A STUDY OF TEACHING DESIGN FOR INFORMATION TECHNOLOGY COURSE BASED ON STEAM EDUCATION CONCEPT

CASE STUDY: CHINESE PRIMARY SCHOOL

YAO LU

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STUDENT	MS. YAO LU
PROGRAM	MASTER OF EDUCATION PROGRAM IN INNOVATIONS IN LEARNING AND TEACHING
FACULTY	SCHOOL OF INTERDISCIPLINARY TECHNOLOGY AND INNOVATION SRIPATUM UNIVERSITY
ADVISOR	ASST.PROF KANYARAT SRIWISATHIYAKUN, ED.D.

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AUTHOR Ms.Yao Lu

ADVISOR Asst.Prof Kanyarat Sriwisathiyakun, Ed.D.

DEGREE Master of Education Program in Innovations in Learning and Teaching

FACULTY School of Interdisciplinary Technology and Innovation
Sripatum University

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ABSTRACT

This study mainly uses the literature analysis method, survey research method, and action research method. There are three objectives: 1) To analysis the teaching status of the primary school curriculum,2) To study the process of a successful STEAM education concept teaching design,3)To study the feasibility process and implementation of primary school teaching design under the STEAM education concept.

The results of students' processing and expression ability, practical ability, and teamwork ability, SPSS paired sample test P<0. 05, indicating a significant improvement. It is helpful to the development of students' interdisciplinary problem solving ability, the cultivation of social responsibility, and the development of core literacy.

ACKNOWLEDGMENTS

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YAO LU

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CHAPTER 1

INTRODUCTION

Background

For a long time, the curriculum in school education has been taught in different disciplines and is divided into segments. It is easy to ignore the needs, background and students life, which can easily lead to the neglect of the practical needs of contemporary social life, and it can easily lead to the separation of disciplines. It restricts the students 'vision and restricts the breadth of students' thinking.

STEAM is an advanced educational concept originated in the United States, and it is an educational approach that uses science, technology, engineering, art, and mathematics as an opportunity to guide students' inquiry, dialogue, and critical thinking. Combining the knowledge of the five college subjects, we are committed to cultivating students' systematic thinking ability in STEAM education, let children learn knowledge in practice, cultivate practical ability in practice, and form scientific thinking, so that children can build up their understanding of the world , Through the cultivation of practical ability, help children improve their ability to solve problems in the future.

The 21st century is the challenge of the world's scientific and technological revolution and the knowledge economy. The wealth created by science and engineering accounts for a higher and higher proportion in the national economy. Scientific and technological innovation is receiving more and more attention. Countries around the world are stepping up their technological innovation strategies. Cultivating students' innovative spirit and ability has become the consensus of the international community, and the cultivation of innovative talents depends on innovative education.

For students, the entire school community and the whole society, the benefits and value of STEAM education are enormous. Therefore, it has become one of the important trends in global school education.

Research Objectives

This study is mainly aimed at the primary school curriculum, under the guidance of STEAM education theory, the primary research teaching design research, the main research contents are as follows:

1. To analysis of the teaching status of the primary school curriculum.
2. To study the process of a successful STEAM education concept teaching design.
3. To study the feasibility process and implementation of primary school teaching design under the STEAM education concept.

Definition of terms

STEAM education

STEAM (Science, Technology, Engineering, Art and Mathematics) is a "post-disciplinary discipline", the establishment of this discipline is based on the fusion of different disciplines, forming the originally dispersed disciplines into a whole.

Chinese primary information technology

China implements nine-year compulsory education, including six years of primary school and three years of junior high school. Students are between 6 and 15 years old. The beginning of the critical first stage is also the stage where students learn language knowledge. Information technology computer programs are also a language. It is very important to study at those ages.

Teaching design

The process of teaching design is not a one-way straight-line process, it is mainly composed of iterative analysis, design, implementation, evaluation, and improvement.

Expected Benefits

Through the analysis of the teaching status of primary school curriculum, it is expected to better discover the problems in the current teaching process, analyze the process of successful STEAM teaching design, and provide effective teaching project ideas for teachers currently engaged in primary school information education design.

Conceptual Framework

The teaching characteristics is the independent variable, Students learning outcome is the dependent one. The relationship between the two is that, if the teaching characteristics is not effective or does not produce effectiveness, it may affect the students' performances inside the classroom and make the students learn nothing or they will not gain enough and more knowledge.

Independent variable Dependent Variable

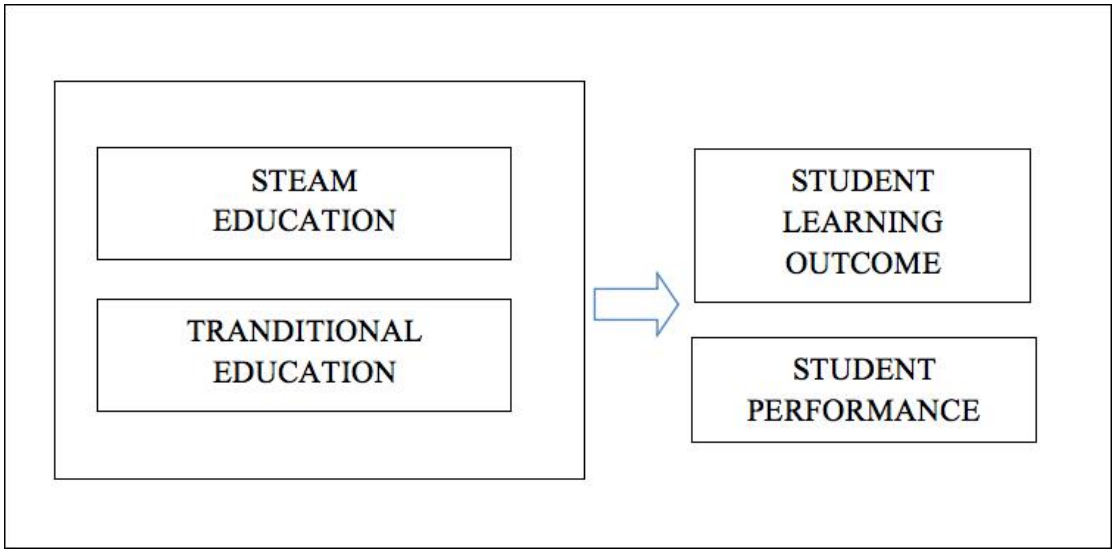

Figure 1 Conceptual Framework

CHAPTER 2

REVIEW OF LITERATURE

STEAM education

The learning process is a process in which learners themselves actively participate in the process of constructing knowledge and independently build their own knowledge system based on the original knowledge structure. Compared with traditional classroom teaching, teachers have become the mentors and supporters of student learning, or will become students' learning partners, encouraging students to trial and error and insight. It pays more attention to the process of students' independent exploration and hands-on practice, so it plays an important role in the implementation of project-based learning courses based on the STEAM concept and the design of information technology courses.

Teaching design

Teachers can recommend topics for project selection in the teaching design, starting from actual life experience or related to student life and combining school and student characteristics. The choice of subject should be dynamic and open, so that students can meet the requirements of teaching goals without losing their personality development.

Information technology

First of all, the primary school information technology education curriculum has a real situation. Starting from the real life and development needs of students, through the process of inquiry, design, production, experience, etc., to cultivate students' comprehensive quality. Second, the primary school information technology education curriculum is comprehensive. Pay attention to the mutual penetration and connection between knowledge, combine brain thinking with hands-on operation, and promote the comprehensive development of students. Finally, the primary school information technology education curriculum is a curriculum that focuses on comprehensive literacy. In project-based learning, combined with digital learning, the knowledge structure, way of thinking, and practical skills are fully utilized, using digital tools to solve problems and cultivating students' core literacy.

Chinese primary school

The Chinese primary school information technology curriculum is to improve each student's comprehensive literacy as the overall goal. Through the learning of the course, students can develop interest in the areas involved in the course, experience hands-on activities, gradually improve their ability to solve practical problems and hands-on skills, and gradually form correct values and necessary qualities.

CHAPTER 3

RESEARCH METHODOLOGY

Research design

This research mainly adopts the literature analysis method, investigation research method and action research method.

1. Literature analysis method

Relevant literature search on STEAM education related websites, in-depth understanding of current research results and development trends related to this research at home and abroad, and comparative analysis, sort out commentary, summary text for the current project teaching design research status and STEAM education Idea analysis.

2. Questionnaire survey method

Before carrying out action research, this study conducts a questionnaire survey on classmates to understand the basic situation of the learners, emotional attitudes, etc., to confirm the students' current knowledge structure level and the students' needs for curriculum projects, and to combine the current primary school curriculum learning Principles and schemes, sum up the schemes of primary school curriculum teaching design under the STEAM education concept of current learners.

3. Action research method

Summarize the preliminary process obtained by the analysis, conduct project teaching design, conduct action research respectively. And through experimental research, the students' interdisciplinary learning ability, problem-solving ability, and emotional attitude were analyzed. The quantitative results were analyzed with statistical software SPSS and Excel to verify the effectiveness of the plan.

Population and Sample

Through observation of the teaching of the primary school curriculum and interviews with teachers, understands that the experimental school has opened technology courses for students, and the students have a simple understanding of the courses. Before the start of the experiment, Class 3 Grade 4(a total of 60 students) were selected to participate in the pre-investigation survey. After the experiment, we conducted a survey on the teaching effect of these 60 students. According to the survey results, the 60 students before and after the experiment were paired and verified.

Research Instruments

The instrument was used in the study was an interview survey and questionnaire which determines the STEAM education and student performance, learning outcome, and student satisfaction.

This interview survey for the teacher has nine questions (Do not count scores) and

student comprehensive interdisciplinary learning ability, Nine indicators, each with 5 points, full 45 points.

Secondly, there are two paper-based questionnaires, the questionnaire was made by the13 researchers, to ensure the gathering of reliable and valid data. Pre-test made by 13 questions. which combine with multiple-choice, question, and answers. The content is about students ' learning situation before STEAM teaching.and Post-test made by 16 questions. The content is about student level of satisfaction.

Data collection procedures

In order to collect more data and better analyzing, I prepared a test before the study and after study for better comparing.

Step one: Through observations and interviews with 5 teachers, we discover the existing problems in current information technology education.

Step two: Pre-test questionnaire for primary school students' information technology course study status survey, 13 multiple-choice questions.

Step three: Conduct STEAM interdisciplinary learning, learning evaluation form, a total of nine indicators, each with 5 points.

Step four: Project design and implementation post-test teaching satisfaction survey questionnaire.

Data analysis

Analysis of Comprehensive Interdisciplinary Learning Ability

Interdisciplinary comprehensive learning ability is a comprehensive analysis of the results of the three aspects of the investigation of students' information processing and expression ability, hands-on practical ability and teamwork ability. The information processing and expression ability investigated the subjects from three aspects: language expression, practical expression, and word expression. The hands-on practical ability evaluates the subjects from three aspects: project design, project completion, and result analysis. Teamwork ability comprehensively evaluates students from the sense of cooperation, cooperation skills, and spirit of cooperation.

For example, as shown in Figure 2, the students' comprehensive interdisciplinary learning ability is presented in the form of radar charts. In these three aspects, students will be scored under nine specific scoring dimensions. This comprehensive ability distribution map makes the formative evaluation given by the teacher to students clear, the advantages of the students in a certain aspect and the areas that need to be improved are obvious, and at the same time, the development tendency of the students' ability after learning through the project is fully collected.

Figure 2 Student score radar chart example

Through the comprehensive analysis of the project or texts completed by the students and the performance of the collaboration, the highest score for each item is five points.

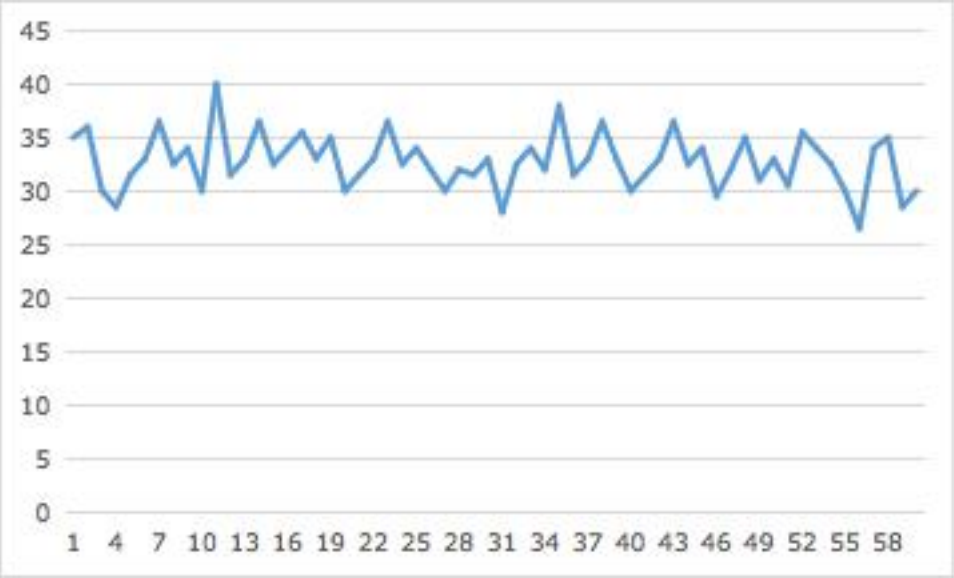

Figure2 Class 3 Grade 4 all student score line chart

It can be seen from the figure above that the students' ability to process and express information, practice and teamwork skills have improved significantly, indicating that students have recognized the importance and necessity of comprehensive learning, and have a sense of collaboration in the process of project learning. The ability to collaborate has improved.

	Dimension	N	Mean	Standard deviation	t value	Sig
1	Processing and expression ability	50	-0.520	1.147	-3.205	0.002*
2	Practical ability	50	-0.880	0.746	-8.340	<0.001*
4	Teamwork ability	50	-1.020	0.892	-8.087	<0.001*

Table 1 Student learning ability pre-test and post-test results

Therefore, after passing the project teaching design under the STEAM education concept, teachers should pay attention to adding group joint research tasks in reasonable circumstances in the project design to improve students' practical ability and information processing and expression ability. When conditions permit, it is recommended to add an evaluation of student group activities to the teaching evaluation. This will not only help students continue to cooperate and explore the motivation but also stimulate students' sense of self-efficacy and cultivate collective ideas through various evaluations.

CHAPTER 4

RESULTS

The objectives of this research were,

1. To analysis of the teaching status of the primary school curriculum.
2. To study the process of a successful STEAM education concept teaching design.
3. To study the feasibility process and implementation of primary school teaching design under the STEAM education concept.

Part 1. To analysis of the teaching status of the primary school curriculum.

Collect data through questionnaire surveys and teacher interviews to investigate the current status of the primary school information technology curriculum project teaching to understand the current situation and problems of the primary school information technology curriculum project teaching. The questionnaire consists of single-choice, multiple-choice and subjective questions. A total of 60 questionnaires were distributed.The analysis of the collected questionnaires and interview data led to the following conclusions:

1) The choice of the theme of the teaching project is out of the real-life of the students

Through a questionnaire survey of students and interviews with teachers, it was learned that in the current primary school information technology project teaching, the choice of theme is mostly based on the topics involved in the textbook, rather than from the real learning and daily life. The student questionnaire reflects that students also want to learn real life-related items, as shown in Figure 4. It can be seen from the figure that 50% of students want to start daily practice projects to start learning, as well as arts categories are also welcomed by students. In this regard, when choosing a theme to carry out project teaching, teachers should extract the theme of project development from the problems of students' real life and close to life to meet the learning needs of students.

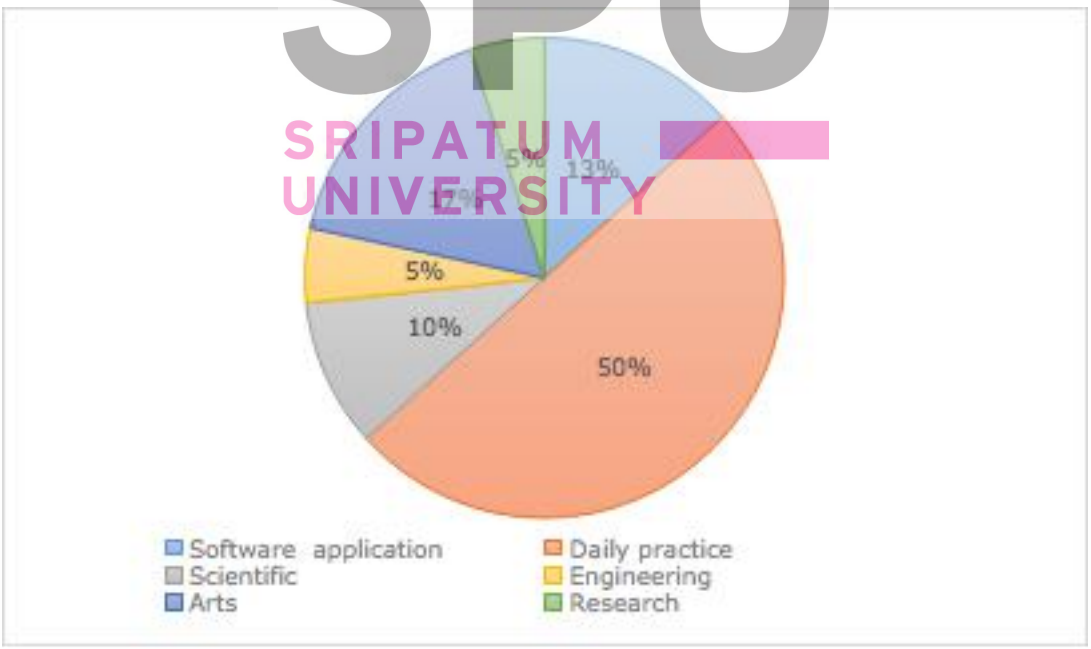

Figure 4 Students preference of project theme

2) Lack of innovation in teaching activities

Through interviews with teachers, I learned that the teaching content of the information technology curriculum is mainly determined by the textbooks, the works and results submitted by students are also fixed, and the project teaching design is single and boring, and when the project teaching is carried out, the teaching content arrangement is customized by the teachers at will, and the correlation between the front and back is weak, which is not conducive to the exertion of students' autonomy, nor is it conducive to generating open ideas and achievements for students.

3) Students do not have enough time to practice their ideas

Among the students surveyed, the main reason for not being interested in information technology courses are long lectures and less opportunities for practice. The second is that they are not interested in the tasks assigned by the teacher. Most students choose the items that they are interested.

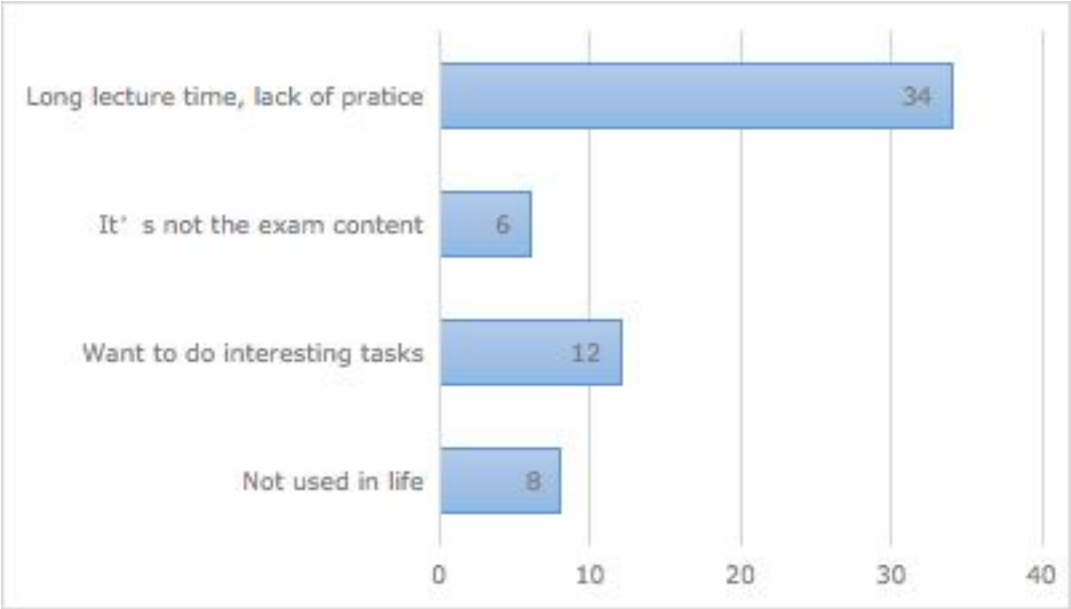

Figure 5 Students feedback of learning problem

4) **Single way to submission students' learning outcomes**

Through interviews with teachers, we learned that the way to communicate and display the teaching results of the primary school information technology curriculum project was only in the form of reports or no results at all. The students did not have a good way to display their works and results. However, what we learned from the survey of students is that the form of exchange of expected project achievements by students is very different from the current way of exchange of project achievements, as shown in Figure 6.

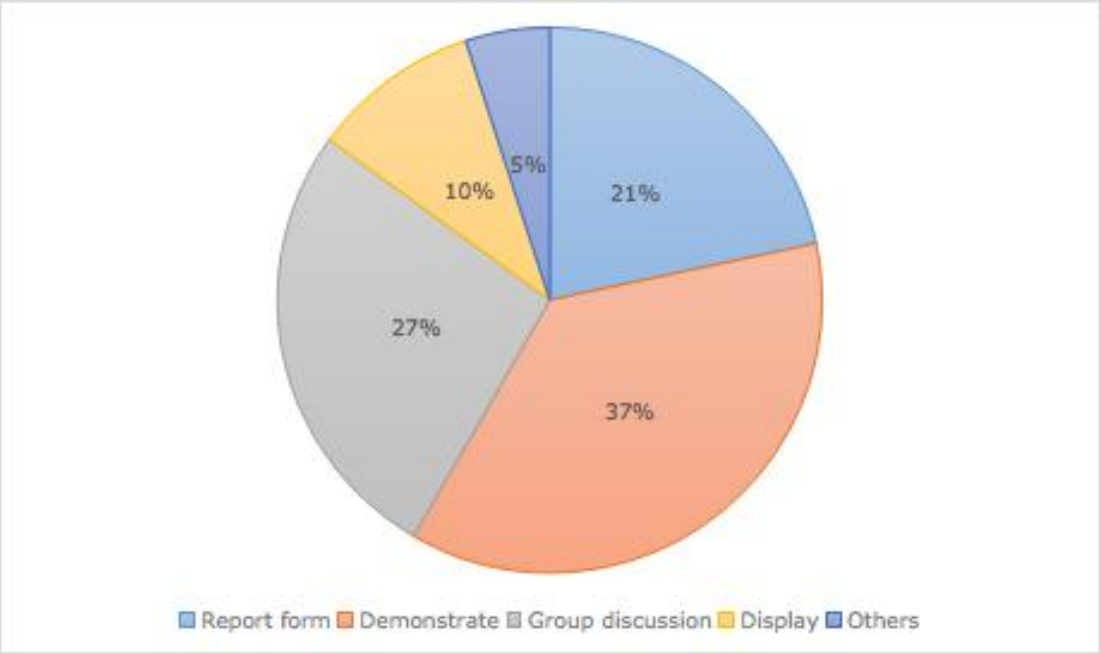

Figure 6 Student expectation task submission method

Students hope to create their own project results and get the opportunity to display and communicate. In the process of communication and presentation, you can also check and review achievements. However, when teachers and teachers carry out information technology curriculum project exchange and display of learning results, it is difficult to take into account all students and provide them with targeted personalized guidance and review learning opportunities.

5) A single way to carry out project teaching evaluation

Among the students surveyed, most of the works completed by the students were handed over to the teachers, and only a few people had the opportunity to display their works. According to the survey, the works completed by the students serve as a direct

evaluation basis for the course learning.

Figure 7 Student current submission method

In summary, the current problems in the development of information technology curriculum projects in primary schools include: choosing a theme that deviates from the real life situation of the students, teachers ignore the learner's dominant position when designing the teaching project, and do not pay attention to the independent opening of learners It is generated with a single way of displaying and evaluating results.

When carrying out the teaching of primary school information technology courses under the STEAM education concept, first of all, teachers recognize the important role of project teaching design in the development of primary school information

technology courses, and pay attention to selecting projects that originate from students' real life scenarios, which not only helps Students' practical life discovers and solves problems, which is more helpful for students to construct new knowledge on the existing knowledge experience system. Secondly, when conducting project teaching design based on the STEAM educational concept, teachers should discuss with students to discuss a reasonable project design plan. In this process, teachers give personalized and targeted guidance according to the differences of students, and provide more opportunities for students to display and exchange works, so that students can conduct secondary learning and give formative multidimensional evaluation.

Part 2. To study the process of a successful STEAM education concept teaching design.

Based on the analysis of the STEAM teaching design, in order to solve the problems in the STEAM teaching design and implementation process, the process and method of teaching design based on the STEAM education concept are initially constructed. The process includes identifying themes, interdisciplinary knowledge goals, creating scenarios, project design, activity implementation,achievement display and communication evaluation.

1)Determine the theme

The determination of the theme can recommend the theme, choose the theme of the

information technology course corresponding to the student's grade, and combine the school's characteristics and actual situation, implement the teaching content related to the information technology discipline, use information technology tools to solve practical problems, and combine the student's Practical life issues select the final theme content. At the same time, it should also follow Maslow's hierarchy of needs theory and project themes designed by students' needs, which can not only increase students' interest in learning, but also promote students' knowledge construction and ability improvement.

2)Interdisciplinary knowledge goals

Information technology teachers are the core subject teachers, and other subject teachers related to the project jointly negotiate to determine the interdisciplinary knowledge points of STEAM projects. The negotiation reflects the teaching goals of the information technology discipline and related disciplines. Students in this session must clarify the goals and requirements of the project.

3)Create a situation

Situation creation includes three aspects: environmental situation creation, software situation creation and emotional situation creation.

First, the creation of environmental scenarios. Provide students with a hardware environment related to the theme of the project to carry out the STEAM concept

primary school information technology curriculum learning, which is conducive to students' empathy, quickly bring their senses into the scene, use a variety of senses to experience the surrounding environment, and realize the existing knowledge system Migration. Second, software scenario creation. First of all, for the teaching of information technology, the application of computer software greatly facilitates students' access to resources and information processing, and can also help students complete STEAM project works. However, there may be differences in abilities among students, leading some students to acquire the knowledge of resources they want. Therefore, this requires teachers to summarize and organize the learning resources and tools that may be used, so as to give targeted help to students. Third, create emotional scenarios. In project learning, students need to communicate and discuss with their classmates to improve their own designs. In the process of cooperative learning, they learn to listen to the views and opinions of others and extract information that can help them to enrich their knowledge system. STEAM concept The primary role of teachers in the teaching of information technology courses in primary school s is to encourage students to personally participate in the creation of works and children to practice, so as to find the answers they want. Students can freely imagine and construct design works independently. Develop creative thinking, complete production, and form innovative capabilities.

4)Project design

The construction of the STEAM project is designed by the teacher based on the selected theme, combined with the current primary school information technology curriculum teaching goals, and the interdisciplinary knowledge goals involved in the previous step. STEAM project learning also pays more attention to students' independent creation and generation, so the constructed learning projects can also be selected by students spontaneously, and finally be reviewed by teachers according to the teaching objectives of this lesson, so as to determine whether students' independent design projects can be carried out. In general, the design of the project is not fixed and never changes, but it can be dynamically changed according to the characteristics of the learner's personality development. In the construction of common knowledge, it is not the inquiry of students' personal development tendency.

5)Project implementation

According to the first four steps of project teaching, students enter the implementation of the project. In this step, students need to discuss the design plan, the practice of planning plan, and revise and improve it in group collaboration to form the final result. This step requires information technology teachers to participate in the whole process, coordinate and resolve any situations that may occur in the process, track and guide students in project learning, and encourage students to personally participate in the creation of works and hands-on practice.

6)Achievement display

The information technology teacher organization group reports, reviews the achievements of the project activities, and reflects on teamwork awareness and ability. During the results exchange report, you can understand the different views of other students on the project, not only to enrich your own knowledge system, but also to learn from the experience of outstanding or failed projects.

7)Multiple evaluations

In the process of evaluation, teachers should first guide students to carry out self-evaluation and project evaluation within the group. In this process, we should pay attention to guiding students to make objective and true evaluations. At the same time, it is also necessary to combine multiple methods when developing formative evaluation. In the evaluation process, the evaluation objectives are multi-dimensional, and the three-dimensional objectives are synchronized with the five dimensions involved in STEAM. The main body of evaluation is diverse, involving individual students, mutual evaluation of students, teacher evaluation, and expert advice. The evaluation method is diversified. The evaluation system of the STEAM education curriculum is based on formative evaluation, combined with multiple evaluation methods, such as observation records and display reports.

Part 3. To study the feasibility process and implementation plan of primary school teaching design under the STEAM education concept.

After carrying out the teaching practice of primary school information technology curriculum project under the STEAM education concept, a total of 60 students of Class 3 Grade 4 participated in the satisfaction survey. The detailed analysis of the data is as follows:

1. About the degree of learning from STEAM projects

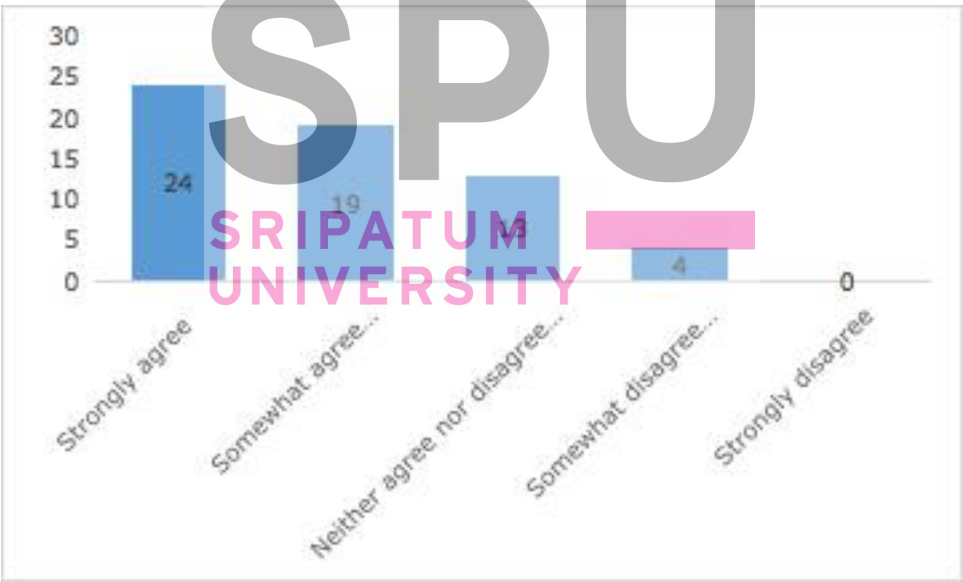

Figure 8 The degree of learning from STEAM projects

From the above picture, it can be clearly and intuitively understood that after students have passed the project, they subjectively judged that they have gained a lot. In the process of learning the information technology course project of the STEAM education concept, the final results and gains are not only knowledge and ability. Growth also includes the improvement of students' emotional attitudes and will. But at the same time, there are very few students who said that they have not gained anything in the course of the information technology course project of the STEAM education concept, which reminds us that we need to provide individual students with personalized and unique guidance and assistance in the development of the project.

2. About the degree of preference for STEAM projects

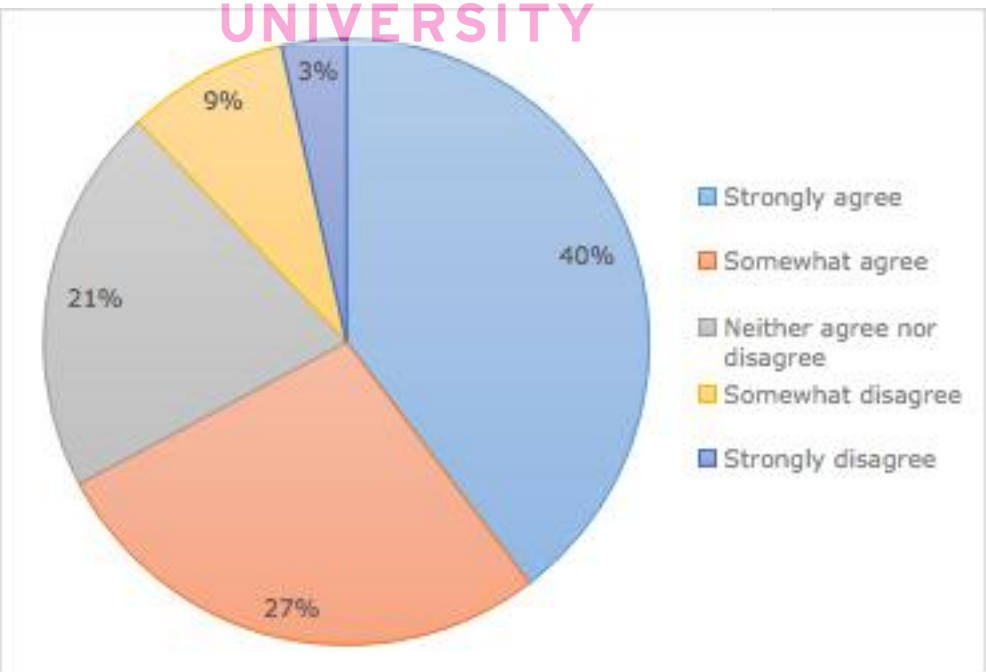

Figure 9 The degree of preference for STEAM projects

From Figure 9, it can be seen that 67% of the students in the primary school information technology course under the STEAM education concept like the selection of the theme project, and they are satisfied with the selection of the theme project, indicating the process of selecting the theme project The principles and methods used in this article are effective. At the same time, students are more satisfied with the selection of thematic projects, which can also enhance their interest in the continued development of the project.

3. About the improvement of the ability of the primary school information technology curriculum project under the STEAM education concept

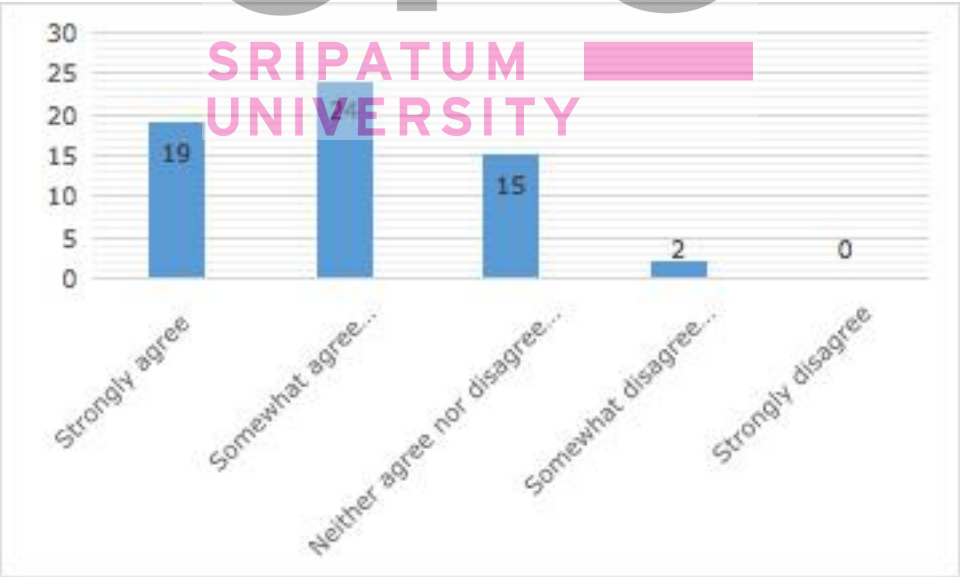

Figure 10 Student improvement from STEAM projects

From the above Figure 10, it can be observed that a lot of students have learned through the primary school information technology course project under the STEAM education concept, and expressed that they have a comprehensive understanding of interdisciplinary knowledge and can have a comprehensive understanding of the internal connections of life. So as to solve practical problems, and use external equipment to materialize the solution of the problem, feel the unique charm of science and technology and culture, establish a positive attitude, and be willing to make rational judgments. It shows that the learning design of the primary school information technology curriculum project under the STEAM education concept is conducive to cultivating various abilities in STEAM literacy, but the degree and direction of ability development between students are different. However, there are also very few who think that they are unable to improve their abilities, which reminds teachers to help students recognize themselves and cultivate a sense of self-efficacy.

4. Analysis of the classroom atmosphere of the project learning room

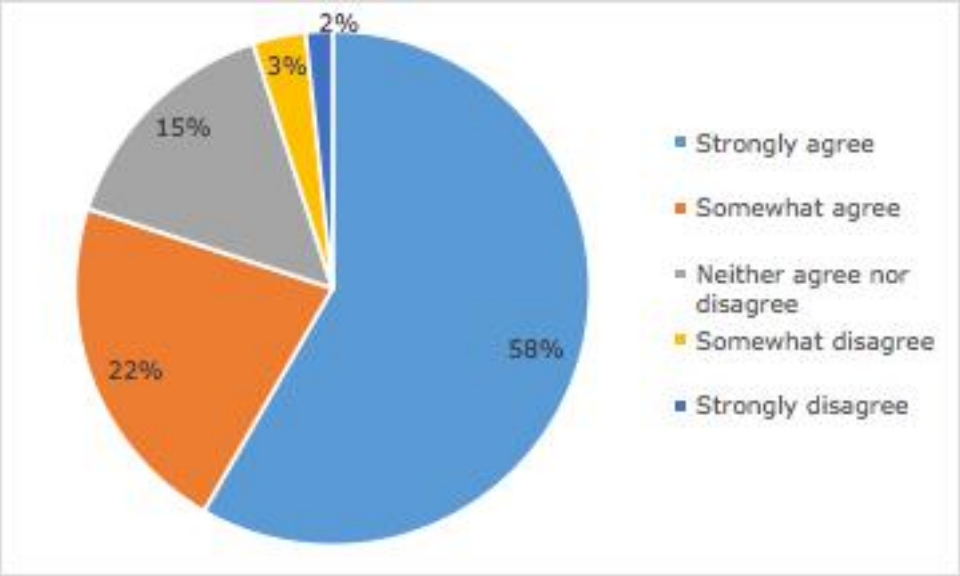

Figure11 Student like STEAM classroom atmosphere

It can be clearly seen from Figure 11 that among the students participating in the satisfaction survey, because different students may have different learning styles, only one student does not like the classroom atmosphere of the primary school information technology course project under the STEAM education concept. Therefore, under the STEAM education concept, the classroom atmosphere of primary school information technology course project teaching is satisfied by most students. An open and orderly classroom atmosphere is conducive to mutual communication and collaboration between students. The collision of different views may stimulate more creativity possibility.

5. Regarding continued STEAM project learning

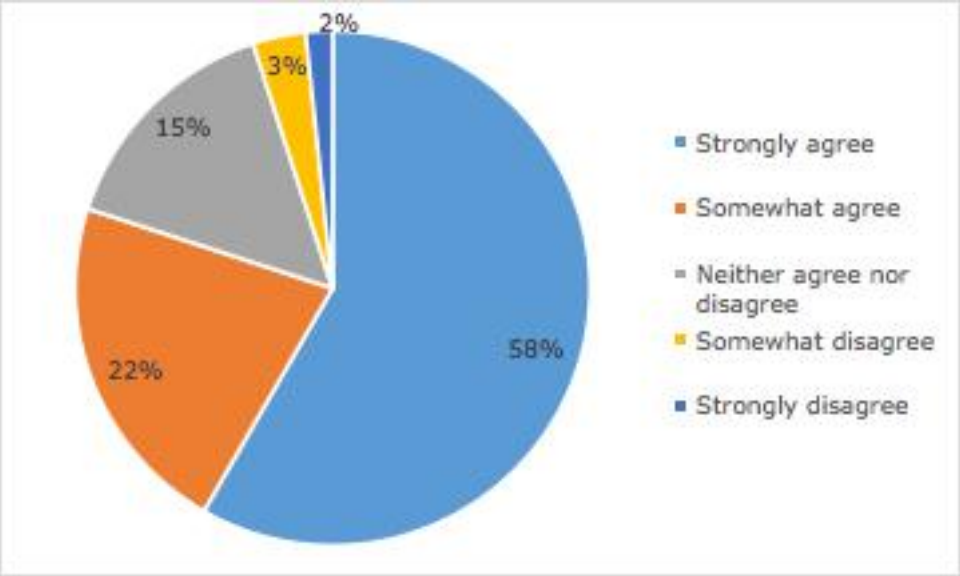

Figure12 Regarding continued STEAM projects project learning

From Figure4-10, it can be seen that 95% of students want to continue the primary school letter under the STEAM education concept.

Information technology course project learning. The primary school information technology course project teaching under the STEAM education concept provides a lot of space for students to exert their autonomy. The teacher is not to instill the students with hands and feet, but to encourage students to explore other feelings within the scope of the curriculum. Subject of interest. Most students hope that the teaching of this project will continue. This is affirmation of the project design process, plan and teaching practice. A small number of students do not want to continue, indicating that there are still individual cases that are not handled properly, which encourages the continued improvement of this research power.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

The objectives of this research were,

1. To analysis of the teaching status of the primary school curriculum.
2. To study the process of a successful STEAM education concept teaching design.
3. To study the feasibility process and implementation of primary school teaching design under the STEAM education concept.

Conclusions

The goal of STEAM education requires that the development of primary school information technology courses start from real problems and transform the problems that you want to explore into projects. Through exploration, design, practice, etc., Cultivate students' comprehensive qualities such as problem-solving, practical ability, and creative thinking, and cultivate talents with global competitiveness for the future. Then, it is very necessary to explore and exhibit primary school information technology project teaching that not only meets the requirements of the new curriculum reform but also meets the development needs of students. Problems were found in the action research, and action research was used to solve and improve them. The following content was completed :

Part 1. To analysis of the teaching status of the primary school curriculum.

1) The choice of the theme of the teaching project is out of the real-life of the students

2) Lack of innovation in teaching activities

3) Students do not have enough time to practice their ideas

4) Single way to submission students' learning outcomes

5) A single way to carry out project teaching evaluation

Part 2. To study the process of a successful STEAM education concept teaching design.

Based on the analysis of the STEAM teaching design, in order to solve the problems in the STEAM teaching design and implementation process, the process and method of teaching design based on the STEAM education concept are initially constructed. The process includes identifying themes, interdisciplinary knowledge goals, creating scenarios, project design, activity implementation,achievement display, and communication evaluation.

1)Determine the theme

2)Interdisciplinary knowledge goals

3)Create a situation

4)Project design

5)Project implementation

6)Achievement display

7)Multiple evaluations

Part 3. To study the feasibility process and implementation plan of primary school teaching design under the STEAM education concept.

71% student think them learning from STEAM projects

67% student agree them preference for STEAM projects

71% student agree them get improvement from STEAM projects

80% student like the STEAM classroom atmosphere

80% student regarding continued STEAM project learning.

Discussions

First of all, education is a long and tortuous and complicated process, which requires not only time and energy but also support and cooperation from multiple parties. Due to the limitation of the hardware and software conditions of the practice site, the study only selected one class in the fourth grade for the study, which has limitations in sample selection.

1. Analyze the existing literature and research results of scholars, and conclude that the elements of the primary school information technology curriculum teaching project under the STEAM education concept are the seven elements of the project theme, scenario, project, goal, activity, outcome, and evaluation.

2. Analyzed the concept, nature, goal, and implementation of the project teaching of primary school information technology curriculum, and concluded that the relevant principles of primary school information technology curriculum teaching design under the guidance of STEAM education concept are really situational, open, and generative principles, The principle of creativity, interdisciplinary integration, cooperation, and learner-centered principles.

3. Construct and improve the teaching design process, which includes: determining the theme, creating the context, project design, determining the goal, implementing the activity, displaying results, and multiple evaluations. The seven parts are organically combined and recycled to make project teaching more effective.

Recommendations

STEAM education concept and project teaching emphasize the need to start from real problems, transform the problems that you want to explore into projects and cultivate students' comprehensive qualities such as problem-solving, hands-on practical ability, and creative thinking through exploration, design, and practice, so as to cultivate the ability for the future Globally competitive talents. Therefore, it is necessary to explore a universal primary school information technology project teaching process that meets the requirements of the new curriculum reform and meets the needs of student development.

If another researcher wanted to further explore this topic, it would be best to do a broader study. My research was only done in 60 students but should be taken place in more schools more class.Future researchers could observe student innovation and curiosity compare to STEAM education and traditional education.

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APPENDICES

Appendix Ⅰ

Teacher Interview Outline

1. Where does your understanding of comprehensive practical courses and project teaching come from? Where do the items in the classroom come from?

_____

2. Project learning or traditional classroom, which one do you prefer? why?

_____

3. In the past, what was the way of result exchange and evaluation in project teaching?

_____

4. This experiment is based on STEAM project learning. What do you think of this learning method?

_____

5. The experimental project is carried out strictly in the order of sub-projects. Do you think it is appropriate?

_____

6. How should teachers guide students during group learning? How to play the role of group leader?

_____

7. Do you think the effect has met expectations?

---

8. Is it a big challenge for teachers to add formative evaluation to classroom teaching with larger class capacity?

---

9. Regarding the teaching of STEAM projects, do you have suggestions for me to learn from?

Appendix II

Pre-test Questionnaire

Pre-test Questionnaire for the Investigation of the Status Quo of the Information Technology Curriculum of Primary School Students Classmates:

Hello there! Due to the needs of research, we are now going to conduct a survey of the current learning situation of "Information Technology Course Learning Activities" for everyone. We do not care about the answers to the questions. Please choose according to your actual situation. Please fill it out carefully. (Please fill in the answer in brackets)

Thank you for your cooperation!

1. School:_____

2. Your grade:_____

3. ( ) How many information technology courses does each week take?

A. No B. One section C. Two sections D. Three sections E. Four sections

4. ( ) What is the reason why you do not like information technology courses?

A. What you don’t like to learn

B. Feeling useless

C. The learning content is too simple

D. The teacher is boring

E. Other_____

5. ( ) Do you like the way teachers take information technology courses?

A. Absolutely not B. OK C. I like it D.Very much

6. ( ) In the information technology course, what aspects of the knowledge you have learned?

A. Software application

B. Social life experience and practice

C. Scientific and technological knowledge development

D. Engineering

E. Fine Arts, Art

7. ( ) Do you prefer to explore by yourself or listen to the teacher?

A. I try to do when teacher teaching, it helps me learn faster

B. Listen to the teacher first, then complete it by myself

C. The teacher left the task, I will investigate it myself, and ask the teacher if there is any problem in the process

D. Other_____

8. ( ) In the information technology course, when the teacher organizes everyone to cooperate and communicate, will you actively participate in the cooperation?

A. No, I like to listen to the teacher

B. No, I like to think independently

C. No, I don’t like my classmates

D. Yes, I like to share my thoughts with you

E. Yes, I want to hear what other people think

9. ( ) In the discussion, what do you do when the students' opinions are different from yours?

A. He/She/Them was wrong I will ignore

B. He/She/Them was wrong, immediately refuted

C. He/She/Them is not right, but there are also merits. We will discuss later

D. Other

10.( ) What kind of activity theme do you like?

A. Technology innovation B. Technology application C. Software programming

D. Animation design class E. Theory research class

11. ( ) After completing the task (homework) in class, what will your work be?

A. Submit to the teacher B. Report in the form of report C. Save on your own USB

D. Other_____

12. ( ) How do you like to show your practical results?

A. Exchange and discussion B. Report format report C. Performance D. Practical operation display E. Other_____

13. How do you want teachers to take information technology classes?

_____

Appendix Ⅲ

Interdisciplinary Comprehensive Learning Ability Evaluation Form

Evaluation Standard			
Processing and expression ability	Language	4	Students are very clear, complete sentences, and can use appropriate subject language.
		3	Students have clearer expressions, more fluent sentences, and can use certain subject language.
		2	The student's expression is not clear and there are pauses.
		1	Students cannot express clearly and cannot form sentences.
	Written	4	Able to write standardized research reports, concise language, and fluent sentences.
		3	Able to write more standardized research reports, written in words, clear language, and fluent sentences.
		2	Can't write standardized research reports, and the sentences are verbose and unclear
		1	Cannot write research reports.
	Practical	4	Can use multimedia technology to make exquisite slides and display them, with abundant content and clear structure.
		3	Can use multimedia technology to make slides and display them, the content is rich, and the structure of the practice table is clear.
		2	Can make slides, with simple content and general structure.
		1	Cannot make a PPT.

Practical ability	Design	4	Students can design elaborate experimental schemes related to the design theme
		3	Students can design more elaborate experimental schemes related to project design research topics
		2	Able to design simple experiment scheme
		1	Students can't design experiments
	Completion	4	Students can complete the experimental tasks with a high degree of completion
		3	Able to complete the experimental tasks and the completion degree
		2	Can complete the experiment but the degree of completion is low.
		1	Unable to conduct or complete experiment
	Achievement	4	Students can accurately analyze and process the experimental results
		3	Can perform more complex processing and analysis of results
		2	Simple analysis of results
		1	The results cannot be analyzed.

Teamwork ability	Cooperation	4	Students actively participate in team activities and actively put forward their own suggestions and ideas
		3	Students are more active in team activities and can put forward their own suggestions and ideas.
		2	Students participate in team activities and rarely give suggestions and ideas.
		1	Students do not participate in team activities, do not give suggestions or ideas
	Skills	4	Students can complete the assignments in a timely manner with a high degree of completion.
		3	Able to complete assigned tasks and have a high level of cooperative skills.
		2	Able to complete the assigned tasks but not high completion
		1	Unable to complete the assigned task.
	Teamwork	4	Students often provide help when others need it, and actively listen to their ideas.
		3	Students can provide help when others need it and can listen to other people's ideas.
		2	Will occasionally help and sometimes interrupt or belittle others.
		1	Does not help others, often interrupts or devalues others.

Appendix Ⅳ

STEAM Teaching Satisfaction Survey Form

Students,

Hello there! This questionnaire wants to know your satisfaction about the project, anonymously, the answer does not matter whether it is right or wrong. Hope students fill in objectively. thank you for your cooperation! Select right answers from A-E into the form.

Questions	Grade					
	A. Strongly agree	B. Somewhat agree	C. Neither agree nor disagree	D. Somewhat disagree	E. Strongly disagree	
I think the choice of the project theme of this information technology course is exactly what I am interested in, and I like it very much.						
I think the difficulty of project production in this information technology course is a certain challenge for me, but it is not very difficult.						
If I have the opportunity, I hope that the future information technology courses will be taught in the form of project groups, so that I will be very happy and study harder.						
After learning through the STEAM education project and completing the results of my work, I think I have gained a lot.						
In the classroom, the atmosphere where everyone actively discusses and makes suggestions together. I like it very much and it helps me think.						
Through the STEAM education project, I feel that I have improved in one aspect or many aspects.						
Among the final results of our group, I personally completed a part.						


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