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Improving Creative Problem-Solving Abilities of English Students through HyFlex Learning Management and Project-Based Learning

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Abstract

Creative problem-solving ability is one of the important skills that need to be developed within learners through appropriate and supportive learning experiences. This research aims to 1) assess the students' creative problem-solving abilities after engaging in HyFlex learning combined with project-based learning; 2) evaluate the students' innovations after engaging in HyFlex learning combined with project-based learning; and 3) study students' opinions regarding HyFlex learning combined with project-based learning. The sample group employed cluster random sampling consisting of 30 second-year English major students. The research tools included an assessment of creative problem-solving abilities, an assessment of innovation, and a questionnaire about students' opinions regarding HyFlex learning combined with project-based learning. Statistical analysis involved means and standard deviations. The research findings were as follows: 1) Students have the highest level of creative problem-solving abilities; 2) Innovations created by students have the highest average score; 3) Students' opinions toward HyFlex learning combined with project-based learning are at the highest level.

Keywords: creative problem-solving abilities, HyFlex learning, project-based learning

1. Introduction

Project-based learning is one of the numerous methods that are being used to improve creative problem-solving abilities. Other methods include teaching and learning management. According to Kokotsaki et al. (2016), active student-centered learning is a kind of education that is defined by students' autonomy, constructive explorations, goal setting, cooperation, communication, and reflection within real-world practices. This type of learning takes place in authentic learning contexts. Learners engage in a process of knowledge acquisition and inquiry to find answers to questions or topics about which they are curious through the use of a range of teaching strategies in project-based learning (Panasan & Nuangchalerm, 2010). Learning takes place as a result of participating in collaborative activities, which ultimately result in the acquisition of new information. This produces an article that is able to relate the findings of the research to real-world situations. According to Yoelao et al. (2014), it is the responsibility of the teacher to help and encourage students to do more research. This may be done by providing students with learning tools to enhance the information learned and acting as a consultant to make ideas work until they result in productivity or performance (Prachagool & Nuangchalerm, 2021; Polyiem & Nuangchalerm, 2022).

The HyFlex Learning platform is the primary educational tool used in the present teaching and learning arrangement. It is a blend of 1) synchronous teaching and learning, which may take place both in-person and online face-to-face, and 2) non-synchronous learning. Hybrid learning and flexible learning are the two educational approaches that gave rise to it (Sosutha et al., 2021). Asynchronous learning is a kind of distance education in which teachers record live classroom teaching and then make it available to students who desire to access it online at a time that is convenient for them. Learners have the ability to customize for themselves what they desire to learn in each activity or topic at various times, which is why the program is dubbed HyFlex Learning (Beatty, 2022). It is possible for educators to facilitate HyFlex Learning via the use of digital technologies (Pholpuntin et al., 2022). Learners are able to engage to the full extent intended by instructors while

using Hyflex learning, according to research conducted by Kohnke and Moorhouse (2021).

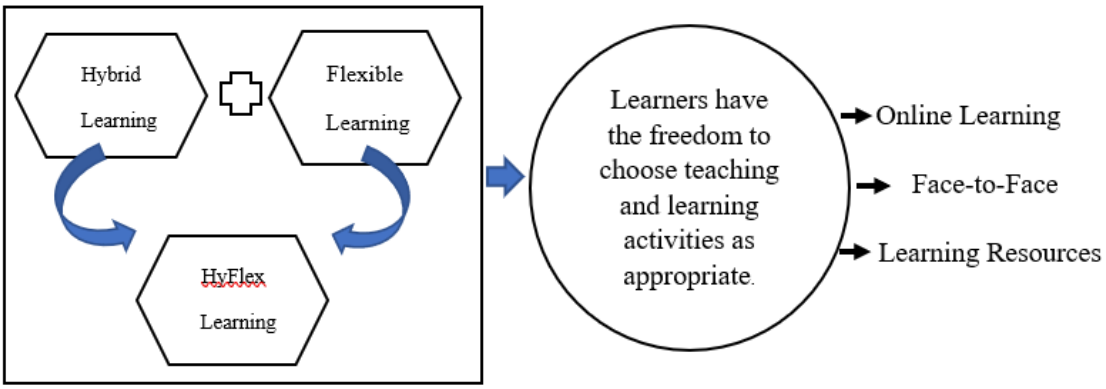

Figure 1. Diagram summarizing the definition of HyFlex learning (Beatty, 2014)

Based on the idea presented earlier, we have decided to employ a project-based learning management model as the foundation for our teaching and learning activities, and we have relied on HyFlex learning as a guideline for the execution of our educational endeavors. Project-based learning management is a learning arrangement that stimulates the teacher to bring the attention generated by the learners (Akarawang et al., 2016). Learners themselves can learn through a group work process to produce collaborative work that creates innovative English learning. It is effective and can help solve learning problems in various aspects. This learning arrangement is known as a project-based learning management system.

Creative problem solving (CPS), which integrates both problem-solving and creative abilities for the advantage of producing inventive ideas (Sujiva et al., 2016), is one of the learning skills that have gained attention in today's period of change. CPS refers to thought processes that help design and create a variety of new ideas. These thought processes consist of convergent thinking and divergent thinking, which encourage each other correctly and use them to solve issues in a creative manner (Vongtatham, 2015; Isaksen et al., 2011). CPS helps design and develop a variety of new ideas. According to Baumgartner (2020), creative problem-solving is a process that begins with the classification of issues in order to get a better understanding of them, continues with the generation of ideas for problem-solving, and concludes with the evaluation of those ideas in order to identify the most efficient solution.

Concurrently, we used HyFlex learning as a management tool for the learning process. Learners participating in HyFlex learning have the ability to choose the most suitable format for their educational pursuits. It is the responsibility of the teacher to provide guidance on the selection of adaptable instructional activities in accordance with the preparedness and requirements of the students. Students will benefit from and enhance their abilities to creatively address challenges through the use of such collaborative learning. As a result, we are interested in utilizing HyFlex learning and project-based learning management as an approach to learning management in order to cultivate students' creative problem-solving talents, help them acquire competence, and enable them to continually better themselves throughout their lives.

2. Objectives

To assess the students' creative problem-solving abilities after engaging in HyFlex learning combined with project-based learning.

To evaluate the students' innovation after engaging in HyFlex learning combined with project-based learning.

To study students' opinions regarding HyFlex learning combined with project-based learning.

3. Method

This experimental research employed a pre-experiment known as one group pre-test post-test design. The details are provided below.

3.1 Participant

The sample group employed cluster random sampling consisting of 30 second-year English major students in the Faculty of Education from one university in Thailand.

3.2 Research Instruments

The research tools included an assessment of creative problem-solving abilities, an assessment of innovation, and a questionnaire about students' opinions regarding HyFlex learning combined with project-based learning.

3.3 Data Collection and Analysis

Researcher clarified the purpose and preliminary agreement with the sample students. The researcher organized learning activities in the course EEC2316 "Media Development and Innovation in English Language Learning" using a project-based learning management model based on a HyFlex learning approach as follows:

- Project-based learning management: Students were divided into groups and collaborated on innovative English language learning plans on any topic of interest. Students planned their collaboration, thought, and solved problems together. Work progress was reported. The researcher provided advices and suggestions to work through questions in an end-up manner that encourages reflection. Students provided guidance and feedback to peer presenting groups, where students observed each other's work processes and provided feedback. This encouraged students to recognize, understand, think, and solve problems in creating creative innovations. The innovations then were presented to researchers and experts from outside, and the innovations were taught to students at Suan Sunandha Rajabhat University Demonstration School.
- HyFlex learning: Throughout project-based learning activities. The researcher combined learning both face-to-face and online learning together with learning from other learning resources. HyFlex Learning allowed students to participate in teaching and learning activities according to their needs and convenience.

The researchers assessed students' ability to solve problems creatively using the creative problem-solving ability assessment. The researchers and experts evaluate students' innovations based on presentations by using the innovation assessment form. The researchers asked students to conduct a questionnaire on students' opinions on HyFlex learning combined with project-based learning management. The researchers collected data for statistical analysis. Statistics used to analyze data are mean, and standard deviations.

4. Results

4.1 Ability to Solve Problems Creatively

Students had the highest level of creative problem-solving abilities after engaging in HyFlex learning combined with project-based learning as shown in Table 1.

Table 1. Ability to solve problems creatively after engaging in HyFlex learning combined with project-based learning

Item	$\bar{x}$	S.D.	Level
1. Students are critical in creating innovations.	60.4	68.0	Highest
2. Students are creative in creating innovations.	4.83	0.38	Highest
3. Students work systematically with clear procedures.	4.60	0.49	Highest
4. Students apply their knowledge of technology to create innovations.	4.73	0.45	Highest
5. Students use technology such as new applications or new software fluently.	4.70	0.47	Highest
6. Students can develop innovations in various and interesting composition	4.70	0.47	Highest
7. Students can develop innovations to be up to date.	4.63	0.49	Highest
8. Students can develop new and creative innovations.	4.60	0.56	Highest
9. The innovations created can be used to solve problems or develop learners.	4.56	0.50	Highest
10. Students can evaluate the innovations they create.	4.56	0.63	Highest
Overall	4.65	0.52	Highest

From Table 1, the overall assessment of students' ability to solve problems creatively was at the highest level. The highest average score is that students are creative in creating innovations, followed by students applying their knowledge of technology to create innovations, and thirdly, students use technology such as new applications or new software fluently, and students can develop innovations in various and interesting compositions (Figure 2 and 3).

Figure 2. Examples of innovations

Figure 3. Examples of applying innovations with students at school

4.2 Innovation Assessment

Students had the highest level of innovation assessment after engaging in HyFlex learning combined with project-based learning as illustrated in Table 2.

Table 2. Innovation assessment after engaging in HyFlex learning combined with project-based learning

Item	$\bar{x}$	S.D.	Level
1. The content of the innovations meets the curriculum that learners will receive.	67.4	52.0	Highest
2. The content of innovations is appropriate to the level of the learners.	83.4	41.0	Highest
3. The learning content is properly prioritized.	50.4	55.0	High
4. Innovations have interesting and diverse forms.	83.4	41.0	Highest
5. The picture and/or sound effects are appropriate for the learners.	67.4	52.0	Highest
6. The size of the letters is appropriate for the level of the learner.	33.4	52.0	High
7. How to use innovations is explained.	50.4	55.0	High
8. Innovations are creative, novel, and interesting.	00.5	00.0	Highest
9. Learners can easily access the use of innovations.	50.4	55.0	High
10. Innovation can be used to solve problems and develop learners' skills.	83.4	41.0	Highest
Overall	67.4	.047	Highest

From Table 2, the result showed that the overall assessment of students' innovation was at the highest level. The highest average score is that innovations are creative, novel, and interesting. Secondly, the content of innovations

is appropriate to the level of the learners, innovations have interesting and diverse forms, and innovation can be used to solve problems and develop learners' skills. And thirdly, the content of the innovations meets the curriculum that learners will receive. The picture and/or sound effects are appropriate for the learners.

4.3 Opinion towards HyFlex Learning Combined with Project-based Learning

Students had the highest level of opinion towards HyFlex learning combined with project-based learning as presented in Table 3.

Table 3. Opinion towards HyFlex learning combined with project-based learning

Item	$\bar{x}$	S.D.	Level
1. Students use modern technology as a tool to study and access learning resources outside the classroom.	4.87	0.35	Highest
2. Students can communicate with others online and experience a diverse range of media.	4.53	0.51	Highest
3. Students engage in self-directed learning.	4.77	0.43	Highest
4. Students exchange learning both inside and outside the classroom by freely and creatively sharing ideas and creating.	4.87	0.35	Highest
5. Students can choose their own study methods or channels to learn freely.	4.93	0.25	Highest
6. Students select topics to study based on their own interests, aptitude, and abilities.	4.83	0.37	Highest
7. Students create a self-designed systematic work plan and engage in a hands-on learning approach	4.80	0.41	Highest
8. Students integrate skills, experiences, and knowledge in accordance with real-world conditions, allowing them to independently construct knowledge.	4.60	0.49	Highest
9. Students express their opinions equally and with mutual respect.	4.93	0.25	Highest
10. Students evaluate their own and others' innovations.	4.73	0.45	Highest
Overall	4.79	0.41	Highest

According to Table 3, students had the highest level of opinion towards HyFlex learning combined with project-based learning. The opinion on HyFlex learning management combined with project-based learning management was the highest overall level. The items with the highest average score are students can choose their own study methods or channels to learn freely, and students express their opinions equally and with mutual respect. Next were Students use modern technology as a tool to study and access learning resources outside the classroom, and students exchange learning both inside and outside the classroom by freely and creatively sharing ideas and creating innovations. And the third is students select topics to study based on their own interests, aptitude, and abilities.

5. Discussion

5.1 Ability to Solve Problems Creatively

After engaging in HyFlex learning combined with project-based learning, the overall assessment of students' ability to solve problems creatively was at the highest level. It was found that the students are creative in creating innovations, followed by students apply their technological knowledge to create innovations. This may be due to the HyFlex learning that consists of teaching and learning in the classroom, online learning, including video instruction, allows students to choose the style of study they want to learn through the use of appropriate technology. Furthermore, they can communicate with instructors and learners both on-site and online. In addition, it combines project-based learning in which students are given projects to finish. They learn to solve problems and encourage creative English language learning by collaborating on innovative media projects.

Moreover, students have the opportunity to choose an innovation model, the content and the process of self-production of innovations, resulting in self-learning for students. Students are encouraged to be creativity in the work process and be able to apply technological knowledge to create innovation appropriately and efficiently. This is in line with the concept of Netwong and Tumnanchit (2010) which claimed that project-based learning is a student-centered learning arrangement by allowing students to learn at their own pace by choosing what interests them and practicality which is a systematic process that generates new knowledge. Students may utilize the methods such as exploration, research, invention, and problem-solving. These methods involved the learners themselves discovering knowledge, and the outcomes are tangible. This is in line with the research conducted by Arlinwibowo et al. (2022), who examined the impact of technology on learners' learning outcomes. The findings indicated that the group of learners who utilized technology for learning exhibited greater academic

achievement compared to those who did not incorporate technology. Therefore, the combination of HyFlex learning and project-based learning meets the requirements of both learning and research. It also encourages students to have the ability to solve problems creatively in creating innovations and to apply their knowledge of technology to create innovations as well.

5.2 Innovation Assessment

After engaging in HyFlex learning combined with project-based learning, the innovations that students created are evaluated at the highest average. It was found that innovations are creative, novel and interesting, with the highest average. This is followed by innovations' content that is appropriate for the learners' level, innovations are interesting and have a variety of forms and elements, and innovations can be used to solve problems and develop learners' skills. This could be attributed to the HyFlex learning arrangement combined with project-based learning in this course, which encourages students to collaborate both on-site and online. As a result, students interact with each other, communicate, and collaboratively plan for innovation. Various modern technologies are employed for studying, researching, and learning.

Consequently, students generate creative and interesting innovations, along with collaborative content planning in the field of innovative media (Nuangchalerm, 2020). This content is tailored to the learners' level and can be utilized to address problems or enhance the learners' skills. This aligns with the concept put forth by Chantem (2010), which explores the advantages of hybrid learning fosters individualized learning paces, enthusiasm for research, enhance communication skills, and numerous interaction channels among instructors and learners, as well as among learners themselves. Furthermore, it assists students in learning how to synthesize knowledge and develop creativity by employing modern technology as a research tool beyond the confines of the classroom. This, in turn, facilitates the exchange of knowledge within the group. It is also in line with the research of Tantivitittapong (2015), who developed a blended skills teaching model with an emphasis on real-world learning to enhance work skills for technology, television, and radio broadcasting students. The results of the research showed that all students had a good level of overall practical skills. It was found that students scored above 60 percent, indicating their proficiency in innovative skills across all groups.

5.3 Opinion towards HyFlex Learning Combined with Project-based Learning

The degree of students' opinions of HyFlex learning in conjunction with project-based learning is at the highest level. It was shown that students who have the freedom to choose their own learning strategies and channels. They share their opinions-had the highest average scores. Students then share learning both inside and outside of the classroom by freely and artistically exchanging ideas and producing. Students then utilize contemporary technology as a tool to study and access learning materials outside of the classroom. This could be because HyFlex learning gives pupils the freedom to choose their own channels or techniques of learning. Additionally, students in a HyFlex learning environment have the chance to share and work together on their learning experiences both inside and outside of the conventional classroom.

Additionally, it makes use of contemporary technology as a tool to aid with information acquisition and study. It encourages students to choose study subjects in accordance with their interests, aptitudes, and talents, much as project-based learning does. Students have fair and equitable access to self-directed learning, hands-on design, and systematic work planning. This is consistent with Beatty's (2022) idea that HyFlex learning enables students to create their own learning paths for each activity or topic at various times, and Kohnke and Moorhouse (2021) claimed that students find it acceptable to be able to completely participate as planned by instructors. It also fits with the idea put forth by Thiamtipran (2016), who defined project-based learning as an educational activity in which students do research, conduct research, and engage in practice activities.

Utilizing scientific or other methodical techniques, students learn in accordance with their aptitudes and capacities. Additionally, this is consistent with Ahmad and Ismail's (2013) research on the advantages of hybrid learning for university students. The findings demonstrated that students were content and that hybrid learning had helped them understand both theoretical concepts and real-world abilities. Additionally, this is consistent with a study Inkaew and Napapongs (2016) that looked at the impacts of HyFlex learning on undergraduate students majoring in photography technology. According to their research, pupils were very satisfied with both their individual learning styles and the HyFlex learning technique. Innovative English language learning media that can be used to solve problems and/or advance language skills among students are produced as a result of flexible blended learning management combined with project-based learning, which also improves students' creative problem-solving abilities. These cutting-edge media resources are also made available to foundational education institutions, all for the benefit of teachers and other educational staff who may use them to support students' ongoing growth. from the idea stated above. In order to conduct teaching and learning activities, we

have used a project-based learning management approach and employed HyFlex learning as a model.

Project-based learning management is a method of instruction that encourages teachers to draw students' attention to their own research projects and group projects. They can produce collaborative work that results in innovative English learning that is efficient and can address a variety of learning issues. HyFlex learning was used to manage learning at the same time. Learners have the opportunity to choose the ideal kind of learning activity for HyFlex learning. The teacher is in charge of providing guidance on the choice of adaptable educational activities based on the students' requirements and level of preparation. The capacity of students to address issues creatively will be encouraged and developed through such collaborative learning. As a result, we are interested in using project-based learning management and HyFlex learning as a learning management strategy to help students build their innovative problem-solving skills, obtain competence, and be able to continually better themselves throughout their lives.

6. Conclusion

The classrooms are suitable places to implement both project-based learning and HyFlex learning management. Both of these educational approaches may be used successfully. The findings of the study indicated that students possessed the highest level of creative problem-solving skills, that they developed learning innovation that was at the highest average score, and that students had perspectives on hybrid learning that combined project-based learning with HyFlex learning that were at the highest level. This new method of learning has the potential to be used in educational institutions like schools and universities on account of the fact that it was advantageous to them.

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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 Canadian Center of Science and Education.

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

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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.

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