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學生研究論文

The Department of Foreign Languages

National Chiayi University

Research Project Report

跨領域雙語教育之歷程

Research on The Process of Cross-Disciplinary Bilingual Education

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ABSTRACT

This study explores the applicability of interdisciplinary courses combined with bilingual education for junior high and elementary school students. The research analyzes the results through actual teaching to the research subjects, adopting the STEAM+E education model: Science, Technology, Engineering, Math, Art, and English. The curriculum design incorporates the seven processes of Finnish education (O for Objective, T for Task, B for Background, I for Ideation, P for Planning, E for Execution, and S for Sharing) as the core structure. In these courses, the main focus is on integrating "science" and "English" as part of interdisciplinary course design, incorporating practical classes and emphasizing the importance of students autonomously exploring and applying knowledge. Additionally, adjustments to the curriculum content are made for different academic systems to enhance diversity and richness, allowing students to learn from various perspectives.

The research results are based on the quantitative analysis of each class's learning sheets and feedback forms. The STEAM+E curriculum is generally feasible and beneficial for junior high and elementary school students. However, some shortcomings still indicate that the interdisciplinary bilingual course system needs to be more mature. Nevertheless, with the increasing development of technology, interdisciplinary bilingual courses are expected to integrate into Taiwan's education system gradually. Our goal is to guide students in adapting to such classes, enabling them to be more competitive in future society.

Keywords: STEAM+E, bilingual education, interdisciplinary, implementation, competitiveness

摘 要

此次研究目的是為了探討跨領域課程結合雙語教育對國中小學生之適用性，並透過實際與研究對象授課的方式分析研究成果，課程設計採用 STEAM+E 教育模式:科學（Science）、科技（Technology）工程（Engineering）、數學（Math）、藝術(Art)、英文(English)，並應用芬蘭式教育 7 大流程(目標 O、任務 T、背景 B、討論 I、計畫 P、執行 E、分享 S)作為課程架構核心。在這些課程中，主要結合「理科」和「英文」做為跨領域課程設計，並加入實作課程，強調讓學生自主探索，學習活用知識的重要性。同時也針對不同學制去調整課程內容，增加課程的互動性以提升多樣化和豐富度，使學生能學到不同面向的主題。

研究結果依據每次上課的學習單與回饋表單量化做研究資料分析，得出 STEAM+E 課程對國中小學生總體而言可行性高且大有益處，但同時仍存在一些不足，顯示出跨域雙語課程體制尚未成熟。然而面對現今科技越來越發達，跨域雙語課程將會逐漸融入台灣的教育體制，我們要做的就是引導學生去適應跨域雙語課程，讓學生能在未來社會更具競爭力。

關鍵詞: STEAM+E、雙語教育、跨領域、實作、競爭力

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1.1 Motivation and Purpose of the Study

This project primarily has two objectives. The first is integrating interdisciplinary themes, introducing the Finnish STEAM+E PROCESS teaching approach, and designing a progressive learning curriculum diversely. The second objective is to respond to Taiwan's 2030 Bilingual Nation policy, implementing bilingual education in junior high and elementary schools in Chiayi.

1.2 Research Questions

Based on the research motivation and objectives mentioned above, the research questions outlined in this study are as follows:

(1) Is the STEAM curriculum suitable for bilingual instructional methods?

(2) Is interdisciplinary practical content suitable for junior high and elementary students in Chiayi?

(3) Whether interactive learning courses can stimulate student interest?

(4) Can AI-assisted learning processes enhance students' advancement in technology knowledge and application skills?

CHAPTER TWO

LITERATURE REVIEW

2.1 The Seven Steps of Finnish Education Processes

The Seven Steps of Finnish Education Processes is a phased method of interdisciplinary learning. Seven main steps in the curriculum structure are: "Objective Setting," "Task Assignment," "Background Knowledge Integration," " Ideation and Group Brainstorming," "Collaborative Planning," "Implementation and Execution," and "Sharing

of Results." In his research, Professor Jiong-Wu Su (蘇炯武) has extensively introduced the origins of these seven steps and the reasons behind initiating this educational model.

These seven teaching processes are mainly designed to match the steps of the STEAM+E course. During Professor Jiong-Wu Su's (蘇炯武) internship, he witnessed a small teamwork task-based activity designed with the following seven significant processes. Here, Professor Su realized the importance of teamwork. The success of group discussions depends on the thinking of students with different knowledge backgrounds. To come up with multiple solutions, teachers should not interfere too much when students are thinking so that students' creativity can be stimulated. (Su, 2023)

The Finnish educational model focuses on students' independent thinking and hands-on learning through diverse interdisciplinary, practically applied approaches. The Finnish STAM (Science, Technology, Arts, and Mathematics) process curriculum operates through seven main steps:

(1) Step 1: Objective Setting
Firstly, establish a goal to determine a clear direction for the plan.

(2) Step 2: Task Assignment
Set course tasks for students to execute personally; incorporating technology and AI, students utilize new technologies to complete classroom tasks.

(3) Step 3: Background Knowledge Integration
Apply acquired knowledge to the curriculum, for example, using English as a background, and combine interactive bilingual games (see Appendix 1) to encourage students to actively answer questions and verbally translate learned vocabulary to accumulate group scores.

(4) Step 4: Ideation and Group Brainstorming
Train students' autonomy in critical thinking; within the curriculum, students are encouraged to discern articles generated by AI programs like ChatGPT, fostering media interpretation skills while teaching the importance of humanities literacy.

(5) Step 5: Collaborative Planning

Engage in peer discussions to promote mutual learning, inspiring students' cooperative abilities; for instance, students discuss in groups to identify which English keywords compose specific images.

(6) Step 6: Implementation and Execution

Design hands-on activities for students to participate in leveraging AI technology; students select and scan cards individually to input data, creating their own AI works (as in Appendices 2 and 3); scientific experiments (see Appendices 4, 5, and 6) are also designed.

(7) Step 7: Sharing of Results

Encourage students to present their course outcomes, internalize learned knowledge, and share experiences; for example, at the end of each session, allocate time to demonstrate their creative processes and insights on stage.

In other words, the seven steps of Finnish Education are designed based on the foundation of "contextual implementation" and "cultivating critical thinking." Through hands-on activities and problem exploration, the curriculum aims to train students in the practical application of knowledge in their daily lives.

2.2 Taiwan's Bilingual Policy in 2023

In response to Taiwan's pivotal position in the global supply chain and the increasing investment from multinational corporations in recent years, there has been a significant surge in the demand for local bilingual professionals. To bolster Taiwan's competitiveness among the younger generation, the government has initiated the 2030 Bilingual Policy. The dual visions of this policy are to "cultivate Taiwanese talent to fit in internationally" and to "align with international enterprises investing in Taiwan, thus linking Taiwan's industries globally and creating high-quality employment opportunities.

In addition to maintaining and enhancing an English-friendly environment for foreigners living and working in Taiwan, the bilingual policy focuses on six main axes: accelerating the bilingualization of higher education, balancing and improving bilingual conditions in secondary and primary education, digital learning, expanding English proficiency exams, enhancing the English proficiency of public servants, and establishing dedicated administrative entities to promote these efforts. These six main axes aim to improve the overall effectiveness of the bilingual policy and provide the next generation with better competitiveness (National Development Council, 2021).

Taking cues from Singapore, Professor Cong-Rong Yang (楊聰榮) from National Taiwan Normal University's Department of Applied Chinese Language and Literature suggests that Taiwan could absorb the experiences, practices, and English-language human resources of neighboring countries when implementing a bilingual policy (Chen & Chen, 2019). Singapore's experience in bilingual development, despite differences in population composition, island environment, and cultural background, can serve as a valuable reference for Taiwan's development. Singapore's success in bilingual development primarily stems from bilingual education, strong government support for language education, the development of Singaporean English with local characteristics, and the recognition among Singaporeans that proficiency in English is crucial for securing good employment opportunities (Wang & Lin, 2021).

In summary, Taiwan is committed to enhancing its global competitiveness in response to its critical position in the supply chain by actively promoting the 2030 Bilingual Policy. The policy aims to cultivate international competitiveness, assist Taiwanese talent in integrating globally, attract foreign investment, and connect Taiwan's industrial chain to the global market. Drawing from Singapore's successful experiences, Taiwan integrates neighboring countries' experiences into its policy, emphasizing bilingual education, locally distinct English, and government-supported language education. These policy implementations help foster excellent bilingual talent, propel Taiwan's integration into the global industrial chain, and create higher-quality and more competitive employment opportunities for the next generation.

CHAPTER THREE

COURSE DESIGN & RESEARCH METHODS

3.1 Design of Cross-Disciplinary Bilingual Education

3.1.1 Development of STEAM Curriculum (From STEM to STEAM)

In this research project, the curriculum design follows the model of the Finnish education process, utilizing the STEAM PROCESS instructional approach.

STEM, the precursor to STEAM, was initially introduced by the National Science Foundation (NSF) in the United States, emphasizing Science, Technology, Engineering, and Mathematics to enhance students' analytical skills in science and foster an innovative spirit. With societal changes and advancements in technology, especially in the current environment of evolving AI technologies, the emotional aspects of the human experience prove challenging for machines to replicate. Cultivating humanity's attainment and aesthetic concepts has become crucial.

To address the limitations of a purely STEM education, the arts (Art) have been integrated into the curriculum as a catalyst for creative development. The STEAM education model aims to contribute to holistic human development by combining rationality and sensibility. The goal is to diversify learning experiences, enhance interdisciplinary skills, and cultivate a competitive edge that AI cannot replace. (Space Foundation Editorial Team, 2022)

3.1.2 Integration of STEAM and English

In response to the Taiwanese government's 2030 initiative to promote bilingualism, English has become a crucial component of interdisciplinary learning. In recent years, the English education paradigm has evolved beyond the traditional focus on listening, speaking, reading, and writing skills. There is now a greater emphasis on contextual learning and practical application. We have incorporated English into our curriculum, employing the STEAM+E bilingual education model to address this shift.

This approach enables students to acquire knowledge across various disciplines and enhances their practical English language skills. Complemented by hands-on courses, our curriculum aims to synergize language proficiency with conceptual understanding, creating a mutually reinforcing learning experience. This approach will better equip students to navigate the challenges of the future society and enhance their competitiveness in the global landscape.

3.1.3 Distinctive Features of the STEAM+E Curriculum

Diverging from the traditional education model that relies on textbooks, emphasizes memorization, and conducts individual subject-based instruction, STEAM+E education breaks free from conventional frameworks. According to Joseph Lathan, Ph.D. (2016), this educational approach advocates for guided inquiry teaching methods, encouraging students to explore independently through the continuous exploration of problems. Discussions and collaborative activities nurture hands-on and problem-solving skills. By integrating interdisciplinary elements, students can receive knowledge and showcase practical results more diversely and flexibly. The aim is to train students in independent thinking, teamwork, communication, and other abilities. The curriculum enhances cross-disciplinary application skills by synthesizing comprehensive knowledge and emphasizing the cultivation of 'competence. This ensures students can apply what they have learned when facing future challenges, showcasing a holistic and integrated effectiveness.

3.2 Course implementation procedures and methods

The STEAM curriculum highlights several key components: interdisciplinary learning, hands-on activities, problem-solving, and practical application. These elements aim to foster a sense of active participation among students during the self-directed learning process. The objective is to empower students with the ability to apply knowledge to solve real-world problems when encountering difficulties in their future lives.

In addition, our curriculum is designed based on the seven processes of Finnish education (Objectives, Tasks, Background, Discussion, Planning, Execution, Sharing), emphasizing a structured approach to goal setting, engaging tasks, contextual understanding,

collaborative discussions, planning, implementation, and sharing of outcomes. In this STEAM+E curriculum, our team has designed numerous themes, including:

- **Magic AI Bilingual Course**

  Collaborating across Foreign Languages, Electrical Engineering, and Physics departments, we have jointly developed a set of vocabulary cards. Utilizing the online drawing system 'Midjourney,' we encode the cards into an artificial intelligence drawing program, generating unique AI images. Students, while inputting the vocabulary cards, simultaneously learn new English words. Through presenting their creations, we aim to highlight the humanistic and innovative aspects of art. (see Appendix 2, Appendix 3, and Appendix 8)

- **Bilingual Science Experiment Practical Course**

  Designing AI Descent - Egg Parachute x Territory Battle (see Appendix 6), Straw Rocket Launch (see Appendix 4 and Appendix 5), and other science experiment activities. Through hands-on learning and practical experiments, students enhance their learning ability through active engagement. The bilingual teaching approach provides students diverse ways to learn a foreign language.

- **Film Appreciation and Discussion Sessions:**

  Organizing film appreciation sessions and discussions to reflect on the impact of new technology on humanity, as depicted in science and humanities-related films (see Appendix 7).

- **Science Popularization Courses:**

  We are developing science popularization courses to train students in media interpretation and teach them to discern the differences between AI technology and human expression methods (see Appendix 1).

3.3 Research Subject and Locations

STEAM+E represents the addition of English and symbolizes Chiayi (嘉義). Hence, our team's project primarily focuses on serving rural junior high and elementary schools in

Chiayi. The goal is to promote bilingual and interdisciplinary courses in Chiayi.

- **Magic AI Bilingual Course ：**

  At Luman Elementary School on July 25, Xiatan Elementary School on August 4th, Chiayi Municipal Daye Experimental Junior High School on September 16, and Jhonghe Junior High School on December 23.

- **Practical Course-Designing AI Descent - Egg Parachute x Territory Battle:**

  At Chiayi Municipal Daye Experimental Junior High School on October 23.

- **Practical Course - Straw Rocket Execution:**

  At Jhonghe Junior High School on October 14.

- **Film Appreciation and Discussion Sessions：**

  At Jhonghe Junior High School on September 25 and Daye Experimental Junior High School on October 23.

3.4 Learning Effectiveness Assessment Tools

Our approach to assessing learning effectiveness involves the creation of course-specific worksheets to assist students in keeping pace with the curriculum. By incorporating open-ended questions, we aim to foster students' proactive critical thinking skills during the course. Additionally, we develop feedback forms to systematically review and improve the course design based on the insights provided by students in each feedback session.

CHAPTER FOUR

RESEARCH FINDINGS AND DISCUSSION

4.1 Results and Discussion on Interdisciplinary Learning

In this section, we integrated various domains into our teaching approach for interdisciplinary learning. In the course at Xiatan Elementary School, we used AI drawing to allow students to learn English (see Appendix 1). By combining the three fields of art, science, and English, students could choose English words they liked and input them into an AI system to generate personalized drawings. Through this approach, students learned the power of AI and enhanced their English proficiency.

Furthermore, at Jhonghe Junior High School, we conducted a small experiment on making "Straw Rockets" with students (see Appendix 1). In addition to guiding them through the step-by-step process of rocket making, we also designed study sheets to help them record and improve their rocket designs. Additionally, during the class, we incorporated elements of competition and games to stimulate students' interest in learning. As for the English aspect, aside from delivering presentations entirely in English, we added a reflection section at the end of the study sheets, where students were encouraged to write in English and share their thoughts with the class (such as Appendix 1 and Appendix 2). Overall, students showed promising performance in response to the cross-domain learning outcomes.

We observed that elementary school students, when learning English through pictures, not only grasped the meanings of words at a glance but also, due to the story element embedded, were better able to retain the associations between words until the final presentations. As for junior high school students, we mainly increased their ability to write “English,” enabling them to practice listening, speaking, reading, and writing comprehensively. We hope that through the cross-disciplinary bilingual approach, the English learning process will no longer be monotonous and increase students' affinity for

English. This provides an additional channel for learning English and changes traditional stereotypes about teaching English.

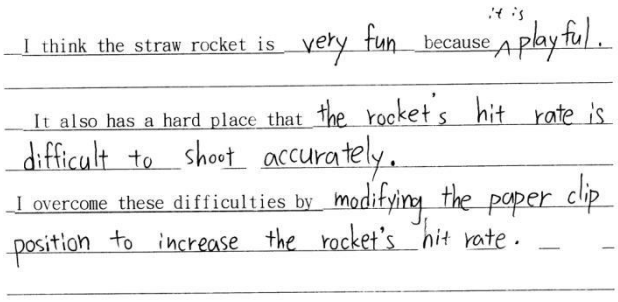
4.2 Results and Discussion of Practical Tasks

In the STEAM+E curriculum activities, we followed the seven steps of the Finnish process (Objective, Task, Background, Discussion, Planning, Execution, and Sharing). During the execution phase, we had one primary instructor per class, while others were assistants. Over the past six months, we visited several rural primary and secondary schools for practical sessions. In each school, we tailored our cross-domain curriculum differently. For instance, at Xiatan Elementary School, we utilized "AI Drawing" for instruction (see Appendix 3). After explaining the usage of Midjourney, we grouped students and assigned one or two assistants to each group to assist with selecting word cards. Assistants scanned the selected word cards into Midjourney, repeating the process to ensure students understood Midjourney's operations clearly. Besides word selection, we encouraged students to choose words with narrative elements, such as a student selecting "watermelon" because of their family's farming background or another choosing based on their zodiac signs (see Appendix 2).

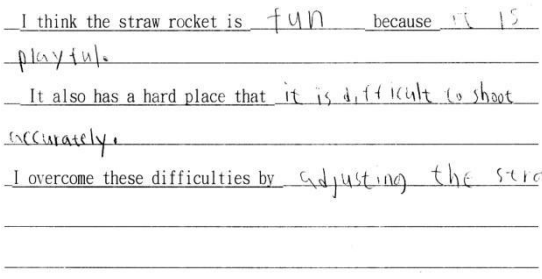
In addition to "AI Drawing," we designed another course called "Bilingual Ball-Throwing Game" (see Appendix 3). Before starting the game, the instructor reviewed the words used that day to help students recall pronunciation and meanings. During the game, students earned points by answering questions posed by the instructor and tossing balls. Gamification increased student engagement and allowed us to assess their English word retention. Through these two main courses, we aimed to help students quickly associate word meanings without resorting to rote memorization, reducing their aversion to English.

At Jhonghe Junior High School, practical sessions involved guiding students in making "Straw Rockets" alongside the instructor. Through bilingual instruction, students followed the English-language slides and listened to the instructor's English narration, using

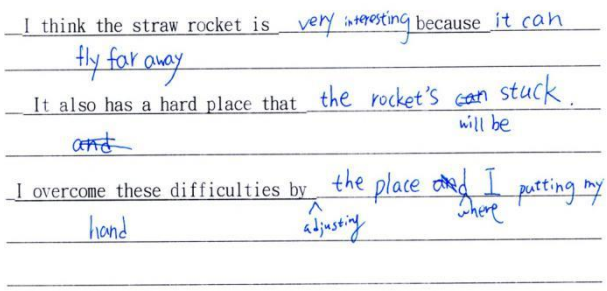
their eyes, hands, and ears to follow the rocket-making process. After completing the rockets, we organized testing, competition segments, and worksheets. The study sheets recorded their test results and provided a section for writing reflections, where students were required to write in English. Finally, a few students were selected to share their reflections with the class (see Appendix 4). Feedback from student reflections confirmed that this course design indeed met our expectations.


I think the straw rocket is very fun because it is playful.
It also has a hard place that the rocket's hit rate is difficult to shoot accurately.
I overcome these difficulties by modifying the paper clip position to increase the rocket's hit rate.

(student A)


I think the straw rocket is fun because it is playful.
It also has a hard place that it is difficult to shoot accurately.
I overcome these difficulties by adjusting the straw.

(student B)


I think the straw rocket is very interesting because it can fly far away
It also has a hard place that the rocket's ~~can~~ will be stuck. ~~and~~
I overcome these difficulties by the place ~~and~~ where I putting my hand adjusting

(student C)

From the students' reflections, it is evident that they have a keen interest in the "Straw Rockets" experiment. Despite encountering difficulties during the production process, they overcame them by applying the content taught in class. Through this method of reflection, we not only gain insight into their learning progress and achieve our primary goal of "cross-domain bilingual" education. In the Xiaotan Elementary School reflections, one student affirmed the acquisition of many English words and practical skills from the course, stating,

"*I learned a lot of English and handicrafts, thank you, teacher.*" (Student D). Another student expressed enjoyment in the class, saying, "*I think it is fun.*" (Student E). These reflections show that our course design aligns with students' interests and stimulates their enthusiasm for learning English.

4.3 Discussion of Quantified Learning Outcomes

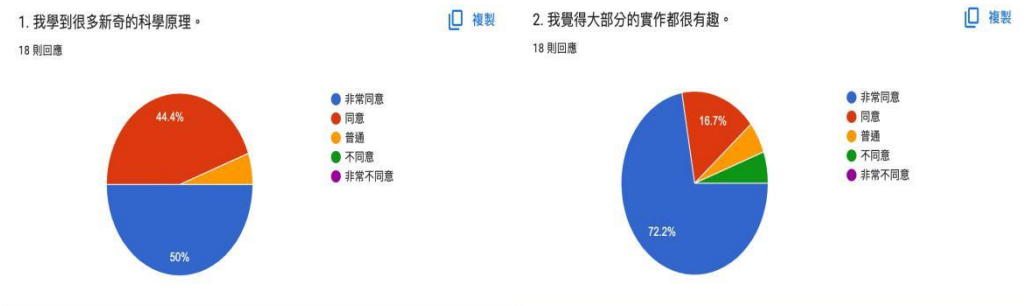
Feedback surveys on "Teaching Content," "Course Approach," and "Learning Outcomes" were used to assess the effectiveness of this course. The survey analysis results are as follows:

4.3.1 Teaching Content

At Xiatan Elementary School, regarding whether students "learned many new scientific principles," 50% of the students strongly agreed, 44.4% agreed, and 5.6% had a neutral response. Furthermore, concerning whether they "found most of the practical activities interesting," 72.2% strongly agreed, 16.7% agreed, 5.6% had a neutral response, and only one student (5.6%) disagreed. This indicates that most students believe that such teaching content enables them to learn new and exciting scientific principles. (Refer to Figure 1)

Figure 1

Analysis Table of Student Learning Feedback on Teaching Content (Xiatan Elementary School)

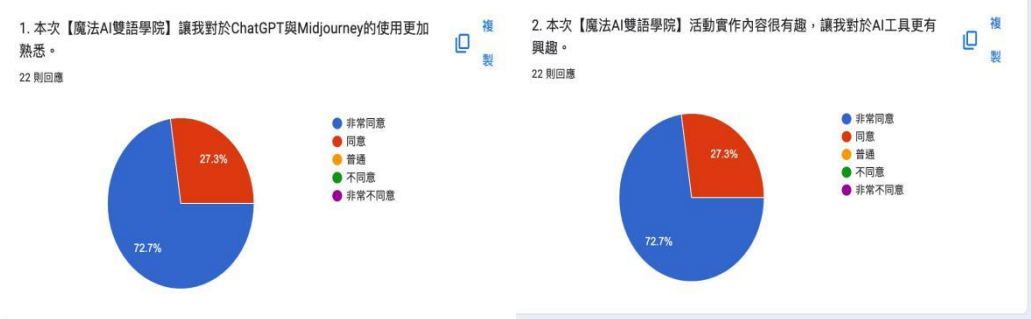


At Daye High School, regarding whether "it made me more familiar with the use of ChatGPT and Midjourney," 72.7% strongly agreed, and 27.3% agreed. Similarly, "the practical activities were interesting and made me more interested in AI tools," 72.7% strongly agreed, and 27.3% agreed. This indicates that the teaching content has achieved our

objectives. (Refer to Figure 2)

Figure 2

Analysis Table of Student Learning Feedback on Teaching Content (Daye High School)



4.3.2 Course Approach

At Xiatan Elementary School, regarding whether "the class format, compared to regular classes, made it easier for me to relax and absorb knowledge," 52.9% of students strongly agreed, 35.3% agreed, and 11.8% had a neutral response. Furthermore, concerning "overall satisfaction with the course design," 72.2% strongly agreed, and the remaining 27.8% agreed (see Figure 3). Similarly, at Daye High School, "the teaching slides were well-designed, visually appealing, and the content was clear and understandable," and "overall satisfaction with the course design," 77.3% strongly agreed, and 22.7% agreed (see Figure 4). In these data, no students opposed the cross-domain bilingual teaching approach, indicating that students do not resist this teaching method. Instead, it helps them better engage with the course content.

Figure 3

Analysis Table of Student Learning Feedback on Course Approach (Xiatan Elementary School)

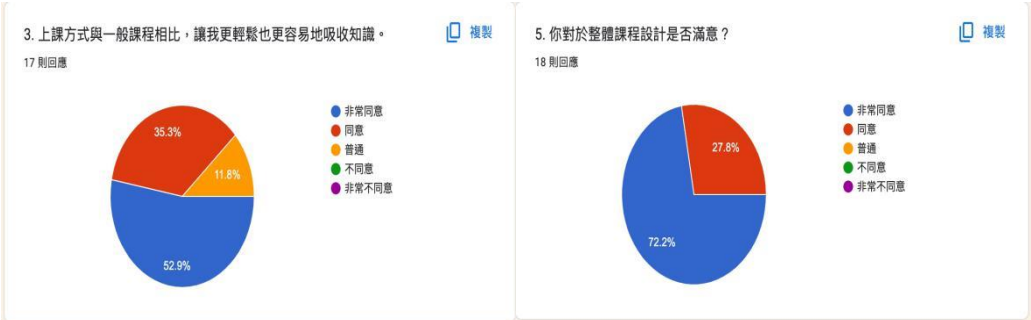
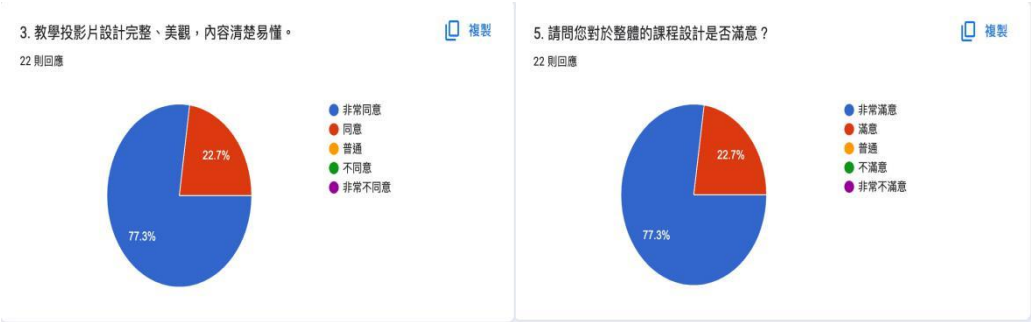


Figure 4

Analysis Table of Student Learning Feedback on Course Approach (Daye High School)



4.3.3 Learning Outcomes

At Xiatan Elementary School, regarding the question, "How do you think Midjourney-generated images can be used in daily life?" 28.4% of students answered: "To assist with drawing." Additionally, 7.1% of students responded: "To create a parkour tower (game)." Here, students contemplate using Midjourney daily (see Figure 5). Furthermore, at Jhonghe Junior High School, "Today's inquiry and practical course was special, allowing me to freely choose experiments to try and collaborate with team members to discuss and solve problems," 82.3% of students agreed that it increased their teamwork abilities, with 52.9% strongly agreeing and 29.4% agreeing. Additionally, 94% of students, after the day's course, understood why materials like straws and rubber bands would make a straw rocket fly and how to modify the structure to control the flight distance. Here, it shows that students learn relevant knowledge from the course and think about how to make straw rockets fly farther (see Figure 6). Overall, students responded positively to the learning outcomes of this course, indicating that they found the learning experience rewarding.

Figure 5

Analysis Table of Student Learning Feedback on Learning Outcomes (Xiatan Elementary School)

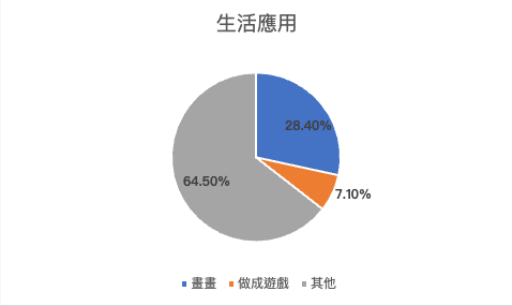
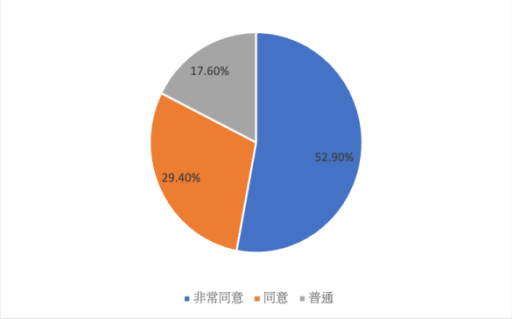


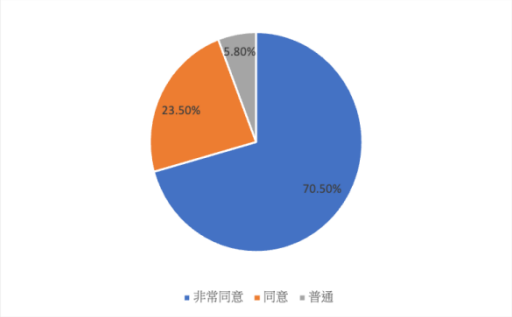
Figure 6

Analysis Table of Student Learning Feedback on Learning Outcomes (Jhonghe Junior High School)

"Today's inquiry and practical course was unique, allowing me to freely choose experiments to try and collaborate with team members to discuss and solve problems."



"After today's class, I understand why materials like straws and rubber bands can make a straw rocket fly and how to modify the structure to control the flight distance of the straw rocket."



CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The applicability of bilingual programs varies across grade levels, revealing a discrepancy in implementation at the junior and senior levels. However, students exhibit significant interest in the STEAM+E instructional model. This course helps students acquire new knowledge and develops students' understanding and application of technology-related skills.

5.1.1 Implementation Process of the Curriculum

Our instructional curriculum is primarily designed with a STEAM+E focus, employing diverse approaches throughout its progression. We conducted the curriculum in various junior high and elementary schools in Chiayi, including Luman Elementary School, Xiatan Elementary School, Jhonghe Junior High School, Daye Experimental Junior High School, etc. The course implementation process follows an interdisciplinary approach, guiding students in bilingual learning:

- AI Drawing Program "Midjourney" – Integration of vocabulary cards with barcodes, allowing quick input of card words into Midjourney’s prompt input by scanning the barcode, generating unique AI images.
- Straw Rockets – Design of a scientific toy based on the principle of reactive forces.
- Egg Parachute – Creation of a parachute using the principle of atmospheric resistance, enabling the egg to land intact on the ground.
- ChatGPT – Introduction to an AI conversational model and dispelling various myths surrounding it.
- Laboratory Equipment Introduction –Introducing standard laboratory equipment and other courses as a bilingual ball-throwing game allows us to achieve the purpose of bilingual teaching. It will enable students to participate in this course with more interest and enthusiasm.

5.1.2 Curriculum Implementation Results

Based on feedback forms and students' reactions during on-site teaching, it is evident that the learning effectiveness varies according to students' grade levels. In the curriculum at Luman Elementary School, we organized students into groups for a 10-minute timed competition using "Midjourney." Each group competed to create the most images and had to pronounce the English words they input and translate them into Chinese to get a score. We observed that younger students needed help with English pronunciation and were hesitant to speak out, so we accompanied them on stage to complete the task. In contrast, senior students confidently pronounced words, shared their creations on stage, and interacted with the audience.

During the bilingual ball-throwing activity at Xiatan Elementary School, it was noticed that younger students faced challenges pronouncing the English words on the cards, leading to excessive reliance on the teacher. On the other hand, students at Jhonghe Junior High School and Daye Experimental Junior High School demonstrated more flexibility in using English vocabulary.

The satisfaction survey within the feedback forms revealed that students responded positively to the course arrangement, finding the learning process enjoyable and informative. Students actively participated in practical implementation and strongly preferred the STEAM+E teaching approach. They also expressed a desire to engage in more similar educational activities.

5.1.3 Implementation and Reflection on the Curriculum

In implementing the curriculum, observations at Luman Elementary School revealed that lower-grade students had difficulties with English pronunciation and were hesitant to speak out, demonstrating a lower proficiency in English usage. In contrast, senior students were more confident pronouncing words and exhibited higher English proficiency. Striking a balance in word selection proved challenging, highlighting the need for age-appropriate teaching materials. Adjustments were made during the course to prioritize students' understanding, and game elements were incorporated to enhance engagement without forcing a strict English-only approach.

At Xiatan Elementary School, students preferred the ball-throwing activity, indicating its effectiveness for future teaching. However, the difficulty level of vocabulary cards for lower-grade students prompted reconsidering card design and the need for additional guidance. Group allocation strategies were also adjusted to evenly distribute

students of each grade evenly, preventing early discouragement. Over-assistance for junior-grade students was recognized as a potential pitfall, as it might lead to excessive dependence on teachers and hinder independent thinking. Considering junior high school students' existing English proficiency, the curriculum materials were prepared in English and Chinese. While attempting to complete English instruction, it was observed that speaking too quickly or using only English caused students to disengage, disrupting the lesson flow. Eventually, a hybrid approach with half English and half Chinese was adopted, improving learning conditions. However, this experience highlighted the inadequacy of bilingual education in Taiwan, as students were not accustomed to fully English-taught classes.

In conclusion, there may be more than a purely bilingual approach to bilingual education in Chiayi's junior high and elementary schools. Adopting a fully bilingual method could hinder students' knowledge absorption and create challenges in engagement.

5.2 Suggestion

5.2.1 Curriculum Design Framework

If the STEAM+E curriculum model is implemented in elementary schools, using Chinese as the primary language and English as a supplementary language is recommended. A balanced approach with an equal mix of English and Chinese is suggested for junior high schools.

5.2.2 Learning Effectiveness Assessment Tools

The assessment tools for this course include worksheets and feedback forms. Worksheets facilitate a quicker transition into the learning state for students and enhance the integration of the curriculum with mathematics, arts, engineering, and English. This integration ensures that practical implementation is genuinely embedded in the subjects, representing a highlight of the course.

Feedback forms provide a better understanding of students' learning statuses, facilitating further course adjustments. While creating worksheets and feedback forms may be time-consuming, following a standardized format to improve efficiency is recommended.

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Appendices

Appendix 1

Bilingual ball-throwing game

Design games to increase the interactivity of student learning.

Appendix 2

Students' AI drawing works

They are creating unique artworks by combining AI drawing software with humanistic literacy.

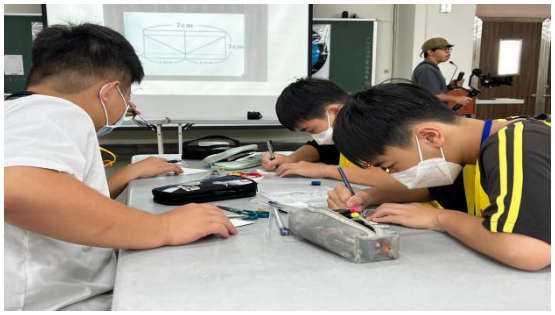
Appendix 3

Xiatan Elementary School class record (AI drawing)




Appendix 4

Chunghwa Junior High School Class Record (Straw Rocket)




Appendix 5

Jhonghe Junior High School (Testing and Competition Sessions)

Testing the straw rocket's jet distance, explosive power, and accuracy separately.






Appendix 6

Egg Parachute Implementation (Teaching, Testing, Volunteer Awards)



Appendix 7

Film Appreciation Symposium

Appendix 8

Jhonghe Junior High School (AI Drawing)


發表1


發表2


GAME RULES: