather qualitative insights to provide further explanation, examples and

recommendations. The survey on self-regulated learning was adapted and condensed, and was originally designed to contain 44 questions to measure students' perceptions[10]. This study intentionally selected 21 questions from the original, which focused on three aspects of self-regulated learning: (1) motivational beliefs - forethought, (2) learning strategies - performance, and (3) self-reflection [13]. For critical thinking assessment, this study adopted the EMI framework [13].

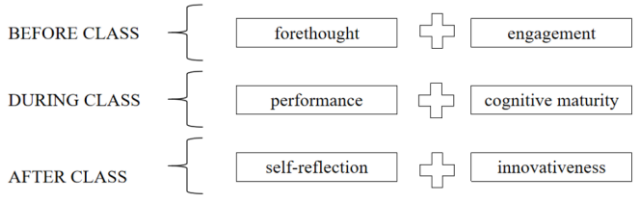

Figure 2 The Effect of Flipped Learning and Project-based Model on Self-regulated Learning and Critical Thinking

2.5. Data Analysis Procedure

The questionnaire analysis used a 5-point Likert scale ranged from "strongly disagree" at 1 to "strongly agree" at 5. The researcher applied Cronbach's alpha to determine the questionnaire's reliability and found that none of the questions were omitted. For the semi-structured interview, participants' responses were analyzed using a thematic coding framework including four steps: coding, categorization, theme identification, and interpretation. In the first step, meaningful quotations were extracted from interview transcripts [10]. In the second step, these quotations were segmented into distinct pieces of information and the relevant properties were assigned. The third step involved coding these properties into multiple categories, which were then refined into smaller sets of themes. Coding tabulation was employed to systematize the data-codification process. Finally, in the fourth step, data interpretation was conducted by identifying and illustrating recurring themes mentioned by at least 25% of the interviewees in accordance with the qualitative research guidelines.

3 Results

The results below include 11 tables according to the 11 categories in the survey delivered to students. The first eight categories fully demonstrated three phrases of self-regulated learning as (1) forethought included self-efficiency, intrinsic motivation, negative achievement, (2) performance consisted of planning and managing time, social support, study environment, study environment, effort regulation, (3) self - reflection included metacognition. The others indicated critical thinking.

Self-efficiency

Table 1 Descriptive Statistics of Students' Self-efficiency

Statement	I am confident in my ability to successfully persist in this class, even if I find the content difficult	I am confident I can put in the effort required to get a high grade in this class	I am confident that I can accurately work out what the task is requiring me to do
Mean	4.03	3.95	4.10
Std. Deviation	0.88	0.93	0.95

From the data collected, most of the students were confident in understanding and fulfilling the given tasks properly, even though they might have faced some difficulties. However, a minority were not confident in achieving high scores. The mean number of answers collected was around four, which means they were confident, comprehensible, and able to overcome challenges. The Standard Deviation was below 1, which means that the calculated data did not vary significantly. As shared in the interviews, students shared that when they were first exposed to materials, some of them did not fully understand what to do. However, thanks to the discussion and sharing part, as well as the evaluation given by teachers, they were becoming increasingly confident in their group work.

- Intrinsic Motivation

Table 2 Descriptive Statistics of Students' Intrinsic Motivation

Statement	I find studying for this class enjoyable	I find it very satisfying when I learn new material in this course	I get a sense of achievement when I learn new skills or information
Mean	4.46	4.28	4.14
Std. Deviation	0.83	0.95	1.02

Most of the students did not agree that they were suffering from negative feelings, such as hopelessness and anxiety, during the course. The standard deviation of around 1.5, and the mean score of around, showed that the students' answers varied from disagree to either agree or disagree. Although they did not feel helpless or anxious, they still wanted to distract themselves to lower their stress level. As a result, it seems that the students did not hold many negative emotions in class, but the class was still challenging to some extent, due to a huge workload for both teachers and students. They shared that some were grouped with friends who they had never worked with before, so it was initially challenging for them to get to know each other. However, they could gradually build mutual understanding. Interviewee 3 answered that whenever a misunderstanding arose, they would set up a video call to discuss and try their best to reach mutual agreement.

- Negative Achievement Emotion

Table 3 Descriptive Statistics of Students' Negative Achievement Emotion

Statement	I feel so helpless that I cannot dedicate all my effort to my studies	While studying, I want to distract myself to lower my anxiety level	I get so anxious that I don't even want to start studying
Mean	2.63	3.99	2.40
Std. Deviation	1.54	1.17	1.66

Most of the students did not agree that they were suffering from negative feelings, such as hopelessness and anxiety, during the course. The standard deviation of around 1.5, and the mean score of around, showed that the students' answers varied from disagree to either agree or disagree. Although they did not feel helpless or anxious, they still wanted to distract themselves to lower their stress level. As a result, it seems that the students did not hold many negative emotions in class, but the class was still challenging to some extent, which could be a result of a huge workload for both teachers and students. They shared that some were grouped with friends they had never worked with before, so it was initially challenging for them to get to know each other. However, they could gradually build mutual understanding. Interviewee 3 answered that whenever a misunderstanding arose, they would set up a video call to discuss and try their best to reach mutual agreement.

- Planning and Managing Time

Table 4 Descriptive Statistics of Students' Planning and Managing Time

Statement	I set short-term goals	I break larger goals smaller	I make detailed actions list
Mean	3.78	3.87	3.99
Std. Deviation	1.23	1.17	1.11

This category illustrates whether students know how to manage their time and plan their schedules. The majority almost agree that they have a clear timetable and make a to-do list to make them more achievable. However, the standard deviation is relatively above 1, which shows that the students' answers range from either agree or disagree to agree. Therefore, about half of the students agreed that they had a clear and detailed schedule for pursuing their learning goals. They explained that because the project was group work, they had to set a clear schedule and distribute tasks to every member of the group. They also noted the lecturers' feedback to easily learn what to revise in their work.

- Metacognition

Table 5 Descriptive Statistics of Students' Metacognition

Statement	I think about strategies	I spend time interpreting	I look over past feedback
Mean	3.95	3.93	3.93
Std. Deviation	1.07	0.98	1.08

This category highlights whether students were aware of what method they were using or if they were trying to combine different methods to achieve the best result. The mean score of 3.9 shows most of them had metacognition when it came to controlling their study. A standard deviation of 1 indicated that the answers were from either agree or disagree to agree. Not all students strongly agreed that they consciously used learning methods that were suitable for them. It cannot be interpreted that they learned without any methods, but that they were not aware of using them. After finishing the group project, students agreed that there were plenty of things they had learned and needed to revise in the long run, including their pronunciation, public speaking skills, vocabulary, and collaboration skills. They acknowledged their drawbacks and were aware that they needed to take action, yet they did not have any clear goals or resolution.

- Study Environment

Table 6 Descriptive Statistics of Students' Study Environment

Statement	I am able to study without distraction	I have access to a distraction-free place
Mean	3.99	4.30
Std. Deviation	1.09	1.02

The survey answers showed that most students had access to quiet and qualified places to study. For group discussion, they arranged a meeting on Discord, as interviewee 5 shared, to have a strong and stable connection to discuss ideas; however, they still admitted that they found themselves distracted during the study period. This resulted from their phone habits and the fact that their attention span was relatively short and they could not focus on a single subject for a long period of time.

- Effort Regulation

Table 7 Descriptive Statistics of Students' Effort Regulation

Statement	I work hard in my study despite interest	I make a special effort to keep focused
Mean	3.95	3.74
Std. Deviation	1.09	1.25

This category shows whether students made an extra effort to study, and the results collected show that they agree that they focus on studying even when they have more interesting things to do. However, it is not sufficient for them to make a special effort to concentrate. The collected results seem to be positive in that at least students concentrate on what they need to do, but it is also clear that they could put in more effort.

- Social Support

Table 8 Descriptive Statistics of Students' Social Support

Statement	I try to help other students when they ask a question	I ask for help from knowledgeable others when I am not sure what to do
Mean	3.86	4.16
Std. Deviation	1.17	0.93

Students agreed that they searched for help from peers or teachers if there were difficulties or confusion; however, the number of students who were active in helping their friends was lower, accounting for more than half of the students in the class. Therefore, it is concluded that students had a supportive environment to seek help when necessary, but they were not willing to offer to help those who were in need. In the

interviews, many participants agreed that the support provided by lecturers played a vital role in their group work. Thanks to the lecturer's clear explanation of a to-do list and constructive feedback, they became increasingly confident about doing projects. However, none of them showed activity in helping others. They only assisted their friends if they were asked to do so.

- The Engagement

Table 9 Descriptive Statistics of Students' Engagement

Statement	Mean	Std. Deviation
I look for opportunities to solve problems.	4.17	1.00
I am able to relate to a wide variety of issues.	3.85	1.14
I enjoy finding answers to challenging questions.	3.72	1.29
I am a good problem solver	3.56	1.26
I am confident that I can reach a reasonable conclusion	3.71	1.10
I am able to apply my knowledge to a wide variety of issues.	3.72	1.10
I am able to explain things clearly.	3.44	1.24
I ask good questions when trying to clarify a solution.	3.69	1.24
I present issues in a clear and precise manner.	3.66	1.20
I keep on working on things until I get them right	3.95	1.10

The majority of the students answered that they always tried to find opportunities to solve problems in class. However, this number decreased slightly when solving more complicated problems or when relating to different problems. As a result, less than half of the students did not agree that they could solve the problems well or briefly explain them. In the interview, half of the students explained that it was easier to followed a lecturer's instruction and figured out the problems rather than connecting it with other topics or understanding it thoroughly enough to brief it for their friends. The later activities required more effort and amount of knowledge which exceeded their abilities in the first few sessions.

- The Cognitive Maturity

Table 10 Descriptive Statistics of Students' Cognitive Maturity

Statement	Mean	Std. Deviation
I listen carefully to the different opinions of others.	4.09	1.12
I am likely to change opinions when I am given opposite ones.	3.79	1.15
I try to consider the facts without leaving my bias affect decision.	4.05	0.99
I can get along with people who do not share my opinions.	3.90	1.14
I consider how my own biases affect my opinions.	3.91	1.03
I try to find multiple solutions to problems.	4.10	1.01
I ask many questions when making a decision.	3.98	1.10
I believe that most problems have more than one solution.	4.22	0.94

Most students were willing to listen to different opinions to avoid bias and come up with more than one solution to problems. They also thought that they could get on well with each other even if they did not share the same opinion. However, this did mean that they would change the opinions of others. They shared that it was a part of their characteristics that they were open-minded and their goal to get things done as soon as possible, so they tended to agree to their teammate as long as it sounded logical. Some admitted that they also valued the relationship with their teammate over their own ideas so they usually came up with the in-between solutions.

- The Innovativeness

Table 11 Descriptive Statistics of Students' Innovativeness

Statement	Mean	Std. Deviation
I enjoy learning about many topics	4.11	1.01
I ask lots of questions in a learning environment	3.84	1.22
It is important to be well informed	4.31	0.89
I enjoy solving problems	3.71	1.22
I enjoy learning even when I am not in school	3.64	1.32
I search for the truth even when it makes me uncomfortable	4.05	1.13
I will go out of my way to find the right answers to a problem	4.03	1.16

Regarding innovativeness, most students loved learning about various topics, and they eventually enjoyed figuring out the problems.They also shared various sources used to compile content for the project, including Chat GPT, TikTok, Wikipedia, and YouTube. However, the activeness was not clearly shown when they needed to work at home or when they needed to come out of their shells to ask questions. It could be concluded that although the students were innovative, they were still shy to some extent, which can be explained by their traditional Asian traits. They just enjoyed being informed new information with lecturers' materials and instructions or content from social media.

5 Conclusion

The findings showed that students held a positive view of their self-regulated learning and critical thinking when joining project-based learning based on flipped classrooms. This enabled students to engage more actively and meaningfully in their projects. They shared various merits that they gained during the process, including making new friends, acknowledgment, and skill enhancement. They also shared a collection of tools that they used to assist in the learning process, such as Discord. However, students also admitted that due to their language limitations, as well as their short span of attention, they still needed time to accommodate themselves in doing a project. Although this study has successfully answered the research question, owing to time and location constraints, it was conducted only at NTTU in 2025. As a result, it suggests further research in the same field at other universities with other majors to consolidate its validity and reliability.

In conclusion, this study succeeded in collecting students' positive perceptions of their self-regulated learning and critical thinking with valuable sharing and suggestions from students to improve project-based learning based on flipped classroom experience.

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Học tập dựa trên dự án kết hợp lớp học đảo ngược nhằm nâng cao khả năng tự học và tư duy phản biện của sinh viên tại Trường Đại học Nguyễn Tất Thành

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Tóm tắt Nghiên cứu này nhằm tìm hiểu nhận thức của sinh viên về khả năng tự học và tư duy phản biện trong mô hình học tập dựa trên dự án kết hợp lớp học đảo ngược trong các lớp tiếng Anh phổ thông. Nghiên cứu khảo sát với sự tham gia của 98 sinh viên không chuyên tiếng Anh tại Trường Đại học Nguyễn Tất Thành, những người đã tham gia mô hình học tập dựa trên dự án kết hợp lớp học đảo ngược trong các lớp tiếng Anh phổ thông – cấp độ 2 và hoàn thành bảng khảo sát theo thang đo Likert 5 điểm. Sau đó, mười sinh viên trong số đó được chọn ngẫu nhiên để tham gia phỏng vấn bán cấu trúc nhằm giải thích thêm về trải nghiệm của họ và đưa ra những đề xuất liên quan đến lớp học đảo ngược. Kết quả cho thấy người tham gia có thái độ rất tích cực đối với mô hình lớp học này về khía cạnh khả năng tự học và tư duy phản biện, đồng thời chia sẻ một số kỹ thuật tham gia hiệu quả cũng như những băn khoăn khi tham dự lớp học đảo ngược. Do đó, nghiên cứu này đã đề xuất một số giải pháp nhằm cải thiện sự tương tác của sinh viên cũng như cung cấp ý tưởng cho giảng viên tiếng Anh khi giảng dạy học tập dựa trên dự án trong môi trường tiếng Anh như ngoại ngữ (EFL).

Từ khóa học tập dựa trên dự án, lớp học đảo ngược, tự học, tư duy phản biện, EFL