DEVELOPMENT OF FLIPPED CLASSROOM TEACHING MODEL TO IMPROVE RESEARCH ABILITY OF UNDERGRADUATE STUDENTS

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Thesis Title Development of Flipped Classroom Teaching Model to Improve Research Ability of Undergraduate Students

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ABSTRACT

This research aimed 1) to examine the factors affecting research ability of undergraduate students. 2) to develop flipped classroom teaching model to improve research ability of undergraduate students and 3) to study the results of implementing flipped classroom teaching model to improve research ability of undergraduate students. The study was conducted in three phases. Phase 1 involved 150 students and 5 lecturers from the educational research methods course at Yulin Normal University during the first semester of the 2023 academic year. These participants, majoring in primary education, helped identify factors affecting research ability. Phase 2 involved three experts validating the developed instructional model against four standards: utility, feasibility, propriety, and accuracy. Phase 3 collected data from 46 students enrolled in the course at Yulin Normal University, utilizing various research tools, including questionnaires, interviews, lesson plans, and scoring rubrics. Data analysis utilized frequency, percentage, mean, and standard deviation.

The findings were as follows:

1. The factors affecting research ability of undergraduate students included internal factors (interest, motivation and attitude, physical health) and external factors (teaching methods, time, environment, family and friends, and infrastructure). Both sets of factors impacted students' research abilities.

2. The flipped classroom teaching model was validated by experts as meeting all four standards (utility, feasibility, propriety, and accuracy) and was developed with five components: principle and rationale, objectives, content, teaching methods and materials, and evaluation.

3. The results of implementing flipped classroom teaching model to improve research ability of undergraduate among the 46 students. Specifically, 84.78% of students achieved an "Excellent" level of research ability, 15.22% achieved a "Good" level, and none were at the "Medium," "Pass," or "Poor" levels.

Keywords: Flipped Classroom Model; Research Ability; Undergraduate Students

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Qin Jianrong

Contents

Contents (Continued)

List of Figures

List of Tables

List of Tables (Continued)

Chapter 1
Introduction

Rationale

The course "Educational Research Methods" is a required course for students majoring in elementary education at Yulin Normal College. The Educational Research Methods course is usually offered in the second year of university or the third year of university, and the course is a 2-credit course with a total of 32 hours. The educational research methods course is one of the main courses to improve the research ability of college students. The objectives of this course are formulated as follows: 1) understanding the general principles of scientific research in education; basic mastery of the general steps of educational research methods and the main scientific research methods, basic knowledge. 2) learn to scientifically pose questions, find, read and analyze literature, design research programs, analyze data in a scientific way to master the scientific research results in the form of expression, writing standard scientific research papers or laboratory reports. 3) to consciously use scientific research methods to carry out research to the best of their ability, have a good ability to reflect on teaching and improve teaching, have a sense of the problem and a sense of research, and be able to skillfully choose the appropriate resources and modern information technology to carry out innovative educational research work. (Yulin Normal University, 2020).

The researcher found that most students had the lowest in research ability, could not conduct scientific research. Scientific research ability includes such constituent elements as observation, attention, memory, language expression, comprehension and thinking ability. The research ability of college students was specifically expressed in four items: 1) the ability to analyze the research dynamics and development trend in the scientific field and to determine the research direction and topic. 2) the ability to collect literature and data to process the literature and data. 3) the ability to design the research plan and to carry out the research experiments. 4) the ability to summarize the research results and to write the experimental report and thesis. Research ability can be understood as consisting of four parts. (Wang, 1985; Qiu et *al*., 2019; Zhang, 2015; Tai.et al, 2002; Jia, 2022)

So the researcher studied from the text, books and another researches and found that flipped classroom teaching model can improve research ability of undergraduate students for the advantages of flipped classroom, the following experts have done corresponding research, for example: Zhang et *al.*, (2013) believe that the flipped classroom fully respects the students' subjective position, mobilizes students' autonomy and enthusiasm, greatly improves students' learning efficiency, and promotes students' all-round development. Ye (2014) pointed out that, firstly, firstly, the concept of flipped classroom "learning before teaching and teaching by learning" allows students to learn to learn independently, which really promotes students' development. Secondly, the exploration activities centered on certain problematic situations" improve students' learning engagement. Wen (2015) argues that the flipped classroom "attaches importance to the development and utilization of digital teaching resources, the cultivation and promotion of a culture of independent learning, and the generation and construction of a symbiotic teaching system".

Dai (2016) argues that the flipped classroom constructs a learner-centred learning model, reshaping the way in which the learner's knowledge system construction method which is conducive to the implementation of quality education. Chang (2021) argues that the adoption of the flipped classroom teaching mode in colleges and universities is conducive to the cultivation of innovative and lifelong learning talents, to the independent construction of knowledge by college students, to the cultivation of the spirit of cooperation and innovation, to the enhancement of college students' subjective initiative in learning, and that the flipped classroom promotes the personalized development of students.

As mentioned above, based on the importance of research capacity development of university students, the importance of research capacity of teachers is also self-evident. Advantages of using the flipped classroom teaching model. The author recognizes the importance of studying the flipped classroom teaching model to improve undergraduate research ability. This is a highly significant study.

Research Questions

1. What are the factors affecting research ability of undergraduate students?

2. Is flipped classroom teaching model to improve research ability of undergraduate students appropriate for implementation and how?

3. What are the results of flipped classroom teaching model to improve research ability of undergraduate students?

Research Objectives

1. To examine the factors affecting research ability of undergraduate students.

2. To develop flipped classroom teaching model to improve research ability of undergraduate students.

3. To study the results of implementing flipped classroom teaching model to improve research ability of undergraduate students.

Research Hypothesis

After implementing flipped classroom teaching model, undergraduate students' research ability will be overall improved at 80% (Good Level). by implementing the flipped classroom teaching model, at least 80% of the students' research ability should be at a good level.

Scope of the Research

Population and the sample group.

Population

A total of 150 undergraduate students from three classes, majoring in Elementary Education with different levels of learning achievements, who enrolled in the Educational Research Methods course at Yulin Normal University in the second semester of the 2023 academic year, were assigned to be the population frame. These three classes are as follows:

Class A: 46 students

Class B: 52 students

Class C: 52 students

The Sample Group

The 46 students who enrolled in the Educational Research Methods course from class section A are obtained by cluster random sampling.

Independent Variable

Flipped classroom teaching model

Dependent Variable

Undergraduate students' research ability

Contents

The Educational Research Methods course consists of six modular units and 32 credit hours. The content is as follows:

Unit 1: Overview of Educational Research Methods. (2 hours)

Unit 2: Selection of Educational Research Topics (2 class hours)

Unit 3: Locating and Analyzing Literature (16 class hours)

Unit 4: Educational Research Design (4 class hours)

Unit 5: Specific Research Methods (4 class hours)

Unit 6: Writing Research Results (4 class hours)

Based on the research capacity of this study, the researcher chose Unit 3 for the experiment.

Unit 3 Locating and Analyzing Literature – the specific content is as follows:

Chapter 1: Selecting a topic (2 hours)

Chapter 2: Collecting and organizing information. (6 hours)

Chapter 3: Researching program design (4hours)

Chapter 4: Communicating or Expressing results (4 hours)

Time Frame

Semester 2 of the academic year 2023 (February to June 2024)

Advantages

1. For Students

Expanding students' learning space improves their subjective initiative. It helps them learn the course knowledge of educational research methods more effectively, enhances their understanding of basic educational research methods, and enables them to solve problems in educational practice.

2. For Lecturers

Exploring teaching strategies and methods allows lecturers to improve their teaching ability. This leads to better teaching quality and increased classroom efficiency.

3. For the University

Providing effective teaching models and practical experience benefits other school programs, enhancing the overall educational environment.

Definition of Terms

The factors affecting students' research ability refer to both internal and external factors collected from students using questionnaires and interviews with lecturers, designed by the researcher. The internal factors include 1) Interest, 2) Motivation and attitude, and 3) Physical health. The external factors include 1) Teaching methods, 2) Time, 3) Environment of friends and family, and 4) Facilities and infrastructure. These factors are based on data collected from students through questionnaires and interviews with lecturers. The results have been compiled into handouts.

The development of a flipped classroom teaching model refers to a relatively stable teaching activity structure and procedure established under the guidance of specific teaching ideas or theories. The process of developing the flipped classroom teaching model involves five components: 1) Principles and rationale, 2) Objectives, 3) Content, 4) Teaching methods and materials, and 5) Evaluation.

The model will also be evaluated by experts based on four standards: 1) Utility, 2) Feasibility, 3) Propriety, and 4) Accuracy, as outlined by Stufflebeam (2012).

Utility standards refer to the model's ability to be manufactured or used and its capacity to produce positive results.

Feasibility standards refer to the model's alignment with what teachers need and pursue in their teaching practices.

Propriety standards refer to the model's suitability for teaching and learning situations.

Accuracy standards refer to the model's degree of conformity to a standard or measure of closeness to a true value. Accuracy relates to the quality of the result

obtained when compared to the standard, which can be determined by the size of the error, encompassing both systematic and accidental errors.

Flipped classroom teaching model refers to a new teaching mode in which students need to complete independent learning tasks before class. In the classroom, students need to report on their pre-class learning and discuss problems, with teachers giving appropriate guidance. After class, students plan their own learning content and progress. The flipped classroom teaching model is designed to make students' learning more flexible, active and engaging. The flipped classroom teaching model has completely overturned the traditional classroom teaching structure and teaching process, triggering a series of changes in the role of the teacher, the curriculum model, the management model and so on. The flipped classroom into three parts: pre-class learning, classroom learning, and post-class learning. Deng (2022); Guo (2019); Zhang et *al.* (2012); Guo (2019)

Step 1: Provide a learning resource environment.

Step 2: Design pre-course practice activities

Step 3: Independent study of pre-course (students Watch the teaching video and so on),

Step 4: students report Pre-course learning, and the teacher gives feedback according to the actual situation.

Step 5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class.

Step 6: Results display, exchange and interaction.

Step 7: Evaluation feedback, suggestions for improvement.

Research ability refers to the ability of students to conduct scientific research. Scientific research ability includes such constituent elements as observation, attention, memory, language expression, comprehension and thinking ability. The research ability of undergraduate students is specifically expressed in four items: 1) The ability to select a topic, refers to analyze the research dynamics and development trend in the scientific field and to determine the research direction and topic, there are 2 standards; 2) The ability to collect and organize information, refers to collect literature and data to process the literature and data, there are 3 standards; 3) The research plan design ability refers to the ability to design the research plan and to carry out the research experiments, there are 2 standards and

4) Communication ability, refers to summarize the research results and to write the experimental report and thesis, there are 2 standards. Research ability can be understood as consisting of four parts. (Wang ,1985; Qiu et *al*.,2019; Zhang,2015; Tai.et *al*., 2002; Jia, 2022)

Undergraduate Students refer to Undergraduate students majoring in Primary education at the School of Education Sciences and studied educational research methods Course at Yulin Normal University.

Yulin Normal University refers to full time regular undergraduate colleges and universities under the jurisdiction of Guangxi Zhuang Autonomous Region.

Research Framework

This study focuses on developing a Flipped Classroom Teaching Model aimed at enhancing undergraduate students' research abilities. The model consists of seven steps: 1) Establishing a learning resource environment, 2) Designing pre-class practice activities, 3) Independent pre-course study (including watching teaching videos), 3) Students' reporting on pre-course learning with teacher feedback, 4) Addressing unresolved issues, promoting teamwork and cooperative learning in class, 5) Displaying results, facilitating exchange and interaction, and 6) Providing evaluation feedback and suggestions for improvement (Deng, 2022; Guo, 2019; Zhang, 2012).

Undergraduate students' research ability is delineated into four key components: 1) Analyzing research dynamics and identifying research directions and topics, 2) Collecting and processing literature and data, 3) Designing research plans and conducting experiments, and 4) Able to conduct academic communication, For example, Summarizing research findings and writing experimental reports and theses (Wang, 1985; Qiu et *al*., 2019; Zhang, 2015; Tai et al., 2002; Jia, 2022). Figure 1.1 depicts the research framework underlying the study.

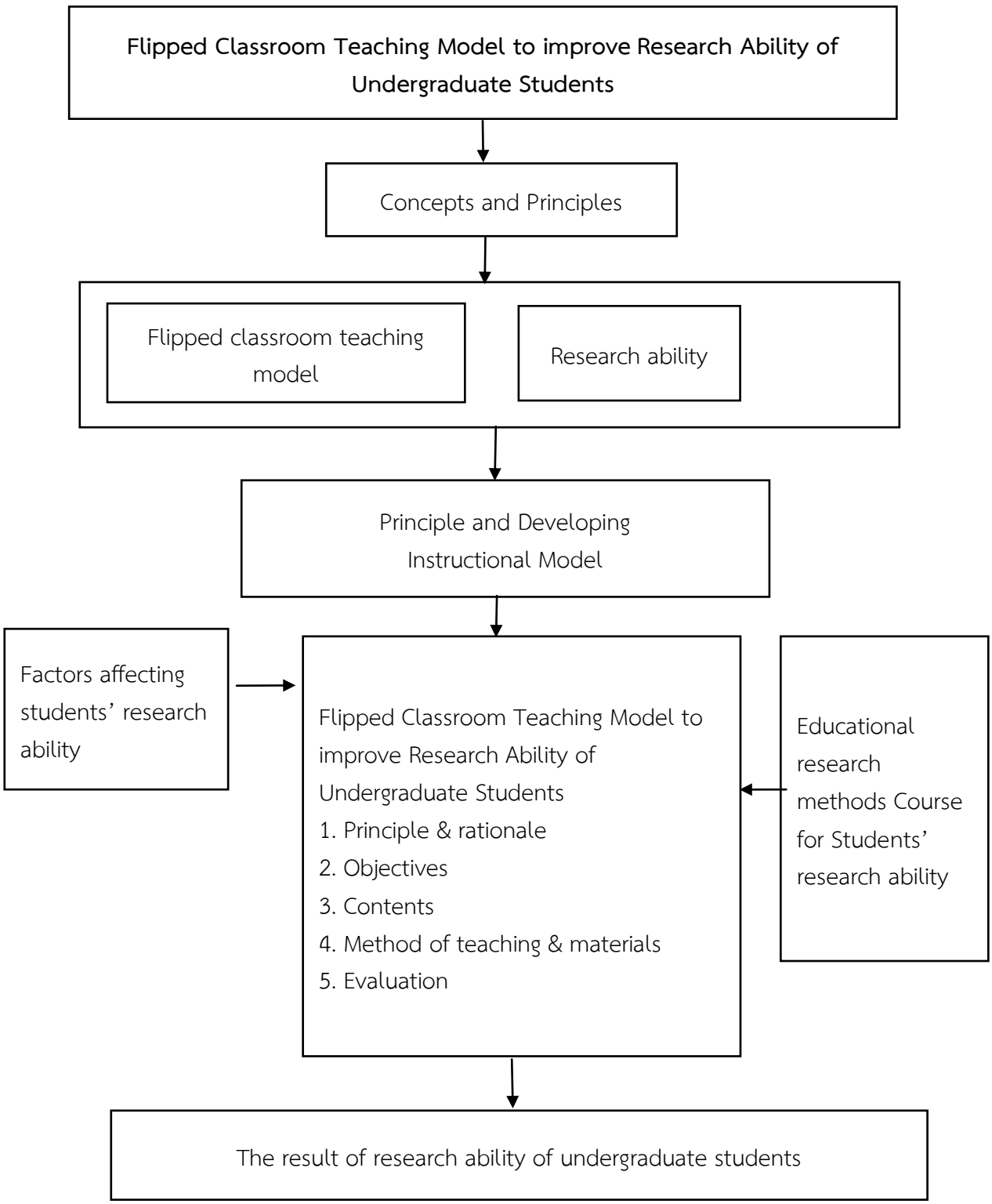

Figure 1.1 Research Framework

Chapter 2
Literature Review

In the study of "Development of flipped classroom teaching model to improve research ability of undergraduate students", the researcher studied the documents concerning the following.

1. Educational Research Methods Course, Yulin Normal College
2. Development of Instructional Model
3. Flipped Classroom Teaching Model
4. Research Ability
5. Related Research

The details are as follows.

Educational Research Methods Course, Yulin Normal College

Principle

The curriculum is the center of educational and teaching activities, which directly affects the learning outcomes of students and the quality of teachers' teaching. A good curriculum should have some basic principles to ensure that students are provided with effective instruction and good learning experiences during the learning process. Integration Implementation process. This course is an educational research methods course offered by the School of Educational Sciences of Yulin Normal College. It is a required course for undergraduate students majoring in elementary education. The Educational research methods course in this study will follow the following principles in order to improve the quality and effectiveness of the course, promote the overall development of students, and cultivate students' learning ability and research ability.

1. The principle of goal orientation. Clarifying the learning objectives of the course helps students to clarify their learning directions and goals and is conducive to teachers' targeted design and evaluation of students' learning. The objectives of this course are to enable students to understand and master the basic knowledge of educational research, while improving students' self-learning ability, improving students' ability to find problems and solve them, improving students' thinking

ability, and improving students' language expression ability. Improve students' data processing ability. To lay a solid foundation for future study and work. Cultivate teachers with strong scientific research ability to meet the needs of primary education in the 21st century.

2. Principle of student subjectivity. Respect the subjectivity of students and cultivate their learning ability and independent learning capacity. Starting from the actual needs of students, paying attention to their interests and specialties, designing diversified learning activities, stimulating students' motivation to learn, and cultivating their independent learning ability and innovative spirit.

3. Principle of resource support. Consider the supporting resources that students need for the course, such as videos, multimedia materials, PPTs, online and offline teaching resources, reference books, etc. These resources should be easily accessible and supportive of the learning process and the achievement of the objectives. These resources should be easily accessible and support the learning process and achievement of student goals.

4. The principle of inspiration. Attaching importance to the cultivation of students' thinking ability and innovation ability encourages students to actively think about inquiry, independent exploration, independent creation, problem solving, In the teaching methodology, the use of heuristic teaching methods, guiding students to inquiry-based learning, cultivating students' creative thinking, and improving students' problem-solving ability and innovation ability.

5. The principle of individualization. Pay full attention to the individual differences of students focus on cultivating students' personality development. In teaching, use different teaching methods and means to meet students' individualized learning needs, help each student discover his or her own potential and interest, and achieve individualized learning goals. (Yulin Normal University, 2020).

Objectives

Curriculum objectives are the specific goals and intentions to be achieved by the curriculum itself It prescribes certain teaching methods It prescribes certain teaching methods. It specifies the extent to which students expect to achieve all-round development of morality, intelligence and physical fitness through the course of study. It is the basis for determining the curriculum content, teaching objectives and teaching methods. According to the syllabus of the Research Methods in

Elementary Education course at Yulin Normal College, the teaching objectives are formulated as follows.

1. Learning the basics of scientific research in education, understanding the general principles of scientific research in education; basic mastery of the general steps of educational research methods and the main scientific research methods, basic knowledge.

2. Students master the basic skills of scientific research: learn to scientifically pose questions, find, read and analyze literature, design research programs, analyze data in a scientific way to master the scientific research results in the form of expression, writing standard scientific research papers or laboratory reports.

3. Form a scientific and rigorous sense of educational research, a realistic scientific attitude and a correct way of thinking, be able to consciously use scientific research methods to carry out research to the best of their ability, have a good ability to reflect on teaching and improve teaching, have a sense of the problem and a sense of research, and be able to skillfully choose the appropriate resources and modern information technology to carry out innovative educational research work.

Curriculum Structure

The Educational Research Methods Course consists of 6 units and 32 hours. They are Overview of Research Methods in Education. Selection of Educational Research Topics. Locating and Analyzing Literature. Educational Research Design. Specific Research Methods. Writing Research Results.

Table 2.1 Unit and Contents Used in the Present Study

Unit	Chapter	Contents	Times (32 hrs.)
1. Overview of Research Methods in Education.	1.1 Basic knowledge of educational research methods	Foundations, characteristics, types and processes of educational research methods.	2 hrs.
2. Selection of Educational Research Topics.	2.1 Finding research questions	Tips and tricks for topic selection. Hot issues in education research	2 hrs.
3. Finding and analyzing literature	3.1 select a topic 3.2 collect and organize information. 3.3 Research program design 3.4 Communication or Expression of results	Selecting a topic, conducting a literature search, literature management, bibliographic analysis and synthesis.	16 hrs.
4. Educational Research Design.	4.1 Methodology and content of educational research design	Writing the application form for the project	4 hrs.
5. Introduction to Commonly Used Research Methods	5.1 Questionnaire method, interview method, observation method, etc.	Questionnaire method, interview method, experimental method, observation method.	4 hrs.
6.Writing Research Results.	6.1 Presentation of research results. 6.2 Techniques, methods, specifications for writing research results	Research paper writing, investigation report writing, conducting research reports	4 hrs.

(Yulin Normal Uiversity, 2024)

The researcher choose Unit 3 for implementing the developed model in the present study.

Development of Instructional Model

Definition of Instructional Model

There are many academics defined about definition of instructional model as follows:

Regarding the meaning of teaching mode, researchers in different countries have different views. The more representative one is the American scholars Joyce & Well (1972). They state that a model of teaching is a pattern or plan which can be taken up with a view to shape a curriculum or course to select appropriate instructional material and to guide the teacher's action. They put forward the classification system of teaching mode, which divided the teaching modes into four categories: cognitive development-centered teaching mode, social-centered teaching mode, activity-centered teaching mode and personality development-centered teaching mode. Li (1996) refers to definition by a comprehensive report on the third Annual Conference of National Teaching Theory on Instructional Model. (A comprehensive report on the third Annual Conference of National Teaching Theory, as cited in Li, 1994). There are roughly three definitions of teaching mode, the first one is that the mode belongs to the category of methods. Some think that the pattern is the method, and some think that the pattern is the synthesis of many methods. The second one holds that there are both connections and differences between modes and methods. Each method shows different spatial structures and time series under specific time, place and conditions, thus forming different modes. The third one is that the model is closely related to the category of "teaching structure-function". The teaching model is the subjective choice of teaching structure made by people under the guidance of certain teaching ideas.

With the development of teaching mode, the definition of "teaching mode as a plan" has been basically eliminated. Xu et *al.* (2021) define the teaching mode as: under the guidance of certain teaching theories, In order to achieve specific teaching objectives, appropriate teaching means and strategies are arranged in each teaching program. The sum of the teaching framework with flexibility and stability and its related teaching evaluation. Through the research of teaching mode, the pressure of

preparing lessons for teachers can be reduced, and the purpose of improving the learning effect of students can be achieved. These views reveal the connotation of teaching mode from different aspects and provide useful references for us to further explore.

From the definition above, it can be concluded that instructional model refers to a teaching structure, which is simply a typical and stable teaching procedure or stage established under the guidance of certain teaching ideas. It is gradually formed by people constantly summarizing and improving teaching in long-term teaching practice. It comes from teaching practice and guides teaching practice in turn. It is an important factor affecting teaching. Tang (2015) defined instructional model as: mathematical mode refers to a relatively stable, systematic and theoretical model of teaching activities formed based on certain teaching ideas and theories. Instructional model is the concretization of teaching theory with practice and a systematic generalization of teaching experience. It can be formed either directly from the rich teaching practice experience through theoretical generalization, or it can be formed after several experiments by putting forward a hypothesis under the guidance of certain theories.

Components of Instructional Model

Li (1996) & Qu (2005) have been identified the complete structure of modern classroom teaching model generally includes five factors: theme, objective, condition, procedure and evaluation, which are interdependent and interact with each other to form a complete teaching model.

1) Theme: The thematic factor of the teaching mode refers to the teaching thought or theory on which the teaching mode is based. In the structure of teaching mode, the theme factor is not only an independent factor, but also permeates or contains in other factors, and other factors are established according to the theme factor. For example, the thematic factor contained in the structure of foreign information processing teaching mode is the theory of information processing, and the thematic factor contained in the structure of non-director teaching mode is the humanistic teaching thought.

2) Goals: Any teaching model points to a certain teaching goal and is created to accomplish a certain teaching goal. Objective is the core factor of the structure of teaching mode, and it has a restricting effect on other factors. For

example, the goal factor of foreign social exploration teaching mode structure is to cultivate the ability to solve social problems through scientific exploration and logical analysis, while the goal factor of undirected teaching mode structure is to cultivate the ability of self-knowledge, self-realization and self-education.

3) Conditions (or means): The conditional factors refer to the various conditions for achieving certain teaching objectives and making the teaching mode effective. Any teaching mode can only be effective under specific conditions. There are many conditions, including teachers, students, teaching materials, teaching tools, teaching time and space.

4) Procedures: Any teaching mode has a unique set of operating procedures, which specify the logical steps of teaching and the tasks completed in each step. For example, the operation procedure of Herbart's teaching model is divided into four stages or steps: understanding, association, system and method, while the operation procedure of Dewey's pragmatic teaching model structure is divided into five stages or steps: situation, problem, hypothesis, solution and verification.

5) Evaluation: Evaluation is an important factor in teaching mode, which includes evaluation methods, standards and so on. Because different teaching modes accomplish different teaching objectives, procedures and conditions, so the evaluation methods and standards are different. Therefore, a teaching model should generally specify its own evaluation methods and standards. For example, the evaluation factors of Broome's mastery teaching model structure are different from standardized evaluation, and its standards are criterial-based.

From the information above, the instructional model employed in the present study involve 5 components in line with the theories above i.e., principle and rationale, objectives, contents, methods of teaching & materials and evaluation.

Confirmatory of model

To ensure the appropriateness of developed instructional model before implementation, the developed instructional model is confirmed depending on program evaluation standards in 4 aspects: 1) Utility standards, 2) Feasibility standards, 3) Propriety standards and, 4) Accuracy standards. (Stufflebeam, 2012).

Utility standards were intended to ensure that the developed instructional model will serve the information needs of intended users.

Feasibility standards were intended to ensure that the developed instructional model will be realistic, prudent, flexible, and frugal.

Propriety standards were intended to ensure that the developed instructional model will be conducted in conformity to teaching principles and provide positive results.

Accuracy standards were intended to ensure that the developed instructional model shows a measure of closeness to a true value.

Flipped Classroom Teaching model

Background

The traditional teaching mode is that the teacher lectures in the classroom and assigns homework for students to practice at home. However, under the "flipped classroom teaching mode", students are free to complete their knowledge before class without any time and space constraints. The classroom becomes a place for interaction between teachers and students, including answering questions and solving puzzles, applying knowledge, etc. Flipped classroom is more advantageous than traditional classroom in cultivating students' learning autonomy, teamwork, innovation, classroom atmosphere and internalization of knowledge.

Li, Xin (2015) Flipped classrooms have been around since 2007, have rapidly expanded globally since 2011, and have been recognized by the Globe and Mail as an important technological change affecting classroom teaching and learning.

Zhang, Wang & Zhang (2012) argued that the flipped classroom has revolutionized the traditional teaching mode by reversing the process of knowledge transfer and internalization, changing the roles of teachers and students in traditional teaching, and rearranging the use of classroom time. In the flipped classroom, information technology and activity-based learning build a personalized and collaborative learning environment for learners, which helps to form a new learning culture.

He & Ou & Gao (2014) argued that many students in flipped classrooms sub the value of collaborative learning, students in flipped classrooms are more concerned with the process of learning, and students in flipped classrooms are more willing to participate in classroom activities.

Song & Yu (2014) believed that the flipped classroom teaching mode requires advanced information technology support, which can be student-centered, fully mobilize cooperation among students, and also increase teacher-student interactions in the classroom, so that the role of the teacher from the traditional knowledge transmitter, changed into a learning. The role of the teacher is changed from the traditional knowledge transmitter to the facilitator and guide of learning.

Li & Liu (2013) recognized that flipped classroom is a teaching mode that can enhance learning interaction, stimulate learning interest, strengthen students' independent learning, and realize the sharing of teaching resources.

Wang et *al.* (2013) believes that the flipped classroom model changes the time and space of learning, which can transform classroom teaching into out-of-class or out-of-school, and turn classroom pre-study into pre-course project-based exploratory learning. A teaching model that emphasizes student-centeredness, tailoring teaching to students' needs, students are active and independent learners, and guiding students to learn how to learn.

Han (2013) believes that the flipped classroom is a reversed arrangement of knowledge transfer and knowledge internalization, in which the knowledge transfer is placed outside the classroom and completed by students independently, and the knowledge internalization is realized in the classroom. Before class, teachers provide students with some rich teaching resources, including multimedia resources in addition to paper textbooks, and students learn independently with the help of information technology; in the classroom, they use what they have learned to solve problems, communicate and dialogue with teachers, and collaborate with classmates, so as to cultivate higher-order thinking among students.

Huang (2013) argued that the flipped classroom enhances learning autonomy and strengthens interaction in learning.

Chen & Zhao (2014) considering Flipped Classroom as a new teaching mode, Flipped Classroom teaching mode has different characteristics from traditional teaching mode. First, it reverses the traditional teaching concept. Flipped classroom emphasizes students' collaborative learning and teachers' targeted guidance in class, so it provides an implementable way for "student-centered", and truly achieves "teaching according to the student's ability"; secondly, it reverses the traditional teaching process. The model puts the learning of new knowledge in the pre-course,

and in the class, group collaborative learning and teachers' Q&A are the main focus to help students master the knowledge they have learned in the pre-course: at the same time, it reverses the roles of teachers and students. In the flipped classroom, unlike the traditional classroom, students are independent learners who actively internalize knowledge, and the teacher is the guide, resource provider, and organizer of classroom activities, responsible for individualized guidance and Q&A.

Xue, Yun & Zheng, Li. (2016) "Flipped Classroom" (Flipped Classroom) teaching mode originated from two chemistry teachers, Jonathan Berman and Aaron Sams, in the United States in 2007, refers to flipping the traditional teaching mode, i.e., students attend classes in the classroom and complete the homework assigned by the teacher after class. Teachers assign homework after class to flip over the teaching mode, students watch teaching videos or PPT before class, independent learning of new knowledge, and in the classroom discussion and in-depth scientific experiments to complete the internalization of knowledge, the real realization of student-led independent learning mode of teaching.

Chang (2016) Flipped classroom is a kind of different traditional classroom teaching method, students can watch the video at home to replace the teacher's classroom explanation, and then in the classroom, they focus on completing the exercises and interacting with the teacher and peers. This practice subverts the traditional school teaching arrangement of "teacher teaching in class and students completing homework after class", which has received very good teaching results and has attracted widespread attention at home and abroad. With the in-depth development of the research and practice of the flipped classroom teaching mode, we find that the flipped classroom is not only a change in teaching time and space, but also an innovation of its teaching content, teaching methods and teaching process to adapt to the requirements of deep learning.

From the above, it can be seen that the flipped classroom teaching mode is a new type of teaching mode, which benefits from the development of information technology and the application of information technology in education. The flipped classroom model emphasizes the subjectivity of students' learning, highlights the student-centeredness, focuses on cultivating students' independent learning ability, and focuses on cultivating students' teamwork spirit and innovation spirit. Flipped classroom can improve the interactivity of the classroom, classroom participation,

flipped classroom teaching mode in line with the needs of the current era of development.

Theory

1. Constructivism learning theory

Constructivism learning theory is based on the academic research of Its main point of view is that "learners determine what kind of knowledge they are going to acquire by harmonizing the input information from the external world and by actively constructing knowledge. Learning is active mental work, not passive teaching. (Dewey, 2002; Piaget, 1972; Vygotsky, 1978, etc.)

Flipped classroom is in line with the theory of constructivism, in the traditional teaching mode, the teacher instills knowledge to students in the classroom, the teacher is the center of the whole teaching behavior, is the transmitter of knowledge and the dominator of teaching, and the students are the passive receivers of external stimuli. Constructivist theory advocates learner-centered learning under the guidance of the teacher, and believes that the acquisition of knowledge is not a simple "stimulus-response" process from the teacher to the student as described by behaviorism, but a process of independent discovery by the student. Students are not passive recipients of information, but actively select, process external information, and with the existing information in the brain connection, and constantly construct, adjust and improve the knowledge system. Therefore, constructivism emphasizes students' subjectivity and initiative in the acquisition process.

2. Self-directed learning theory

Self-directed learning is a series of processes in which learners decide on their own learning behaviors and contents, give autonomy to themselves, set their own learning links, learning goals, control their own learning procedures, and deepen their own learning content, with three characteristics: self-reliance, self-activity and self-discipline. This fully demonstrates that learning is ultimately accomplished by the learners themselves, who can decide their own learning process, learning progress and learning methods, and dominate their own learning. In the flipped classroom, whether it is in the pre-class knowledge transfer link, or in the classroom knowledge skirt link, is the classroom learning rights and autonomy to the students, learning to take what kind of learning methods, using what kind of learning strategy, along what

kind of learning path are decided by the students themselves, the learning task is mainly completed by the students themselves, so that the students have the full right to learn, and to become the master of learning, fully embodied the theory of independent learning. (Wang, & Wang, 2023; Fei, 2020)

Methods of Teaching

In order to better study the flipped classroom teaching mode, the author analyzes the relevant research results. The specific contents are as follows:

Sams (2013) The traditional version of the flipped classroom model: video lecture followed by problem solving Pioneers of the flipped classroom Bergmann and Sams' early practice of flipped classroom teaching can be referred to as the traditional model of the flipped classroom. They state, "The flipped classroom generally involves students watching instructional videos at home and then completing traditional homework assignments in class. "Such a traditional model is mainly composed of two parts. The specific steps are as follows:

1. Students watch the teaching video at home and complete the learning tasks assigned by the teacher.

2. Students complete traditional classroom homework in class.

Guo (2019) Professor Talbert, who serves at Franklin College in Canada, has proposed a more operational model based on the traditional model of the flipped classroom, which consists of two sessions before and during class. Students watch an instructional video before class and then engage in guided pre-class practice. Students then enter the offline classroom, first completing a quick handful of tests and then solving related problems to facilitate the absorption of knowledge. Finally, the instructor debriefs and gives feedback. Compared to the traditional model of the flipped classroom, Talbert's model incorporates pre- and in-class exercises that promote students' understanding and help the teacher grasp students' knowledge, and finally the teacher provides feedback based on students' responses. The specific steps are as follows:

1. Before class, watch the video lecture.

2. Before class, conduct targeted guided practice.

3. In the classroom, conduct a quick, small number of tests to understand the students' learning status.

4. In the classroom, solve problems and promote the absorption of knowledge.

5. In the classroom, students report and the teacher gives feedback according to the actual situation.

Zhang (2012) expanded Talbert's model by providing a more specific design for the offline teaching and learning activities, including six parts: identifying the problem, creating the environment, independent exploration, collaborative learning, exchange of results, and feedback and evaluation. The model also emphasizes the role of information technology, communication platforms and activity-based learning. Wang, H., et al. (2013) also constructed a flipped classroom model based on Talbert's model: the pre-course session includes creating teaching videos, developing pre-course exercises, watching videos independently, pre-course exercises, and communicating through social media; and the classroom session includes identifying research questions, solving problems independently, collaborative inquiry activities, communicating results and evaluating feedback. Overall, there is not much difference between the two models. The specific steps are as follows:

1. Before the class, the teacher creates a teaching video to provide a learning resource environment.

2. Before the lesson, the teacher develops pre-course exercises.

3. Before the lesson, students watch the video independently.

4. Before the lesson, students carry out targeted pre-course practice.

(Social media can be utilized at any time prior to class)

5. Teachers and students work together to identify research questions (problems to be solved).

6. Students solve problems independently first. Collaborative inquiry activities are conducted.

7. Students present their learning outcomes.

8. Teacher conducts instructional evaluation and feedback.

Guo (2019) proposed a generic model of O-PIRTAS flipped classroom on the basis of existing research and showed that its teaching effect was significantly better than the traditional teaching model through a semester experiment. The author points out that the concept of flipped classroom should be understood at both curricular and pedagogical levels. Flipped classroom is usually narrowly understood

as a change of teaching method, but we believe that it must be recognized from a higher level, i.e., from the height of the curriculum. To carry out flipped teaching, the target curriculum must be systematically redesigned, and we call this stage the preparation stage of the flipped classroom. Only after that can we enter the implementation stage of the flipped classroom, i.e., the flipped classroom at the level of teaching method. It consists of seven sections: Objective, Preparation, Instructional video, Review, Test, Activity and Summary. The specific steps are as follows:

Flipped classroom preparation stage:

1. Selecting the classroom and determining the content

2. Design the teaching program and make courseware.

3. Record teaching videos (or provide existing online course resources) and prepare teaching materials.

Implementation stage of flipped classroom:

1. Formulate teaching objectives, divided into low-order and high-order objectives, which are conducive to students' clear learning direction and teachers' teaching arrangement and guidance.

2. Carry out pre-course preparation activities, mainly to stimulate students' learning motivation, students explore on their own and form a basic cognitive foundation.

3. Students study the teaching video. This link is completed by students' self-study outside the classroom, aiming at the initial mastery of knowledge.

4. Review the content of self-study before class. Teachers should first briefly review the content of the video before class, so that students can quickly recall the relevant knowledge points, and focus on the target content, cognitively and psychologically ready for the next stage of learning.

5. Conducting classroom tests. Through the classroom test, teachers can understand the learning effect of students watching the teaching video before class, and provide targeted guidance.

6. Conducting classroom activities. Teachers can design appropriate teaching activities (e.g. debates, role-plays, debriefings, etc.) according to the higher-order teaching objectives formulated earlier, so as to develop students' competence and literacy through face-to-face classroom time for interaction, communication and

cooperation. The design and organization of activities in this section can be combined with more mature teaching models such as problem-based learning, project-based learning and peer teaching to achieve the desired teaching effect.

7. Conduct classroom summarization and enhancement. Teachers need to summarize, reflect on, and enhance the entire teaching process and content in the classroom, explicitly directing students' attention to the most important, deep structural features and helping them form integrated knowledge. After that, the teacher can set up the pre-class preparation activities for the next class in order to start the next cycle of the O-PIRTAS flipped classroom teaching process, thus forming a complete closed loop. It should be noted that at the end of the class, the teacher may also assign some post-class exercises to the students or let them prepare for the classroom activities of the next class.

Deng (2022) divided the flipped classroom into two parts: pre-course learning and post-course learning. It also emphasizes that the instructional design of the pre-course learning part is crucial to the flipped classroom, and the quality of the pre-course learning activities carried out directly affects the implementation effect of the flipped classroom teaching. The specific steps are as follows:

Pre-class learning

1. Teachers make preset learning resources. Preset learning resources are learning resources designed and produced by teachers according to teaching needs and teaching objectives that students must use and master. Teachers can make their own teaching videos, or they can utilize high-quality teaching resources on the Internet, such as MOOC network and other high-quality open courses are also high-quality pre-course learning materials for flipped classroom.

2. Design pre-course practice activities. The design of pre-course practice activities is also an important part of the flipped classroom. Teachers should take students' individual knowledge structure and knowledge needs into full consideration, and reasonably design the difficulty, depth and number of pre-course practice activities. It is better to take the task-based teaching mode as the leading one, so that students can internalize and strengthen the knowledge of the text through completing tasks of different difficulties.

3. Watch the teaching video. With the help of the Internet platform, according to the implementation of the teaching program, teachers should guide and supervise

students to watch the teaching video independently. Through the Internet platform, students can realize holistic and fragmented learning at any place and any time with a cell phone.

4. Carry out interactive learning activities before class. After learning the online teaching video, students have basically completed the targeted exercises designed by the teacher. At this time, the main purpose of the interactive learning activities is to strengthen the knowledge of the content before class and further consolidate what they have learned, and to promote students' active thinking and deep understanding of the content before class.

Classroom learning

1. Summarize the pre-class learning and identify the problems that need to be further solved. Teachers should make a comprehensive evaluation of the students' self-study and discussion in the pre-course session, in the form of individual students or group representatives of the pre-course learning process and the results of the study of reporting, self-assessment and mutual evaluation, the teacher according to the content of the evaluation and at the same time combined with the teaching of the key points to put forward a number of representative and value of the significance of the problem for classroom inquiry. At the same time, the problems that are still not solved in the discussion process before class will be put in the classroom to continue in-depth research.

2. Independent thinking, independent inquiry. Teachers should take into account the differences between individuals and design different levels and scopes of inquiry questions for students. Students should have an accurate orientation of their own knowledge structure, according to their own interests and mastery of the knowledge they have learned, from the teacher set the inquiry questions independently choose the appropriate questions for their own exploration. Through this independent thinking, independent inquiry, independent problem solving, students further strengthen the knowledge they have learned.

3. Teamwork and cooperative learning. Individuals according to the previous step to get the results of the exploration, this time the teacher should be based on the learning situation to form a learning team, so that students can further study and exploration, team members elected a team leader, organization and supervision of

the group's exploration and learning. So that each group member can actively participate in group learning.

4. Results display, exchange and interaction. After completing the above cooperative inquiry activities, each group should present its research results to the classmates. Results show can be selected according to the actual situation of the course progress as appropriate, the teacher can add a class with the theme of results show, requiring all the groups to report the results. Or before the end of the lesson, a few groups (group representatives) are randomly selected to present their results to the class. Teachers and other students should talk about the results of group cooperation.

5. Evaluation feedback, suggestions for improvement. Teaching evaluation is a test of teaching results and feedback on teaching effects. The teaching evaluation of flipped classroom is mainly divided into two ways: one is classroom evaluation. After the end of classroom learning activities and classroom demonstration, the whole teaching of flipped classroom comes to an end, and teachers should organize students to evaluate the whole learning process and learning effect in the flipped classroom, which is divided into self-assessment, mutual assessment, teacher evaluation and other contents. Second, regular evaluation. Regular evaluation is simply a stage teaching summary evaluation, which can be divided into monthly exams, midterm exams and final exams. The main purpose of this evaluation is to test the mastery of students' knowledge, focusing on theoretical knowledge, the main test is a written and oral examination.

Post-class learning

1. Review course content already learned. Solve course problems that you still do not understand.

2. Completing post-course assignments given by the instructor.

Table 2.2 The frequency of each process of flipped classroom teaching model

Component	Deng (2022)	Guo (2019)	Zhang (2012)	Guo (2019)	Sams (2013)	Frequency
Step 1 - creates a teaching video to provide a learning resource environment.	√	√	√			3
Step 2 - Design pre-course practice activities - Design the teaching program and make courseware.	√	 √	√	√		4
Step 3 -students Watch the teaching video	√	√	√	√	√	5
Step 4 - Carry out interactive learning activities before class -solve problems and promote the absorption of knowledge.	√	 √	√	√		4
Step 5 - Summarize the pre-class learning and identify the problems - students report and the teacher gives feedback according to the actual situation.	√	√	√	 √		4

Table 2.2 (Continued)

Component	Deng (2022)	Guo (2019)	Zhang (2012)	Guo (2019)	Sams (2013)	Frequency
Step 6						
- Teamwork and cooperative learning.	√					4
- Review the content of self-study		√		√	√	
Step 7						
- Results display, exchange and interaction.	√					2
- Conducting classroom tests.		√				
Step 8						
- Evaluation feedback, suggestions for improvement.	√	√	√			3

Flipped classroom teaching model. Important references include Deng (2022); Guo (2019); Zhang (2012); Guo (2019); Sams (2013). Based on the analysis and combing of numerous implementation steps, 7 key steps of flipped classroom teaching model implementation are obtained:

Step 1: Provide a learning resource environment

Step 2: Design pre-class practice activities

Step 3: Independent study of pre-course (students Watch the teaching video and so on),

Step 4: Students report Pre-course learning and the teacher gives feedback according to the actual situation.

Step 5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class.

Step 6: Results display, exchange and interaction.

Step 7: Evaluation feedback, suggestions for improvement.

Based on the above analysis of the flipped classroom teaching mode, the author optimized and adjusted the flipped classroom according to the actual teaching and the nature of the course, and the following is the flipped classroom teaching mode researched in this paper, as shown in the figure 2.1 below.

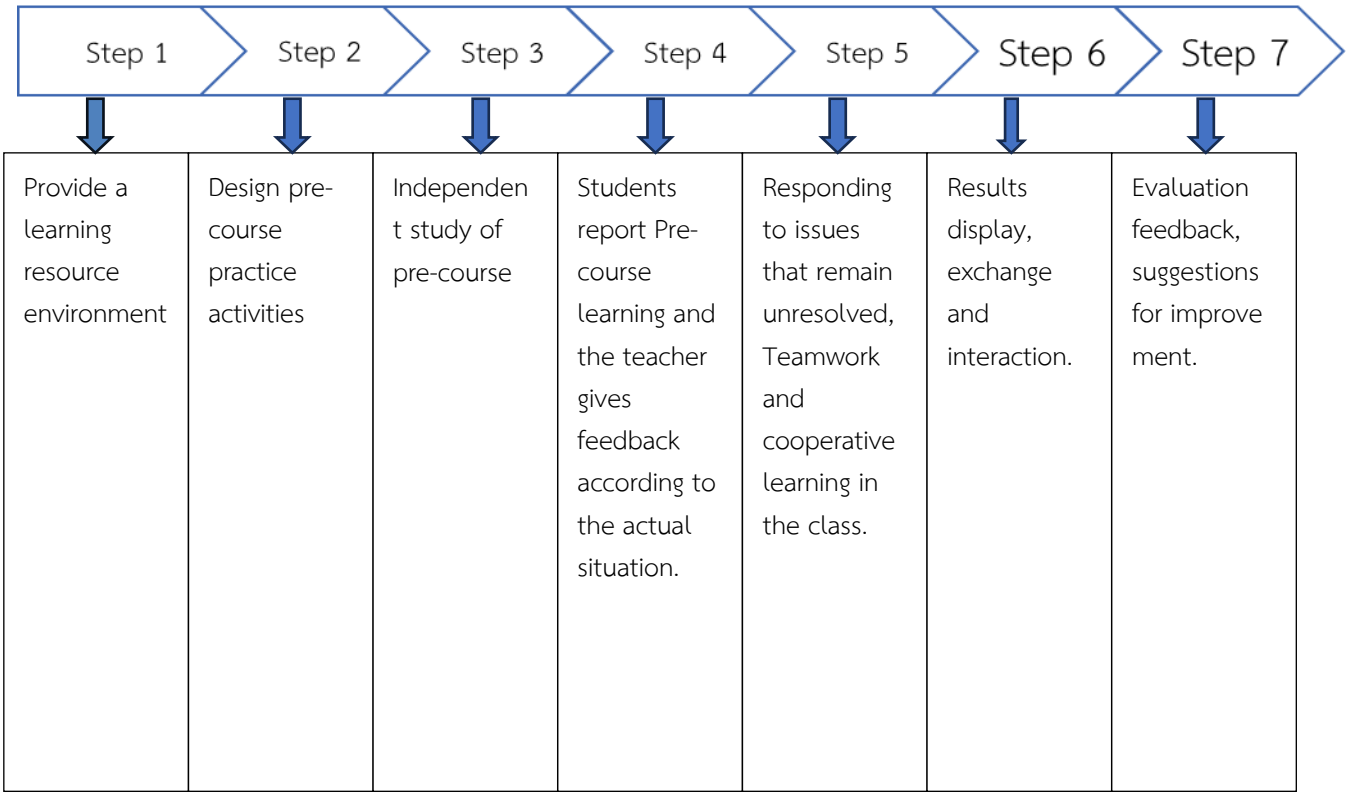

Figure 2.1 Implementation framework for the flipped classroom model

Roles of Teachers and Students

Roles of teachers

In the flipped classroom teaching model, the teacher is the chief designer of student learning, the integrator of student learning resources, the guide of student learning, the co-operator of student learning, the observer and supervisor of student learning, and the supporter and helper of student learning.

1. Chief designer: according to the Situational leadership theory, how teachers lead and manage the classroom needs to consider the degree of preparation of students -that is, the difficulty of the curriculum and the level of students - to set up the configuration of curriculum Flipped classroom education.

2. Resource Integrator: Effectively integrating a large amount of learning resources from the internet into courses that are beneficial to oneself.

3. Process guidance: also known as organizer or coach, as flipped classroom education involves multiple platforms and channels to break the limitations of traditional classroom time and space, activities are more diversified and the process is more complex, a clear framework/time concept is needed to organize and guide the process. Teachers need to monitor the progress of the process in multiple ways and provide clear guidance in a timely manner.

4. Collaborator of students, in the flipped classroom teaching mode, the teacher is a collaborator of learning by communicating and exchanging with students on an equal footing, completing the task of learning together, and guiding students to learn.

5. Supervisors: Teachers should timely monitor students' learning outcomes, carefully design monitoring of the learning process and measurement of learning outcomes. At least during the stage when students are accustomed to new learning methods, frequent monitoring and measurement should be conducted to collect feedback, ensuring that students find effective learning methods, have sufficient participation, respond promptly to questions, and have appropriate understanding and application of knowledge.

6. Supporter: Teachers act as guides to let students know where and how to obtain information, leaving the initiative to students to learn independently, answer questions, and explore problems in team discussions. When students cannot solve problems on their own, teachers need to act as supporters in a timely manner, continue to guide or provide inspiration, and provide the support and assistance students need.

Roles of students

In the flipped classroom teaching mode, students are no longer the passive receivers of knowledge in the traditional classroom, but the main body of learning, the seeker of new knowledge, the reflector of learning, and the raiser and solver of problems.

1. The subject of learning. In the flipped classroom teaching mode, students are the main body of learning, the main role of learning, students can control their own learning anytime and anywhere, can be in the school, can be at home, can be

in any place he wants to learn, and can arrange their own learning according to their own situation, it can be the morning learning, can be at noon, can be at night, and can even be in the meal can be observed during teaching Video learning.

2. Seekers of new knowledge. In the flipped classroom teaching mode, students can learn to explore knowledge in different ways. For example, they can watch the teaching video, observe the classroom resources on the Internet, look up books and materials, interview others, etc. Students no longer passively accept knowledge, but independently explore knowledge.

3. Learning reflector. In the flipped classroom teaching mode, learning needs to evaluate and summaries their own learning, which requires students to reflect on their own learning and make judgements about their own learning. In this mode of teaching students have a very high degree of freedom, which also determines that students should always reflect on their own learning.

4. Problem solver and problem solver. In the flipped classroom teaching mode, students have to learn deeply through discussion, mutual questioning, answering and learning. Mutual questioning, answering and exchanging promote the internalization of knowledge and deeper learning. The students' ability to raise questions and solve problems is mentioned.

Strengths and Weaknesses of flipped classroom model

Strengths of flipped classroom model

Fu (2023) believed that In the flipped classroom, students are transformed from receivers and "spectators" to active learners and information constructors, while teachers are transformed from "the authority of imparting knowledge" to facilitators of students' learning, guiding the learning activities when needed. Meanwhile, the more interactive activities in the flipped classroom increase the interaction between teachers and students. Flipped classrooms can enhance students' learning ability, improve students' academic performance significantly, and make students' learning attitudes more positive.

Wang & Dong (2018) believed that flipped classroom makes personalized teaching possible. Under the flipped classroom teaching model, students can choose and control the time and progress of learning according to their own learning needs, watch videos and materials repeatedly to learn, or seek help from teachers and classmates to complete learning tasks. This enables students at different levels and

with different personality traits to realize their individual learning needs. In the classroom, students can reflect their unanswered questions and difficulties left before class to the teacher, and get ideal answers through face-to-face discussion and guidance. At the same time, teachers can understand the students' learning progress and task completion, as well as the confusion and difficulties encountered in the learning process through the teaching management system, and then communicate and interact with students in a timely manner to provide targeted and individualized learning guidance, thus promoting educational equity. Flipped classroom provides more opportunities for teachers' professional development. Teachers are not only the planners, organizers and implementers of teaching activities, but also the practitioners and learners of the teaching process. In the flipped classroom, teachers can learn relevant teaching courses and improve their teaching research level through the excellent teaching platform. Flipped classroom can also promote the development of education information. Flipped classroom makes full use of network tools for teaching, is a product of the deep integration of information technology and education teaching, it will be the organic integration of online learning and offline discussion, process evaluation and results feedback, teacher guidance and student exploration, so that the whole teaching process is in an information-based dynamic, accelerating the transmission and internalization of knowledge. Information technology has given birth to the flipped classroom, and the flipped classroom is conducive to the development of education information technology.

Weaknesses of flipped classroom model

Fu (2023) believed that Flipped classroom has increased the burden of teachers to a certain extent, as it requires teachers to make reasonable pre-investment and sophisticated instructional design. Whether it is the preparation of recording videos or preparing other learning materials before class, or carrying out a variety of activities in the classroom to guide students to internalize their knowledge, teachers need to have strong IT literacy and teaching design skills. In addition, some students have poor self-control and are resistant to the flipped classroom. The learning part of the flipped classroom requires students to learn and explore independently, which requires students to have strong self-control, and some students do not like this kind of learning.

Wang & Dong (2018) believed that flipped classroom requires students to have better self-learning ability, self-control and willingness to learn, which is a high requirement for students. The independent learning before the flipped classroom, emphasizing students' active participation, has great demands on students' learning habits, learning styles, learning attitudes, and requires students to have a high degree of self-learning ability and self-control, so that if students can not be actively involved in the learning before the class, or can not adapt to the flipped classroom as a mode of teaching, then the students' learning will be counterproductive, and the effect of learning will be greatly reduced. In the flipped classroom, the comprehensive ability of students is also very high, requiring students to have the ability of teamwork, language expression, problem analysis and solution ability. As the main body of the flipped classroom, students' learning habits and comprehensive ability are the cornerstone of effective flipped classroom.

All in all, flipped classroom has advantages but also faces challenges, opportunities and challenges co-exist, which requires us to pay attention to the above issues when conducting flipped classroom design is order to do a better job.

Research Ability

Research ability refers to a person's ability to be able to conduct scientific research, which includes a number of aspects such as investigation, analysis, problem solving and creative thinking. Research competence is the foundation of scientific research and is a necessary skill for many professions.

Wang (1985) states that Scientific research ability includes observation, attention, memory, language expression ability, comprehension ability, thinking ability and other components, about how to evaluate scientific research ability, then it can be carried out through three aspects, the first is to analyze the research dynamics and development trend of the scientific field, to determine the direction of the research and the subject. The second is to develop research methods to conduct experiments, put forward hypotheses, inferences and proofs. The third is to organize and summarize the research results, write experimental reports and papers.

Research ability can be understood as having three components.

Item 1: the ability to analyze the research dynamics and trends in the scientific field through investigation and research, and to determine research directions and topics.

Standard: to formulate new questions, meaningful and valuable questions.

Item 2: develop research methods to conduct experiments, formulate hypotheses and draw inferences to prove them.

Standard: complete the analysis of the problem, solve the problem

Item 3: organize and summarize research results, write lab reports and papers.

Standard: Ability to summarize and express in language, ability to summarize and write up one's research results in concise and clear language.

According to Luo & Li (1997), "Educational research ability mainly includes the ability to choose topics, the ability to experiment on educational reform, the ability to collect and organize research materials and the ability to write educational and teaching papers (thesis).

According to Xiao (1994), research competence should be rich in content, not simply a practical implementation and operational ability, but should include: the ability to identify problems in the educational process, the ability to collect data and information, the ability to read and translate foreign languages (in English), the ability to independently design experiments and carry out calculations, the ability to scientifically analyze the problem and to carry out a scientific argumentation from the theoretical level, better written expression ability, the ability to creatively use the results of educational research in one's own educational activities. The ability to express oneself in writing and to use the results of educational research creatively in one's own educational activities.

According to Yang (2000), research competence is defined as having the ability to collect and utilize literature, the ability to develop and process information, and good written communication skills.

Zhang (2009) believed that the scientific research ability of college students refers to the special ability that directly affects the efficiency of college students' scientific research activities and ensures the successful completion of college students' scientific research activities. It includes: creative ability, logical reasoning

ability, data collection and processing ability, practical (hands-on) ability, and language expression ability.

Zhang, Wang & Xu (2014) believed that research competence includes: the ability to collect and analyze scientific information; the ability to formulate scientific questions; the ability to formulate hypotheses and devise solutions to scientific questions; the ability to complete experimental protocols with the skilled use of basic experimental techniques; the ability to analyze the results to draw scientific conclusions; the ability to elaborate on the scientific significance of the conclusions; and the ability to write scientific papers.

Meng (2001) concluded through a questionnaire survey that scientific research ability includes creativity, logical reasoning, data collection and processing, and problem solving.

Xu (1999) believed that good educational research quality includes having profound professional knowledge, the ability to discover and scientifically analyze educational and teaching problems in a timely manner, the ability to collect data and process information, good written expression skills, and a spirit of innovation.

From the above, it can be seen that there is not yet a unified opinion in the academic world about the composition of research ability. However, the core composition of research ability is also found through reviewing the above literature, such as the ability to find problems, the ability to find literature, and the ability to express language. Considering the nature of the course and the limitation of the experimental time, this study constructs a model of research ability in Figure 2.2 as follows:

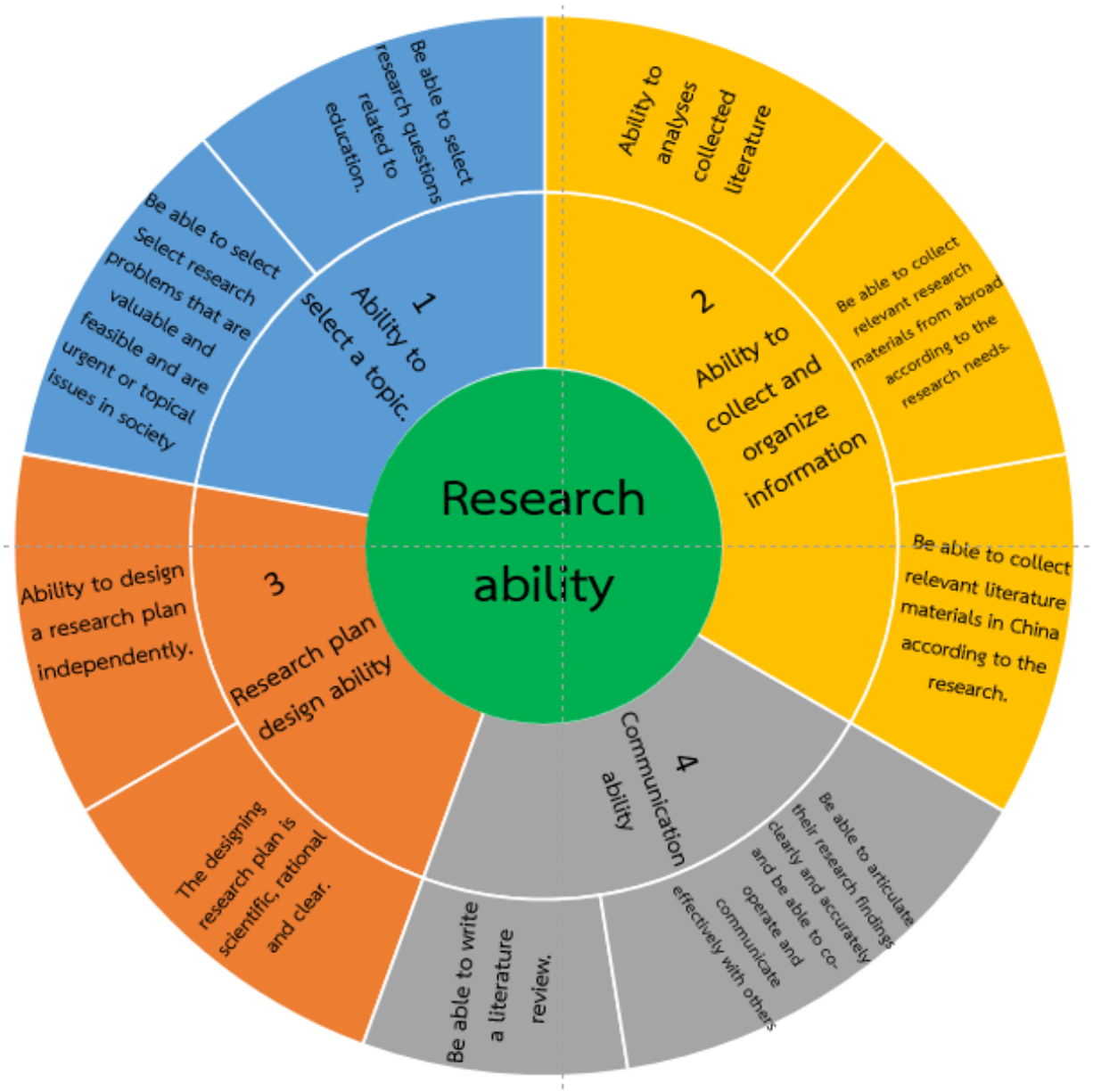

Figure 2.2 Research ability model

Related Research

There are many studies related to flipped classroom teaching. The details are as follows.

Chang (2016) points out that flipped classroom teaching has received increasing attention, with early flipped classrooms emphasizing the flipping of the learning process, in which students learn independently through instructional videos before class, and then complete assignments and personalize their learning under the guidance of the teacher in class. However, more and more studies have argued that the flipped classroom should not simply flip the learning time and space, but should emphasize changes in teaching methods and learning environments, as well as the application and innovation of learning. Flipped classrooms should not look at moving learning forward into self-study with pre-course videos, but should place more emphasis on the activities that take place in the classroom to create an environment for classroom teaching that is suitable for deep learning.

Zhang (2014) believes that the flipped classroom teaching mode has strong operability and practicability, and at the same time fully embodies the students' subjective position, so that their learning enthusiasm, initiative and creativity are stimulated and enhanced. Through the design and application of the flipped classroom teaching mode in practice, it is found that the teaching results are remarkable, students generally recognized and adapted to, and can prompt students to acquire more knowledge, comprehensive ability has been improved, and we hope that the flipped classroom teaching mode will bring about changes in China's education.

Yu & Liu (2016) argued that the SPOC-based flipped classroom teaching model in university physics courses. It has obvious effects in increasing students' interest in learning and improving their independent learning ability, but to achieve good teaching results puts high demands on high-quality videos, teachers' comprehensive ability and campus network resources. Therefore, to promote this teaching mode, it needs to be developed and improved continuously in practice. It is believed that the flipped classroom teaching mode has positive significance in promoting the teaching reform in the information technology environment.

Zeng, Zhou, & Dong (2015) believe that the organic combination of MOOC resources and the flipped classroom, the construction of MOOC video alternative

mode, "MOOC video + homemade video" mode, the secondary development mode and other three new types of flipped classroom teaching mode, colleges and universities combined with their own actual situation to choose and apply the flipped classroom teaching quality can be improved. The three new flipped classroom teaching modes can be selected and applied by colleges and universities according to their own actual situation, which can improve the quality of flipped classroom teaching and give full play to the role of MOOC in higher education.

Table 2.3 Summary of course plan design

Chapter	Content/Time	Method	The flipped classroom model /Step							Research ability				Instruments/ Activities
			S.1	S.2	S.3	S.4	S.5	S.6	S.7	D.1	D.2	D.3	D.4	
3. Finding and analyzing literature	1. Select a topic (2hrs)	flipped classroom model	T	T	L	T+L	T+L	T+L	T+L	√				1.Attending Class 2.Observation 3.Checking exercise 4.Testing 5.Scoring
	2. Collect and organize information. (6hrs)		T	T	L	T+L	T+L	T+L	T+L		√			
	3.Research program design (4hrs)		T	T	L	T+L	T+L	T+L	T+L			√		
	4.Communication or Expression of results (4hrs)		T	T	L	T+L	T+L	T+L	T+L				√	

S.1: Provide a learning resource environment.

S.2: Design pre-course practice activities

S.3: Independent study of pre-course

S.4: students report Pre-course learning and the teacher gives feedback according to the actual situation.

S.5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class.

S.6: Results display, exchange and interaction.

S.7: Evaluation feedback, suggestions for improvement.

D.1: Ability to select a topic D.2: Ability to collect and organize information. D.3: Research plan design ability. D.4: Communication ability.

S is Step D is Dimension T is Teacher L is Learner

Chapter 3
Research Methodology

The study titled "Development of Flipped Classroom Teaching Model to Improve Research Ability of Undergraduate Students" employed a mixed-method research approach, divided into three phases:

Phase 1 To examine the factors affecting research ability of undergraduate students.

Phase 2 To develop flipped classroom teaching model to improve research ability of undergraduate students.

Phase 3 To study the results of flipped classroom teaching model to improve research ability of undergraduate students.

The details are as follows.

Phase 1 To examine the factors affecting research ability of undergraduate students.

Participants

Group 1 consisted of 150 former Primary Education Major students in their third year, who had completed the Educational Research Methods course in Semester 1 of the academic year 2023 at Yulin Normal University classified into 3 classes – Class A: 50 students, Class B: 50 students, and Class C: 50 students.

Research Instrument

The research instrument used for Phase 1 was a questionnaire specifically designed for students at Yulin Normal University. It was structured into two main parts. Part 1 gathered common demographic data from all 150 respondents. Part 2 focused on assessing internal factors such as interest (Items 1-2), motivation and attitude (Items 3-4), and physical health (Items 5-6), as well as external factors including teaching methods (Items 1-2), time management (Items 3-4), and the influence of social and infrastructural support (Items 5-6). Thesis advisors reviewed the draft questionnaire and interview form to ensure their accuracy and completeness.

The draft questionnaire on factors enhancing research ability for undergraduate students at Yulin Normal University was presented to three experts listed in Appendix A for evaluation, as recommended by Phongsri (2011). Each expert assessed the Index of Item-Objective Congruence (IOC) using the following criteria:

+1 if they were certain the items measured their objectives,
0 if unsure, and
-1 if the items did not measure the objectives.

The IOC values were required to be 0.6 to be considered acceptable. The validation measure yielded an IOC calculation of 1.00, indicating strong alignment between the questionnaire items and their intended objectives. The questionnaires employed a Likert 5-point rating scale to evaluate the rating criteria as follows: 5 for the highest, 4 for high, 3 for moderate, 2 for few, and 1 for the fewest.

Data Collection and Data Analysis

The researcher commenced with obtaining permission for data collection from the institution director, followed by administering the questionnaires to designated students. Subsequently, data analysis involved descriptive statistics such as frequency, mean (μ), and standard deviation (σ). Factors influencing research ability, based on Miller's (1990) pyramid theory, were interpreted with ratings ranging from 4.51 to 5.00 indicating the highest, 3.51 to 4.50 denoting high, 2.51 to 3.50 signifying moderate, 1.51 to 2.50 representing few, and 1.00 to 1.50 indicating the fewest.

Group 2 comprises five lecturers currently teaching the Educational Research Methods Course at Yulin Normal University.

Research Instrument

The research instrument selected for this study was an interview form. The design process for this instrument involved 4 steps:

1) Reviewing literature on flipped classroom teaching to enhance research capabilities and identify factors influencing them;

2) Constructing a preliminary open-ended interview draft focusing on internal factors such as interest (Questions 1-2), motivation and attitude (Questions 3-4), and physical health (Question 5), as well as external factors including teaching methods

(Questions 1-2), time management (Questions 3-4), and environmental factors related to student support, family, facilities, and infrastructure (Question 5);

3) Reviewing the draft by advisors to ensure accuracy and completeness; and

4) Assessing the validity of the open-ended interview on research factors by three experts listed in Appendix A, using the Index of Item-Objective Congruence (IOC) method proposed by Phongsri (2011). Each item was rated as follows:

+1 for clear measurement of objectives,
0 for uncertain relation to objectives, and
-1 for clear deviation from objectives.

The IOC values were required to be 0.6 will be considered acceptable, with an IOC of 1.00 indicating perfect congruence.

Data Collection and Data Analysis

Following permission for data collection, data were gathered from the designated lecturers using the finalized interview protocol. Data analysis primarily involved content analysis.

Output Phase 1

The result from Internal factor and external factor from students and interview from the lecturers affecting research ability by table 3.1

Table 3.1 Summary of Phase 1 Scheme

Topics	Details
Research Process	Analysis of internal and external factors
Research Objectives	To examine the factors affecting research ability of Graduate Students
Research Method	The questionnaire for students and the interview for the lecturers
Target Group	1. Population - 150 students 2. Key Informants - 5 Lecturers
Instruments	1. The questionnaire for students 2. Interview for teachers
Data Analysis	Descriptive Statistics i.e., Frequency, Mean (μ), Standard Deviation (σ) Content analysis
Results	Factors affecting research ability of undergraduate students

Phase 2 To develop flipped classroom teaching model to improve research ability of undergraduate students.

Research instrument

The Conformity Assessment Form was outlined for evaluating the flipped classroom teaching model across accuracy standards, propriety standards, feasibility standards, and utility standards. The design process of the questionnaire for the Index of Item-Objective Congruence (IOC) involves several steps:

1) Analyzing relevant concepts, principles, and processes related to developing the flipped teaching model and its impact on research ability (Research Objective 1)

2) Drafting a handout detailing the development of the flipped classroom teaching model, encompassing five components: 1) Principles & Rationale, 2) Objectives, 3) Content, 4) Teaching Methods & Materials, and 5) Evaluation, assessed across four aspects: Utility standards, Feasibility standards, Propriety standards, and Accuracy standards

3) Formulating a questionnaire to evaluate the appropriateness of the flipped classroom teaching model development based on these standards and the draft questionnaire scrutinizing by advisors to ensure accuracy and completeness

4) Assessing the validity of such a questionnaire by three experts listed in Appendix A, using the IOC method by Phongsri (2011). Ratings include:

+1 for clear alignment with objectives,
0 for uncertain relevance, and
-1 for significant deviation.

The IOC values were required to be 0.6 are considered acceptable, with an IOC of 1.00 indicating perfect alignment.

Data Collection and Data Analysis

After obtaining permission for data collection, appropriateness assessments from the three experts were collected using the developed conformity assessment form of the flipped classroom teaching model. Data analysis primarily involved descriptive statistics such as frequency and percentage. Acceptable items must achieve a minimum threshold of 100% adherence to standards.

Output Phase 2

Project-based flipped classroom teaching the appropriateness of which is confirmed by experts for further implementation. The acceptable items 100% by table 3.2.

Table 3.2 Summary of Phase 2 Scheme

Topics	Details
Research Process	1. Design Handout 2. Develop assessment form of flipped classroom teaching model 3. Collect appropriateness of the flipped classroom teaching model
Research Objectives	To develop flipped classroom teaching model to improve research ability of undergraduate Students at Yulin Normal University
Research Method	Conformity assessment based on the flipped classroom teaching model
Resources/Target Group	3 experts
Instruments	Development of flipped classroom teaching model. in terms of accuracy standards, propriety standards, feasibility standards, and utility standards.
Data Analysis	Descriptive analysis i.e. frequency and percentage.
Results	The result of the flipped classroom teaching model's acceptable

Summary handout of flipped classroom teaching model by figure 3.1.

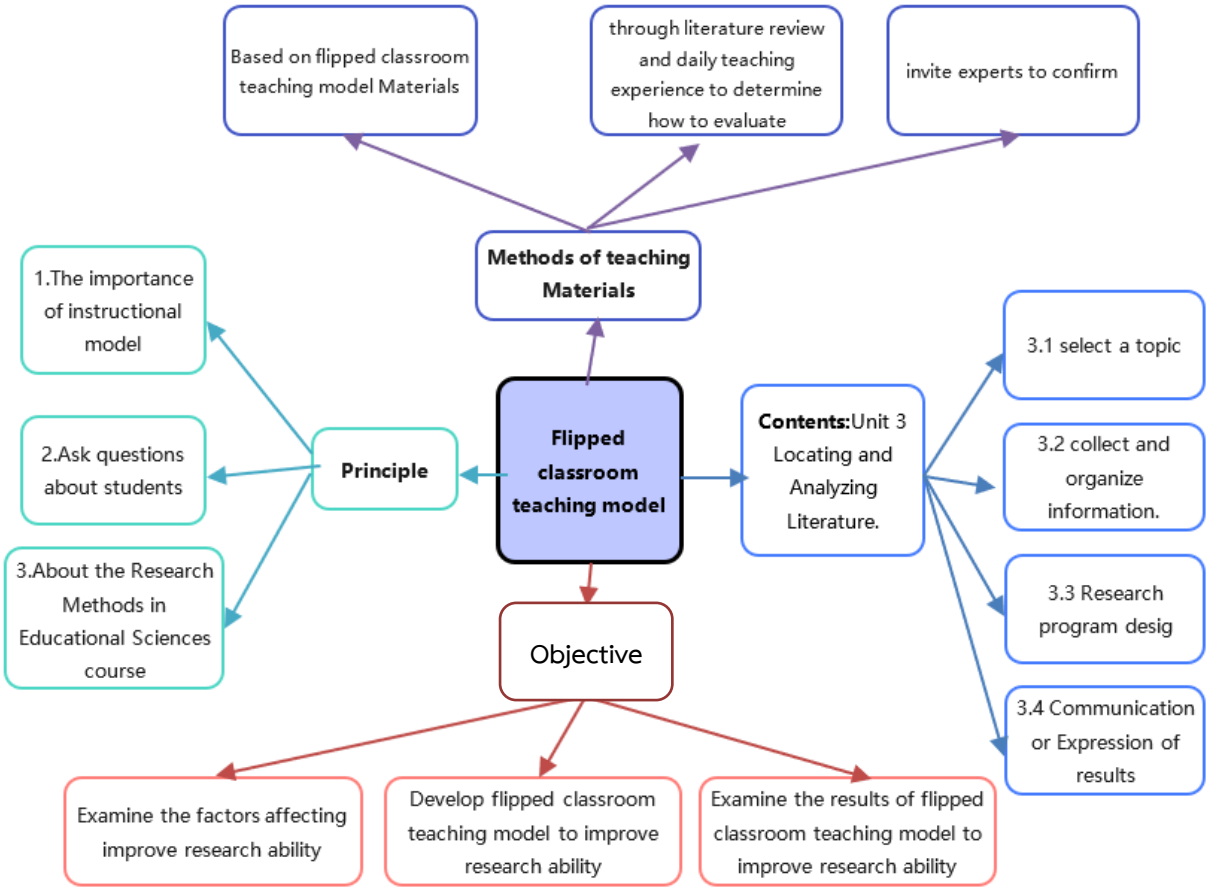

Figure 3.1 Summary handout of flipped classroom teaching model

Phase 3 To study the results of flipped classroom teaching model to improve research ability of undergraduate students.

Research Design

Table 3.3 Research Design

Group	X	T1
Sample group	Flipped classroom teaching model	Undergraduate Students' research ability

X – Flipped classroom teaching model.

T1 – Students' research ability.

Population and Sample Group

The population under study comprises first-year students majoring in Primary Education at Yulin Normal University who enrolled in the Educational Research Methods Course during semester 2 of the academic year 2023. The total population consists of 150 students divided into three groups: Group A: 46 students, Group B: 52 students, Group C: 52 students

From these, a sample of 46 students has been selected from Group A using cluster random sampling for further study.

Research instruments

The research instruments for this study involve two components: Lesson plans using the flipped classroom teaching model, assignment of each lesson, and a rubric scoring form the purpose of which is to implement the teaching model and elicit students' research ability data.

Designing instrument 1 (Lesson plans using flipped classroom teaching model):

1. Thoroughly studying the objectives, contents, methods of teaching, materials, and evaluation criteria relevant to the flipped classroom teaching model

2. Developing four lesson plans adhering to a specified format

3. Presenting these four lesson plans to thesis advisors for reviewing to ensure correctness, completeness, and to seek suggestions for improvement.

4. Evaluating the validity of the designed lesson plans with input from three experts listed in Appendix A, using the Index of Item-Objective Congruence (IOC) criteria outlined by Phongsri (2011). Ratings will be assigned as follows:

+1 for strong alignment with objectives,
0 for uncertain relevance, and
-1 for significant misalignment.

Acceptable items must achieve an IOC value of not less than 0.5, with an IOC of 1.00 indicating perfect congruence.

5. Conducting a trial of the developed lesson plans with another group of participants with similar qualifications (Group B Students) to gather feedback for further refinement and preparation for implementation with the assigned sample group.

Designing instrument 2 (Assignment of each lesson)

To draw data in terms of research ability from the sample group, 4 assignments were determined aligning the lesson plans as shown in thesis appendix as shown in Table 3.4. It also mapped the lesson assignment with items and standards to be observed. The students' research skills were assessed on basis of the rubric scoring as detailed in the subsequent section through students' report presentation.

Table 3.4 Assignments of the 4 Lessons

Lessons	Assignments	Items and Standards
1. Selecting a topic	Find out the topic concerning education	**Item 1:** Ability to select a topic *Standard 1*: Be able to select research questions related to education *Standard 2*: Select research problems that are valuable and feasible and are urgent or topical issues in society
2. Collecting and collating literature	Collecting and collating related literature	**Item 2:** Ability to collect and organize information Standard 1: be able to collect relevant literature materials in China according to the research Standard 2: Be able to collect relevant research materials from abroad according to the research needs Standard 3: Ability to analyses collected literature
3. Designing research plans	Designing research plan	**Item 3:** Research plan design ability Standard 1: Ability to design a research plan independently Standard 2: The designing research plan is scientific, rational and clear
4. Literature Review and Academic Presentation	Write a literature review and conduct an academic presentation	**Item 4**: Communication ability *Standard 1*: Be able to write a literature review *Standard 2*: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others

Designing instrument 3 (Rubric scoring form to assess students' research ability)

The Rubric scoring form to enhance students' research ability, begins with a comprehensive study of rubric scoring criteria. The form is structured with four items along with their particular standards, utilizing a Likert 5-point rating scale for assessment.

Item 1: Ability to select a topic. (Full score: 10 points)

Standard 1: Be able to select research questions related to education. (Full score: 5 points)

Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society. (Full score: 5 points)

Item 2: Ability to collect and organize information. (Full score: 15 points)

Standard 1: be able to collect relevant literature materials in China according to the research. (Full score: 5 points)

Standard 2: Be able to collect relevant research materials from abroad according to the research needs. (Full score: 5 points)

Standard 3: Ability to analyze collected literature. (Full score: 5 points)

Item 3: Research plan design ability. (Full score: 10 points)

Standard 1: Ability to design a research plan independently. (Full score: 5 points)

Standard 2: The designing research plan is scientific, rational and clear. (Full score: 5 points)

Item 4: Communication ability. (Full score: 10 points)

Standard 1: Be able to write a literature review. (Full score: 5 points)

Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others. (Full score: 5 points)

Criteria from Table 3.5 are employed to interpret the learning outcomes associated with these research abilities.

Table 3.5 Criteria of interpreting learning outcomes 4 items of research ability

Research ability (4 items and 9 standards)	Item 1: Ability to select a topic. (Full score: 10 points) Item 2: Ability to collect and organize information (Full score: 15 points) Item 3: Research plan design ability. (Full score: 10 points) Item 4: Communication ability (Full score: 10 points)
Score	**Grade**
37-45	Excellent
28-36	Good
19-27	Medium
10-18	Pass
Less than 10	Poor

Table 3.6 item 1 Ability to select a topic

Item1: Ability to select a topic	Standard 1: Be able to select research questions related to education. (Full score: 5 points) Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society. (Full score: 5 points)
Score	**Grade**
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Table 3.7 Criteria to evaluate item 2. Ability to collect and organize information

Item 2: Ability to collect and organize information	Standard 1: be able to collect relevant literature materials in China according to the research. (Full score: 5 points) Standard 2: Be able to collect relevant research materials from abroad according to the research needs. (Full score: 5 points) Standard 3: Ability to analyze collected literature (Full score: 5 points)
Score	**Grade**
13-15	Excellent
10-12	Good
7-9	Medium
4-6	Pass
Less than 4	Poor

Table 3.8 Criteria to evaluate item 3. Research plan design ability

Item3: Research plan design ability	Standard 1: Ability to design a research program independently (Full score: 5 points) Standard 2: The designing research plan is scientific, rational and clear. (Full score: 5 points)
Score	**Grade**
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Table 3.9 Criteria to evaluate item 4. Communication ability

Item 4: Communication ability	Standard 1: Be able to write a literature review. (Full score: 5 points) Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others. (Full score: 5 points)
Score	**Grade**
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Upon developing the rubric scoring criteria to enhance students' research ability, the next steps involve presenting the completed rubric to thesis advisors for reviewing, ensuring accuracy, completeness, and identifying areas for refinement. Following this, the validity of the designed rubric scoring criteria will be assessed by five experts listed in Appendix A, using the Index of Item-Objective Congruence (IOC) method as per Phongsri (2011). Ratings will be assigned based on the extent of alignment with assessment issues:

+1 for clear relevance,
0 for uncertainty, and
-1 for clear irrelevance.

Valid items must achieve an IOC value of not less than 0.5, with an IOC of 1.00 indicating perfect alignment.

Data Collection and Data Analysis

Subsequently, after obtaining permission for data collection, student performance was evaluated using the rubric scoring criteria. Data analysis involved categorizing students' performance levels based on the descriptors outlined in the rubric scoring criteria.

Output Phase 3 (Rubric Scoring Criteria)

After implementing learning through flipped classroom teaching model, students' score of research ability was attained for testing the research hypothesis that overall performance would be improved at 80% (Good Level). by implementing the flipped classroom teaching model, at least 80% of the students' research ability should be at a good level.

Table 3.10 Summary of Phase 3 Scheme

Topics	Details
Research Process	Design the Lesson plan, design scoring rubric form. The implementation of instructional model.
Research Objectives	To study the results of flipped classroom teaching model to improve students' research ability
Research Method	Lesson plan Rubric scoring form
Resources/Target Group	Population – 46 students
Instruments	1. Lesson plans using flipped classroom teaching model. 2. Rubric scoring form
Data Analysis	Categorize students' performance according to rubric scoring criteria into their levels descriptor.
Results	Results of implementing based flipped classroom teaching model – students' performance according to rubric scoring criteria into their levels descriptor.

Chapter 4
Results of Analysis

This chapter presents findings obtained through the fieldwork procedures detailed earlier, emphasizing the critical data collection essential to this study. The objectives, as delineated in Chapter I, serve three primary aims:

Objective 1 To examine the factors affecting research ability of undergraduate students.

Objective 2 To develop flipped classroom teaching model to improve research ability of undergraduate students.

Objective 3 To study the results of flipped classroom teaching model to improve research ability of undergraduate students.

Objective 1 To examine the factors affecting research ability of undergraduate students

Participants in this research were expected to possess a foundational understanding of flipped classroom teaching instructional model to improve students' research ability for Yulin Normal University. This knowledge was necessary for them to provide informed, analytical, and critical perspectives based on these frameworks.

Data Analysis Results

Objective 1: To examine the factors affecting students' research ability.

This section presents analysis results serving objective 1 using table and description in terms of MEAN, standard deviation, interpretation (Level of Attitude), and ranking of all factors in overview. After that, items of all factors are presented likewise.

The amount of students College.

From class A: 50 students, Primary Education of Yulin Normal University.

From class B: 50 students, Primary Education of Yulin Normal University.

From class C: 50 students, Primary Education of Yulin Normal University.

150 students from Yulin Normal University. The basic data and analysis are as follows:

Table 4.1 Common data of the respondent in overall.

(N=150)

Data	Frequency	Percentage)%(
Gender		
A. Male	12	8.00
B. Female	138	92.00
Total	**150**	**100.00**
Age		
A. below 18yrs	1	0.60
B. 18-19yrs	22	14.70
C. 20 -21yrs	114	76.00
E. Over 21 yrs.	13	8.70
Total	**150**	**100.00**

From table 4.1, the common data of respondents show that the overall gender is mostly female, female accounting for 92.00 % of the total. Male respondents accounted for 8.00 % of the total. This is very consistent with the characteristics of more woman in primary education. People aged 20-21 years old accounted for 76.00 % of the total, 18-19 years old accounted for 14.7%, under 18 years old accounted for 0.60 %, and over 21 years old accounted for only 8.70% of the total. This is also very much in line with the age characteristics of second-year undergraduate students.

Table 4.2 The result of questionnaire from students in overview.

(N=150)

Factors	μ	σ	Level	Ranking
Internal Factor				
1. Do you think educational research methods courses is very interesting for your education and it will affecting improve your research ability.	4.09	0.79	High	5
2. Do you think interesting in educational research methods course will affect you to study in higher education and can do research?	4.21	0.76	High	3
3. Do you think the Motivation and attitude for you will affect you to study educational research methods course and make you like to study this course?	4.08	0.82	High	6
4. Do you think if you have a positive attitude that will make you successful in studying in this course and affect improve research ability?	4.18	0.75	High	4
5. Do you think if you are well – being, brain health to study educational research methods course, will affect you improve research ability and to find a better job after graduation?	4.31	0.73	High	1
6. Do you think better heath , the absence of sickness and disease can improve quality of studying in educational research methods course?	4.22	0.79	High	2
Total Average	**4.18**	**0.77**	**High**	
External Factor				
1. Do you think if the lecturers have the difference instructional model to teach in educational research methods course can improve students' research ability?	4.25	0.83	High	3

Table 4.2 (Continued)

(N=150)

Factors	μ	σ	Level	Ranking
2. Do you think if the lecturers finish education by major or have the high or experience to teach educational research methods course can improve students' research ability?	4.29	0.73	High	1
3. Do you think if the students manage the time to study educational research methods course both inside and outside the classroom can improve students' research ability?	4.23	0.77	High	4
4. Do you think if the students manage the time to discuss with the lecturers and friends , have the participating together inside and outside the classroom can improve students' research ability?	4.29	0.75	High	1
5. Do you think that the teaching environment (including class size, classroom environment, facilities, teacher-student interaction, relatively fixed and quiet teaching place) of the educational research methods course affects students' research ability?	4.26	0.77	High	2
6. Do you think the facilities and infrastructure outside the classroom (including internet at home, attending from your parents, and , society 's friendship and membership) affects students' research ability?	4.22	0.83	High	5
Total Average	**4.26**	**0.78**	**High**	

Table 4.2 indicates that internal factors affecting the students' research ability for Yulin Normal University are found to be at a high level overall (μ=4.18). Considering each item individually, it was found that No.5 have the highest mean (μ=4.31), followed by No.6 (μ=4.21). and the lowest mean is No.3 (μ=4.08).

For external factors affecting the students' research ability for Yulin Normal University, the overall level is also found to be at a high level (μ=4.26). Considering each item individually, it was found that No.2 and No.4 has the highest mean (μ=4.29). followed by No.5 (μ=4.26). and the lowest mean is No.6 (μ=4.22).

Table 4.3 Common data of the respondent in Yulin Normal University of Primary education major Class A.

(N=50)

Data	Frequency	Percentage)%(
Gender		
A. Male	0	0.00
B. Female	50	100.00
Total	**50**	**100.00**
Age		
A. below 18yrs	0	0.00
B. 18-19yrs	37	74.00
C. 20 -21yrs	13	26.00
E. Over 21 yrs.	0	0.00
Total	**50**	**100.00**

From table 4.3 the common data of the respondent in overall shows that 100.00 % were female. The age distribution of students is highest in the 18-19yrs group at 76.00 %. Fits the age profile of a sophomore.

Table 4.4 the mean and standard deviation of factors affecting (Class A)

(N=50)

Factors	μ	σ	Level	Ranking
Internal Factor				
1. Do you think educational research methods courses is very interesting for your education and it will affecting improve your research ability.	4.10	0.74	High	5
2. Do you think interesting in educational research methods course will affect you to study in higher education and can do research?	4.18	0.69	High	4
3. Do you think the Motivation and attitude for you will affect you to study educational research methods course and make you like to study this course?	4.20	0.73	High	3
4. Do you think if you have a positive attitude that will make you successful in studying in this course and affect improve research ability?	4.18	0.69	High	4
5. Do you think if you are well – being, brain health to study educational research methods course, will affect you improve research ability and to find a better job after graduation?	4.32	0.65	High	1
6. Do you think better heath , the absence of sickness and disease can improve quality of studying in educational research methods course?	4.22	0.65	High	2
Total Average	**4.20**	**0.69**	**High**	
Internal Factor				
1. Do you think educational research methods courses is very interesting for your education and it will affecting improve your research ability.	4.10	0.74	High	5

Table 4.4 (Continued)

(N=50)

Factors	μ	σ	Level	Ranking
2. Do you think interesting in educational research methods course will affect you to study in higher education and can do research?	4.18	0.69	High	4
3. Do you think the Motivation and attitude for you will affect you to study educational research methods course and make you like to study this course?	4.20	0.73	High	3
4. Do you think if you have a positive attitude that will make you successful in studying in this course and affect improve research ability?	4.18	0.69	High	4
5. Do you think if you are well – being, brain health to study educational research methods course, will affect you improve research ability and to find a better job after graduation?	4.32	0.65	High	1
6. Do you think better heath , the absence of sickness and disease can improve quality of studying in educational research methods course?	4.22	0.65	High	2
Total Average	**4.20**	**0.69**	**High**	

Table 4.4 indicates that internal factors affecting the students' research ability for Yulin Normal University are found to be at the high level overall (μ=4.20). Considering each item individually, it was found that No.5 have the highest mean (μ=4.32), followed by No.6 (μ=4.22). and the lowest mean is No.1 (μ=4.10).

For external factors affecting the students' research ability for Yulin Normal University, the overall level is also found to be at a high level (μ=4.25). Considering each item individually, it was found that No.1 has the highest mean (μ=4.32). followed by No.2 (μ=4.30). and the lowest mean is No.3 (μ=4.12).

This data is basically consistent with the results of the total data survey.

Table 4.5 Common data of the respondent in Yulin Normal University of Primary education major Class B.

(N=50)

Data	Frequency	Percentage)%(
Gender		
A. Male	5	10.00
B. Female	45	90.00
Total	**50**	**100**
Age		
A. below 18yrs	1	2.00
B. 18-19yrs	14	28.00
C. 20 -21yrs	35	70.00
E. Over 21 yrs.	0	0.00
Total	**50**	**100.00**

From table 4.5 the common data of the respondent in overall shows that females outnumber males, of these, 90.00 % were female and 10.00 % male. The age distribution of students is highest in the 20-21yrs group at 70.00 %. consistent with the distribution of overall statistics.

Table 4.6 The mean and standard deviation of factors affecting (Class B)

(N=50)

Factors	μ	σ	Level	Ranking
Internal Factor				
1. Do you think educational research methods courses is very interesting for your education and it will affecting improve your research ability.	3.80	0.81	High	4
2. Do you think interesting in educational research methods course will affect you to study in higher education and can do research?	3.94	0.82	High	2
3. Do you think the Motivation and attitude for you will affect you to study educational research methods course and make you like to study this course?	3.64	0.85	High	5
4. Do you think if you have a positive attitude that will make you successful in studying in this course and affect improve research ability?	3.92	0.75	High	3
5. Do you think if you are well – being, brain health to study educational research methods course, will affect you improve research ability and to find a better job after graduation?	4.04	0.81	High	1
6. Do you think better heath , the absence of sickness and disease can improve quality of studying in educational research methods course?	3.94	0.89	High	2
Total Average	**3.88**	**0.82**	**High**	
External Factor				
1. Do you think if the lecturers have the difference instructional model to teach in educational research methods course can improve students' research ability?	3.98	0.92	High	4

Table 4.6 (Continued)

(N=50)

Factors	μ	σ	Level	Ranking
2. Do you think if the lecturers finish education by major or have the high or experience to teach educational research methods course can improve students' research ability?	4.06	0.71	High	2
3. Do you think if the students manage the time to study educational research methods course both inside and outside the classroom can improve students' research ability?	4.06	0.79	High	2
4. Do you think if the students manage the time to discuss with the lecturers and friends , have the participating together inside and outside the classroom can improve students' research ability?	4.08	0.78	High	1
5. Do you think that the teaching environment (including class size, classroom environment, facilities, teacher-student interaction, relatively fixed and quiet teaching place) of the educational research methods course affects students' research ability?	4.06	0.79	High	2
6. Do you think the facilities and infrastructure outside the classroom (including internet at home, attending from your parents, and , society 's friendship and membership) affects students' research ability?	4.04	0.83	High	3
Total Average	**4.05**	**0.80**	**High**	

Table 4.6 indicates that internal factors affecting the students' research ability for Yulin Normal University are found to be at a high level overall (μ=3.88). Considering each item individually, it was found that No.5 have the highest mean (μ=4.04), followed by No.2 and No.6 (μ=3.94). and the lowest mean is No.3 (μ=3.64).

For external factors affecting the students' research ability for Yulin Normal University, the overall level is also found to be at a high level (μ=4.05). Considering each item individually, it was found that No.4 has the highest mean (μ=4.08). followed by No.2, No3 and No5 (μ=4.06). and the lowest mean is No.1 (μ=3.98). This data is basically consistent with the results of the total data survey.

Table 4.7 Common data of the respondent in Yulin Normal University of Primary education major Class C.

(N=50)

Data	Frequency	Percentage)%(
Gender		
A. Male	7	14.00
B. Female	43	86.00
Total	**50**	**100**
Age		
A. below 18yrs	0	0.00
B. 18-19yrs	8	16.00
C. 20 -21yrs	42	84.00
E. Over 21 yrs.	0	0.00
Total	**50**	**100**

From table 4.7 the common data of the respondent in overall shows that females outnumber males, of these, 86.00 % were female and 14.00 % male. The age distribution of students is highest in the 20-21 yrs group at 84.00 %. consistent with the distribution of overall statistics.

Table 4.8 The mean and standard deviation of factors affecting (Class C)

(N=50)

Factors	μ	σ	Level	Ranking
Internal Factor				
1. Do you think educational research methods courses is very interesting for your education and it will affecting improve your research ability.	4.38	0.73	High	6
2. Do you think interesting in educational research methods course will affect you to study in higher education and can do research?	4.52	0.65	The highest	2
3. Do you think the Motivation and attitude for you will affect you to study educational research methods course and make you like to study this course?	4.40	0.70	High	5
4. Do you think if you have a positive attitude that will make you successful in studying in this course and affect improve research ability?	4.44	0.70	High	4
5. Do you think if you are well – being, brain health to study educational research methods course, will affect you improve research ability and to find a better job after graduation?	4.56	0.65	The highest	1
6. Do you think better heath , the absence of sickness and disease can improve quality of studying in educational research methods course?	4.50	0.71	High	3
Total Average	**4.47**	**0.69**	**High**	
External Factor				
1. Do you think if the lecturers have the difference instructional model to teach in educational research methods course can improve students' research ability?	4.44	0.81	High	5

Table 4.8 (Continued)

(N=50)

Factors	μ	σ	Level	Ranking
2. Do you think if the lecturers finish education by major or have the high or experience to teach educational research methods course can improve students' research ability?	4.50	0.74	High	3
3. Do you think if the students manage the time to study educational research methods course both inside and outside the classroom can improve students' research ability?	4.52	0.68	The highest	2
4. Do you think if the students manage the time to discuss with the lecturers and friends , have the participating together inside and outside the classroom can improve students' research ability?	4.54	0.68	The highest	1
5. Do you think that the teaching environment (including class size, classroom environment, facilities, teacher-student interaction, relatively fixed and quiet teaching place) of the educational research methods course affects students' research ability?	4.46	0.71	High	4
6. Do you think the facilities and infrastructure outside the classroom (including internet at home, attending from your parents, and , society 's friendship and membership) affects students' research ability?	4.38	0.81	High	6
Total Average	**4.47**	**0.74**	**High**	

Table 4.8 indicates that internal factors affecting the students' research ability for Yulin Normal University are found to be at a high level overall (μ=4.47). Considering each item individually, it was found that No.5 have the highest mean (μ=4.56), followed by No.2 (μ=4.52). and the lowest mean is No.1 (μ=4.38).

For external factors affecting the students' research ability for Yulin Normal University, the overall level is also found to be at a high level (μ=4.47). Considering each item individually, it was found that No.4 has the highest mean (μ=4.54). followed by No.3 (μ=4.52). and the lowest mean is No.6 (μ=4.38). This data is basically consistent with the results of the total data survey.

The Lecturers Interview analysis results

The amount of lecturers University. From 5 lecturer, work on Yulin Normal University.

Teacher 1: Mr. Chen.

Teacher 2: Mr. Liu.

Teacher 3: Mr. Chen.

Teacher 4: Miss Ni.

Teacher 5: Miss Li.

Table 4.9 Common data of the respondent in Yulin Normal University.

(N=5)

Data	Frequency	Percentage)%(
Gender		
A. Male	3	60.00
B. Female	2	40.00
Total	**5**	**100.00**
Teaching experience		
A. Below 3 yrs.	0	0.00
B. 3-6 yrs.	0	0.00
C. 7- 9 yrs.	1	20.00
D. Over 9 yrs.	4	80.00
Total	**5**	**100.00**

Table 4.9 (Continued)

(N=5)

Data	Frequency	Percentage)%(
Age		
A. below 25yrs	0	0.00
B. 25-35yrs	1	20.00
C. 35 -49yrs	3	60.00
E. Over 49 yrs.	1	20.00
Total	**5**	**100.00**
Professional title		
A. Professor	2	40.00
B. Associate Professor	2	40.00
C. Assistant Professor	0	00.00
D. Lecturer	1	20.00
Total	**5**	**100.00**

From table 4.9, the common data of the lecturers shows that the most common gender is male, representing 60.00 % of the respondents, while female lecturers make up 40.00% of the sample in terms of teaching experience, 7-9 years accounted for 20.00 % and over 9 years accounted for 80.00 %; In terms of the age of teachers, 25-35years accounted for 20.00 %, 35-49 years accounted for 60.00 % and Over 49years accounted for 20.00%. In terms of Professional title, Professor accounted for 40.00%, Assistant Professor accounted for 40.00% and Lecturer accounted for 20.00% each. It can also be seen that the interviewees are experienced and representative.

Through interviews with 5 teachers, the factors affecting research ability in Yulin Normal University are summarized as follows:

Internal Factor

The internal influencing factors of teacher interview mainly include Interesting, Motivation and attitude, Physical health. After finishing, it is mainly manifested in:

Interesting: Interest is a very important factor. 5 lecturers agreed that interest in learning is a non-important factor. Mr. Chen (Teacher 1) believed that interest is the best teacher, students are interested in learning, interested in research, students

will listen attentively to the class, students will be able to explore independently, students will learn independently, and they will spend more time on improving their own research ability. Miss. Li (Teacher 5) believed that interest is equally important to the Teacher, if the teacher is interested in teaching, then the teacher will spend more time on researching and teaching, the teacher will spend more time on preparing the materials needed for teaching, and the teacher will spend more time thinking about how to improve the students' research ability in the research methodology course. Mr.Liu (Teacher 2) believes that only when students are interested in learning, they will be willing to cooperate with the teacher's teaching work and the teacher's teaching plan, and that interest is very important for learning, especially for improving students' research ability. Therefore, students' interest in learning is one of the very important factors affecting their research ability.

Motivation and attitude: The five teachers felt that the motivation and attitude of the teachers of the Educational Research Methods program were very important. Scientific research is a very rigorous thing, and scientific research is a logical and methodical thing. It is difficult for students to improve their research ability only through self-study, and they need the teacher's demonstration and guidance. The improvement of research ability requires long-term practice and accumulation, and very professional teachers. Therefore, the teaching of educational research methods courses is very demanding for teachers. Teachers' personal research ability and understanding of educational research will affect the improvement of students' research ability, especially teachers' motivation and attitude. Mr. Chen (Teacher 3) believes that attitude determines everything, educational research methods course is a very practical course, it is difficult for students to improve their own research ability only by self-study. Only when the teacher carries out serious teaching, guidance and demonstration can the students' research ability be improved. This requires teachers to spend a lot of time on teaching design and discussion, and without motivation and a good attitude, they can't do this job well. Miss. Li (Teacher 5) believes that only when teachers are motivated and have a good attitude towards teaching, teachers will devote themselves to teaching, and teachers will seriously guide students to practice, and students' research ability will be really improved. li also believes that that the improvement of students' research ability requires students to learn seriously and

more importantly, teachers need to teach seriously, if teachers do not teach seriously, the learning of learning cannot be carried out, which will definitely affect the improvement of students' research ability.

Physical health: Teachers' physical condition and health will affect the teaching of educational research methods in the classroom, and will affect the students' learning effect. Mr. Chen (Teacher 1) believes that a healthy body is the prerequisite for teachers to teach the course, if the teachers do not have a healthy body, then the teachers cannot devote themselves to the teaching, which will affect the effectiveness of the teaching, and will affect the students' ability to improve their research skills. Miss. Ni (Teacher 4) believes that only with a healthy body can the teachers teach the course. If the teacher is not healthy, the teaching cannot be carried out at all, which will affect the students' learning and the improvement of their research ability. Miss. Li (Teacher 5) believes that physical health is very important. It will definitely affect the improvement of research ability. Mr. Liu (Teacher 2) thinks that teacher's health is a prerequisite for teaching educational research methodology courses and a key factor for improving students' research ability. So, the teacher's physical condition and health are very important.

External Factor

The external influencing factors of teacher interview are mainly carried out from three aspects: Method of Teaching, Time, Environment of friends and family and facilities and infrastructure. After finishing, it is mainly manifested in:

Method of Teaching: This includes the selection of teaching models, the preparation of course materials, the organization of course delivery, evaluation and feedback. Good education must have a good teaching model. All five interviewees agreed that a comprehensive understanding of the students' situation, the selection of a suitable teaching mode in conjunction with the teaching objectives of the educational research methods course, and the scientific organization of its implementation are among the factors affecting students' research ability. Mr. Chen (Teacher 1) believes that many teachers are now trying to use project teaching mode, flipped classroom teaching mode, problem-oriented teaching mode, online and offline blended teaching mode and so on in the teaching of educational research methods, but they have achieved certain results and also have certain shortcomings. At present, the author is also in the flipped classroom teaching mode,

and the effect is relatively significant. Mr. Chen (Teacher 3) believes that by analyzing the students' situation, level, and grasping the students' needs as a whole, and carrying out the selection of the appropriate teaching mode, choosing the appropriate teaching strategy, and improving and adjusting it according to the students' situation, the teaching goal can be achieved. Miss. Ni(Teacher 4) believes that the characteristics of the educational research methods course with strong practicality determines the choice of teaching mode. Flipped classroom teaching mode is a teaching mode that focuses on students' self-learning motivation development and independent inquiry, which is in line with the structure of students' research ability, so the flipped classroom teaching mode is more suitable for the teaching of educational research methods course. It can achieve the purpose of improving students' research ability. Mr. Liu (Teacher 2) believes that there is no definite method of teaching, but there is a method of teaching, and its most fundamental purpose is to improve students' ability and improve their research ability. No matter which teaching mode is adopted, students should be put in the position of the main body, and the teacher is only the participant and guide of learning. The flipped classroom teaching mode precisely reflects the characteristic of student subject teacher leading. This will help students to improve their research ability. Miss. Li (Teacher 5) believes that teaching mode affects the teaching effect to a great extent, and different courses have corresponding teaching modes, teachers should choose the appropriate teaching mode according to the nature of the course and the situation of the students.

During the interviews, all five teachers mentioned the need to reform the current evaluation mechanism for teaching educational research methods courses. Miss. Li (Teacher 5) believes that research ability is a comprehensive ability, and that it is inappropriate to judge the learning effect of students only through the question paper examination in the past. Because the most important criterion for judging research ability is whether the students can do research alone, not the examination. Mr. Chen (Teacher 1) thinks that educational research methodology courses are very practical courses, and it is not suitable for the assessment of such courses to be carried out through the examination of paper. We can't evaluate students' learning effect only by paper examination, students' performance before and after class, students' usual practice, report of learning and so on should be part of the course

evaluation. This also relates to the teachers' ability to make reasonable decisions on the selection of course materials, the Organization of teaching, the implementation of the course, etc. Miss. Ni (Teacher 4) believes that research ability is a comprehensive ability and the evaluation criteria should be diversified. This is one of the factors affecting students' research ability.

Time: The five interviewees consistently agreed that time is a key factor affecting research ability, and that research ability is a comprehensive ability that requires sufficient time guarantee to improve students' research ability. Mr. Chen (Teacher 1) believed that the improvement of research ability requires students to spend a lot of time practicing and practicing in order to really improve students' research ability. Adequate time is also very important for teachers because they need sufficient time to design lesson plans, answer students' questions and discuss with them, etc. Miss. Li (Teacher 5) thinks that sufficient time is very important for the course of Educational Research Methods because it is a course that requires a lot of practice, and Mr. Liu (Teacher 2) thinks that sufficient time is very important for both teachers and students, because research ability must be improved through practice. Because a lot of training is necessary for the enhancement of research skills. Miss. Ni (Teacher 4) believes that different courses have different characteristics, and the nature of the Educational Research Methods course dictates that teachers have to invest a lot of time in teaching the course, such as preparing course materials for students and having academic discussions with students. Students have to spend more time on practice and hence self-improvement.

Environment of friends and family and facilities and infrastructure: All five interviewees said that a good curriculum teaching environment, campus atmosphere, home learning environment and good teaching facilities contribute greatly to the improvement of research ability. Mr. Chen (Teacher 3) believes that a good learning environment is very important for learning, and there has been a saying in China since ancient times that Mencius' mother moved three times. It shows the importance of environment to a person's growth, and learning is the same, the environment is very important, if the school has a good learning atmosphere, then students will involuntarily study hard, if the family learning environment is good, students can devote themselves to learning, if the learning infrastructure is good, such as the library environment is good, then it will be conducive to students'

learning. Obviously, a good environment is very important to enhance students' research ability. Miss. Li (Teacher 5) believes that a good teaching environment is very important to students' research ability, for example, the number of classrooms, if the number of classes is too large, the teachers will not be able to take care of them, which will affect the quality of learning. A good infrastructure that facilitates after-class discussion and exchange between teachers and students is also conducive to the enhancement of teachers' research ability. Mr. Liu (Teacher 2) believes that a good environment allows students to learn happily and teachers to teach smoothly, which is naturally conducive to the teaching of the curriculum and to the enhancement of students' research ability. Miss. Ni (Teacher 4) believes that the environment is an invisible force that affects the quality of students' learning, and I've seen a lot of universities. I have seen many universities, often the good ones have a better learning environment, and the quality of students' learning is also better, which shows that a good learning environment is conducive to the enhancement of students' research ability.

Through the above interviews with teachers, it is found that the results of factors affecting students' research ability are basically consistent with the results of students' questionnaire survey.

After comparing the data collected by the student questionnaire and the lecturer interview, the researcher made a summary analysis according to the two groups of people, internal factors and external factors, and reached a conclusion as shown in table 4.10 below.

Table 4.10 Summary of factors affecting students' research ability.

Students' opinions		Lecturers' Opinions		Synthesized Opinions	
Internal factors	**External factors**	**Internal factors**	**External factors**	**Internal factors**	**External factors**
1) Interesting: Interest is the best teacher and students should increase interest in the Educational Research Methods course.	1) Method of teaching: Professional, experienced teachers and scientific teaching methods can effectively improve students' research ability.	1) Interesting: Interest in learning is an important factor in the improvement of students' research ability.	1) Method of teaching: The choice of instructional model, course implementation, evaluation and feedback can affect the improvement of students' research ability	1) Interesting: Emphasis is placed on stimulating students' interest in learning and making learning love the educational research methods course, which is conducive to improving students' research ability.	1) Method of teaching: Professional, experienced teachers and scientific teaching methods are very important. Choosing the flipped classroom teaching mode is in line with the characteristics of educational research methods courses and can improve students' research ability.

Table 4.10 (Continued)

Students' opinions		Lecturers' Opinions		Synthesized Opinions	
Internal factors	**External factors**	**Internal factors**	**External factors**	**Internal factors**	**External factors**
2) Motivation & attitude : Good motivation and attitude towards learning helps in learning and research ability.	2) Time: Adequate practice time is important for research ability.	2) Motivation & attitude : Teachers with positive motivation and attitudes can provide students with higher quality course instruction and are important factors in students' research ability.	2) Time: Adequate time is fundamental to the provision of high quality teaching and learning in the course, allowing more guidance and discussion with students and facilitating research ability.	2) Motivation & attitude : Extremely positive motivation and attitudes are equally important for students and teachers, which allows both parties to invest more time and effort and is an important factor in research ability.	2) Time: Adequate time is as important for students as it is for teachers, who can provide higher-quality teaching, and for students, who have more time to practice, which is a fundamental guarantee of improved research ability.

Table 4.10 (Continued)

Students' opinions		Lecturers' Opinions		Synthesized Opinions	
Internal factors	**External factors**	**Internal factors**	**External factors**	**Internal factors**	**External factors**
3) Physical health: Physical health is the fundamental guarantee of learning; without it you cannot learn and improve your research ability.	3) Environment of friends and family and facilities and infrastructure: A good classroom environment, school environment, family environment, friendships, etc. are all effective in promoting research ability.	3) Physical health: Teachers possessing good health, clear thinking, etc. are fundamental to the teaching of the curriculum and to the research ability of the students.	3) Environment of friends and family and facilities and infrastructure: A good teaching environment, campus atmosphere, home learning environment etc. can be a tremendous aid in teaching educational research methods courses.	3) Physical health: Having a healthy body, a clear mind, and staying away from illness is important for both students and teachers. It is a fundamental factor that affects research ability.	3) Environment of friends and family and facilities and infrastructure: The classroom and extracurricular environments in which educational research methods courses are taught can be stimulating. It improves the efficiency and quality of student learning.

From Table 4.10, it can be seen that the internal factors affecting the research ability of students majoring in elementary education in Yulin Normal College are: 1) Attaching importance to the stimulation and cultivation of students' interest in learning, teachers have to study the students and teaching in depth, to understand the level and needs of the students, and to design the course teaching carefully to improve the research ability of the students. 2) Cultivating good motivation and learning attitude of the students, so that the students love to learn and like to learn, and the teachers provide Higher quality teaching, students are investing more time and energy. This is an important factor to improve students' research ability.3) Having a healthy body, clear thinking, and staying away from diseases are the most fundamental factors affecting the improvement of students' research ability.

The external factors affecting research ability of students majoring in elementary education in Yulin Normal College are 1) Excellent and professional teachers and scientific teaching methods are the key to improving students' research ability. Choosing the flipped classroom teaching mode is in line with the characteristics of educational research methods courses, which can improve students' research ability; 2) Sufficient time is equally important for students and teachers, teachers can provide higher quality teaching, while students have more time for practice, which is the fundamental guarantee for improving research ability. 3) The classroom and extracurricular teaching environment of educational research methods courses can stimulate students' interest in learning. It improves the efficiency and quality of student learning. It can play a good supporting role.

By analyzing the data collected from the two groups of respondents, it was found that among the factors affecting research ability, having a healthy body, clear thinking, and staying away from illnesses were the most fundamental factors. Having sufficient time is an important factor. the data collected from both groups of respondents agreed that educational research methods courses is a highly practical course that requires a lot of time investment, teachers spend a lot of time on adequate preparation for teaching the course, and students spend a lot of time practicing the course. At the same time, the mode of teaching, the classroom and extracurricular environment, and positive and effective assessment all contribute to students' research ability. In addition, the motivation and attitude of teachers and the motivation and attitude of students are also very important factors.

Objective 2: To develop flipped classroom teaching model to improve research ability of undergraduate students.

To serve objective 2, the collected data of confirming the appropriateness of 5 components of instructional model are analyzed in 4 areas, i.e. utility, feasibility, propriety, and accuracy and presented by frequency and percentage of the specialists as shown in table 4.11 description below.

Table 4.11 Frequency and percentage of confirmability of utility, feasibility, propriety, and accuracy of the instructional model components in 5 components of instructional model by specialists.

NO	Components of flipped classroom teaching model	Opinion of the Specialists															
		Utility				Feasibility				Propriety				Accuracy			
		Agree		Disagree		Agree		Disagree		Agree		Disagree		Agree		Disagree	
		f	%	f	%	f	%	f	%	f	%	f	%	f	%	f	%
1	Principle and rationale	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
2	Objectives	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
3	Contents	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
4	Methods of Teaching & materials	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
5	Evaluation	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0

From table 4.11, the confirmability of each component of flipped classroom teaching model by specialists 100 % all utility standards, feasibility standards, propriety standards, and accuracy standards.

Principle and Rationale

The utility of principle and rationale of flipped classroom teaching model is confirmed to be appropriate by 3 Thai and Chinese specialists; feasibility 3 specialists; propriety 3 specialists; and accuracy 3 specialists.

Objectives

The utility of objectives of flipped classroom teaching model is confirmed to be appropriate by 3 Thai and Chinese specialists; feasibility 3 specialists; propriety 3 specialists; and accuracy 3 specialists.

Contents

The utility of contents of flipped classroom teaching model is confirmed to be appropriate by 3 Thai and Chinese specialists; feasibility 3 specialists; propriety 3 specialists; and accuracy 3 specialists.

Methods of Teaching & Materials

The utility of methods of teaching & materials of flipped classroom teaching model is confirmed to be appropriate by 3 Thai and Chinese specialists; feasibility 3 specialists; propriety 3 specialists; and accuracy 3 specialists.

Evaluation

The utility of evaluation of flipped classroom teaching model is confirmed to be appropriate by 3 Thai and Chinese specialists; feasibility 3 specialists; propriety 3 specialists; and accuracy 3 specialists.

Objective 3: To study the results of flipped classroom teaching model to improve research ability of undergraduate students.

By using the scoring to score of the research ability of undergraduate students in Yulin Normal University, the analysis results are given. Flipped classroom teaching model described in Chapter 3 combines tabular and descriptive analysis.

In this study, research ability is divided into 4 items and 9 standards. Specific results are presented in table 4.12.

Table 4.12 Students' research ability rubric sore assessment

Aspects of assessment	$\overline{X}$	SD	level
Item 1: Ability to select a topic	8.26	0.80	Excellent
Item 2: Ability to collect and organize information	12.98	0.68	Good
Item 3: Research plan design ability	8.09	0.69	Excellent
Item 4: Communication ability	8.54	0.89	Excellent
Total	**37.87**		**Excellent**

Table 4.12 indicates that after implementing the flipped classroom teaching instructional, through analysis, the total scores of 46 students were rated as Excellent ($\overline{X}$=37.87). Among them, Ability to select a topic, which are the foundation of Educational research methods Course, showed the most significant improvement, reaching excellent ($\overline{X}$=8.26). Secondly, the Ability to collect and organize information is relatively low, but also good ($\overline{X}$=12.98). Thirdly, The Research plan design ability reaching excellent ($\overline{X}$=8.09). Fourth, The Communication ability also reaching excellent ($\overline{X}$=8.54). The score of students' research ability improved by the flipped classroom teaching instructional model is shown in figure 4.1

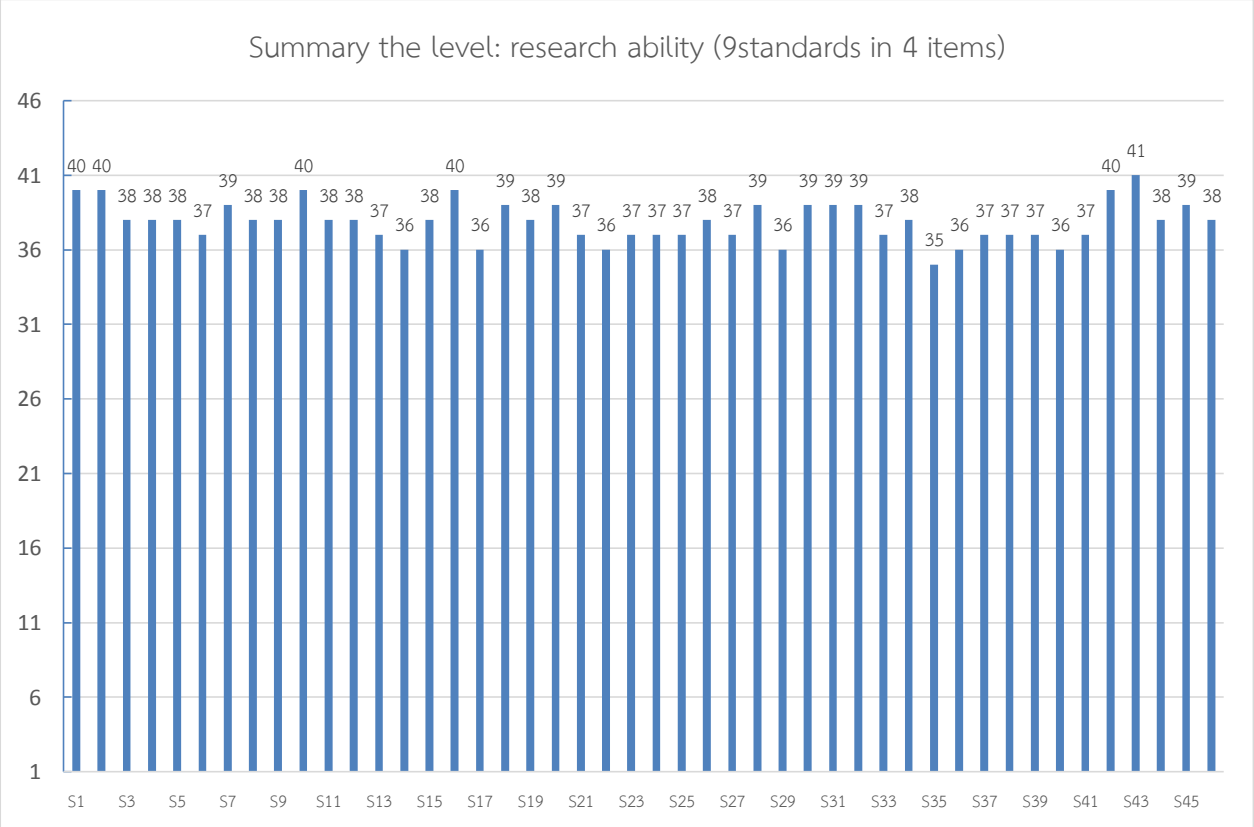

Figure 4.1 Summary the level: research ability (9standards in 4 items)

Summarizing 9 standards from four dimensions, developing the flipped classroom teaching instructional model to improve students' research ability score and analysis are shown in table 4.13.

Table 4.13 Research ability score grading and summary the level

Research ability	Item1: Ability to select a topic Item 2: Ability to collect and organize information Item3: Research plan design ability Item4: Communication ability

Summary the level: Research ability (9 standards in four items)

Score	**Grade/Development level**	**Frequency**	**Percentage**
37-45	Excellent	39	84.78%
28-36	Good	7	15.22%
19-27	Medium	0	0.00%
10-18	Pass	0	0.00%
Less than 10	Poor	0	0.00%

Table 4.13 shows that 100% of the 46 students in the study showed good calligraphy comprehensive ability in the calligraphy course. Among them, 39 were excellent (84.78%), 7 were good (15.22%). No student below medium level.

It can be seen that all the students (100.00%) have improved their Research ability after implementing flipped classroom teaching instructional model. This result is consistent with the study hypothesis that the overall Research ability of students will be improved by 80% (good grade or higher) after the flipped classroom teaching instructional model is implemented. It is further proved that flipped classroom teaching instructional model is very effective to improve the Research ability of Yulin Normal University students.

In the process of improving the Research ability of Yulin Normal University students through the flipped classroom teaching instructional model, the detailed scores of students in the experiment of Ability to select a topic, the first dimension of Ability to select a topic, are shown in figure 4.2:

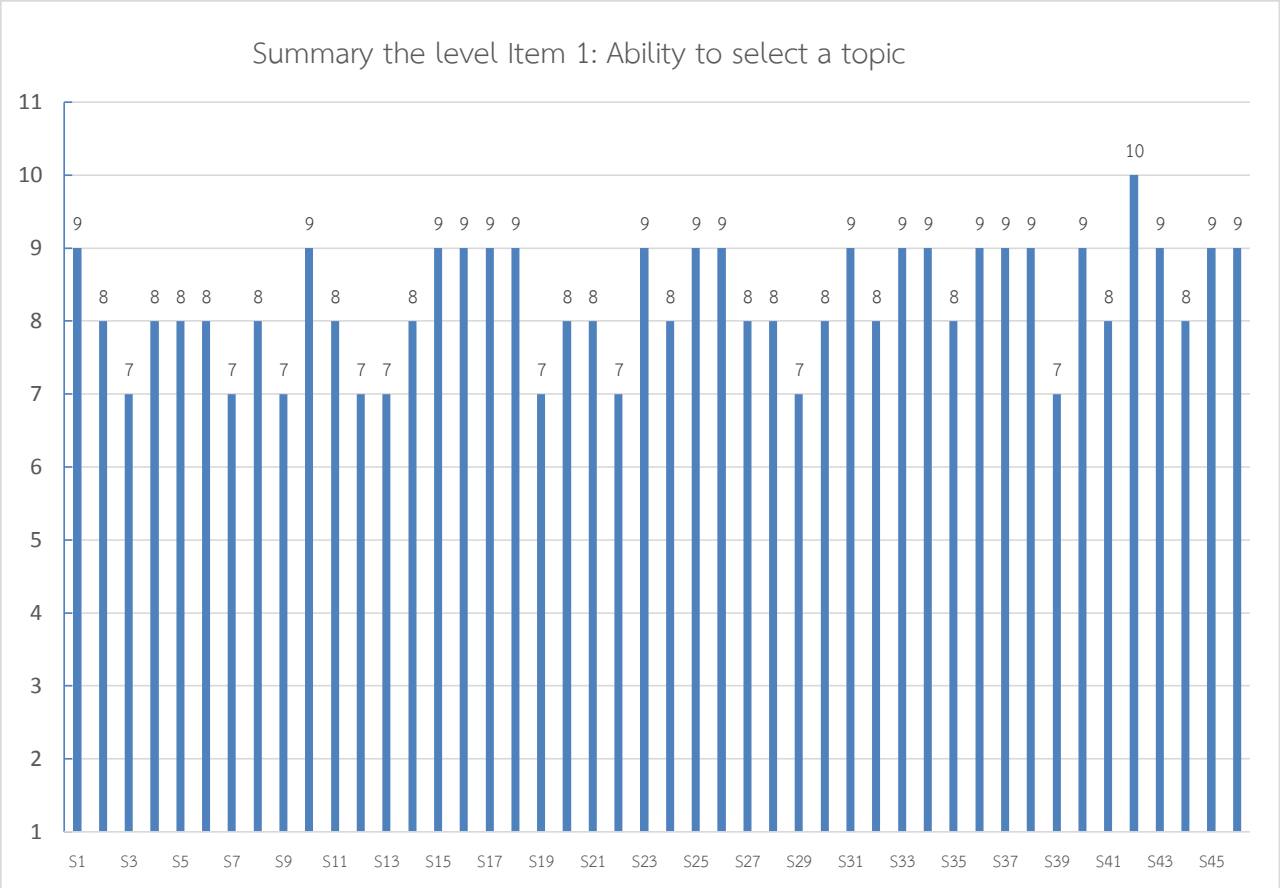

Figure 4.2 Summary the level Item 1: Ability to select a topic

Develop flipped classroom teaching instructional model to improve students' Ability to select a topic. Item 1: Ability to select a topic, student scores and summary level, data analysis as shown in table 4.14.

Table 4.14 Item1: Ability to select a topic score grading and summary the level

Item1: Ability to select a topic	Standard 1: Be able to select research questions related to education. Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society

Summary the level item 1

Score	**Grade/Development level**	**Frequency**	**Percentage**
9-10	Excellent	20	43.48 %
7-8	Good	26	56.52%
5-6	Medium	0	0.00%
3-4	Pass	0	0.00%
Less than 3	Poor	0	0.00%

Table 4.14 shows that 100.00% of students have mastered good Ability to select a topic in the educational research methods Course. Among them, 20 were excellent (43.48%), 26were good (56.52%). No student below medium level. This fully proves that flipped classroom teaching instructional model plays an important role in improving students' Ability to select a topic, which is consistent with the total data.

In the process of improving the research ability of college students through the flipped classroom teaching instructional model, in the experiment of the second dimension of research ability – ability to collect and organize information, the detailed scores of students are shown in figure 4.3:

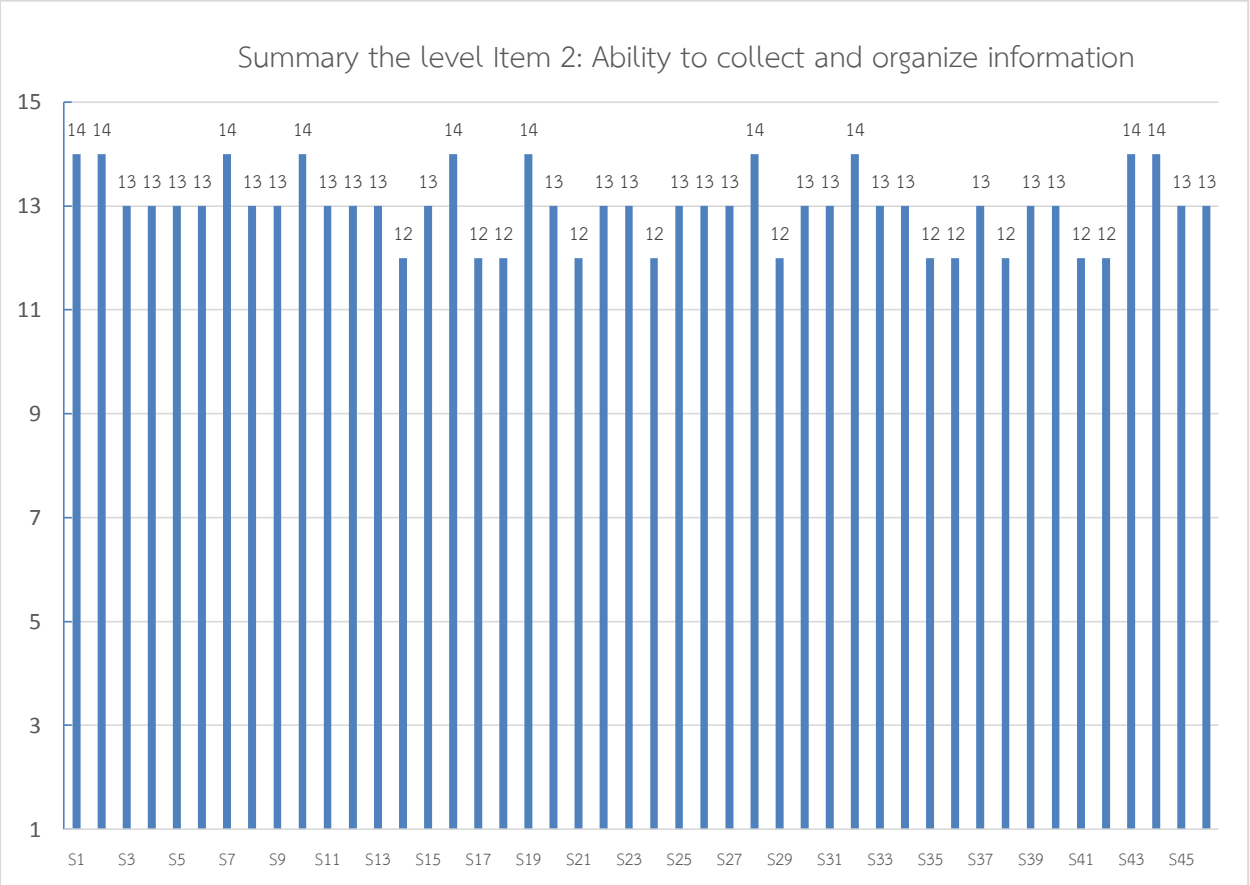

Figure 4.3 Summary the level Item 2: Ability to collect and organize information

Develop the flipped classroom teaching instructional model to improve students' research ability. Item 2: Ability to collect and organize information, student scores and summary level, data analysis as shown in table 4.15.

Table 4.15 Item 2: Calligraphy aesthetic ability score grading and summary the level

Item 2: Ability to collect and organize information	Standard 1: be able to collect relevant literature materials in China according to the research. Standard 2: Be able to collect relevant research materials from abroad according to the research needs. Standard 3: Ability to analyses collected literature

Summary the level item 2

Score	Grade/Development level	Frequency	Percentage
13-15	Excellent	35	76.09%
10-12	Good	11	23.91%
7-9	Medium	0	0.00%
4-6	Pass	0	0.00%
Less than 4	Poor	0	0.00%

Table 4.15 shows that 100.00% of students have developed a good research ability in the educational research methods Course. Among them, 35 were excellent (76.09%), 11were good (23.91%). No student below medium level. This fully proves that flipped classroom teaching instructional model plays an important role in improving students' Ability to collect and organize information, which is consistent with the total data.

In the process of improving the research ability of college students through flipped classroom teaching instructional model, the detailed scores of students in the experiment of research plan design ability, the third dimension of research plan design ability, are shown in figure 4.4:

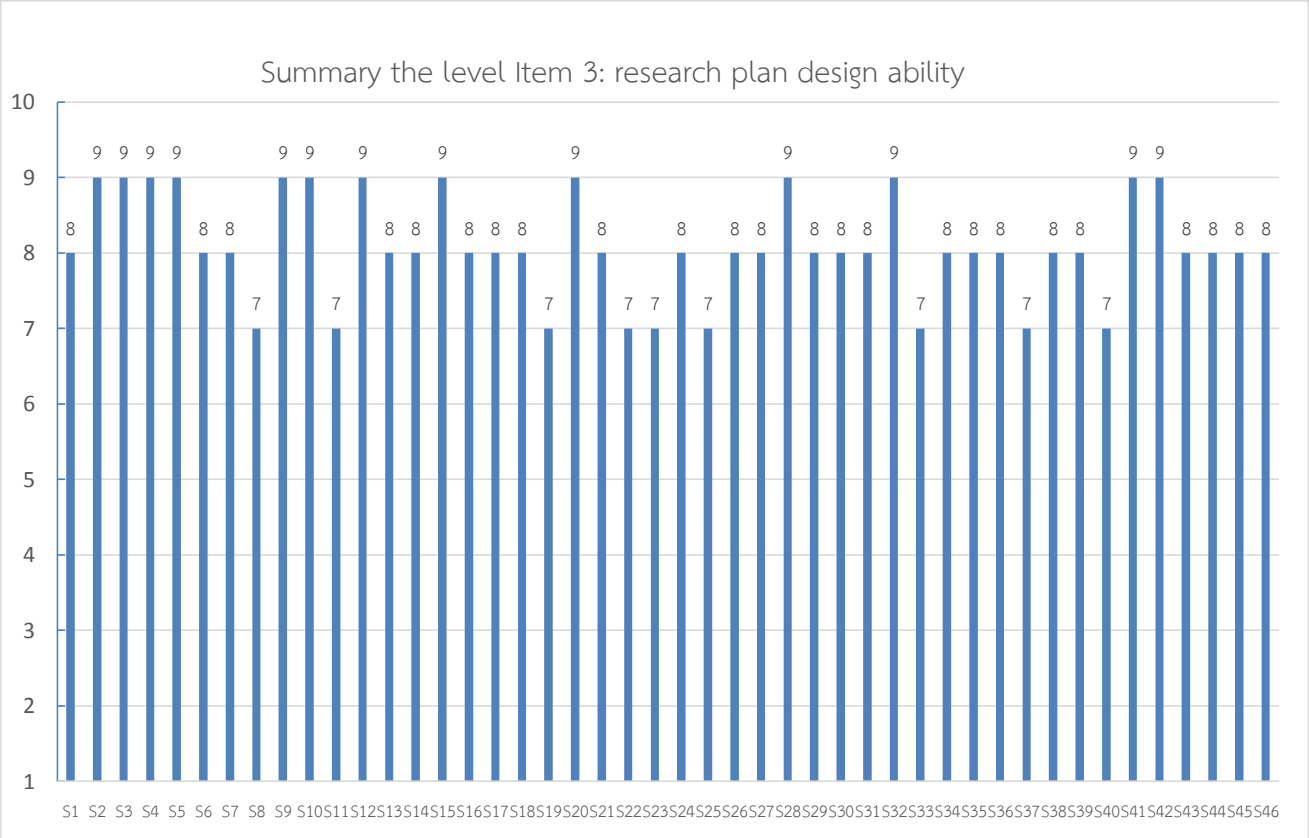

Figure 4.4 Summary the level Item 3: research plan design ability

Develop the flipped classroom teaching instructional model to improve students' research ability. Item 3: research plan design ability, student scores and summary level, data analysis as shown in table 4.16.

Table 4.16 Item3: Research plan design ability scores grading and summary level

Item3: Research plan design ability	Standard 1: Ability to design a research plan independently. Standard 2: The designing research plan is scientific, rational and clear.		
Summary the level item 3			
Score	**Grade/Development level**	**Frequency**	**Percentage**
9-10	Excellent	13	28.26%
7-8	Good	33	71.74%
5-6	Medium	0	0.00%
3-4	Pass	0	0.00%
Less than 3	Poor	0	0.00%

Table 4.16 shows that 100.00% of students have good research plan design ability in the educational research methods Course. Among them, 13 were excellent (28.26%), 33 were good (71.74%). No student below medium level. This fully proves that flipped classroom teaching instructional model plays an important role in improving students' research plan design ability, which is consistent with the total data.

In the process of improving the research ability of college students through flipped classroom teaching instructional model, the detailed scores of students in the experiment of Communication ability, the fourth dimension of Communication ability are shown in figure 4.5:

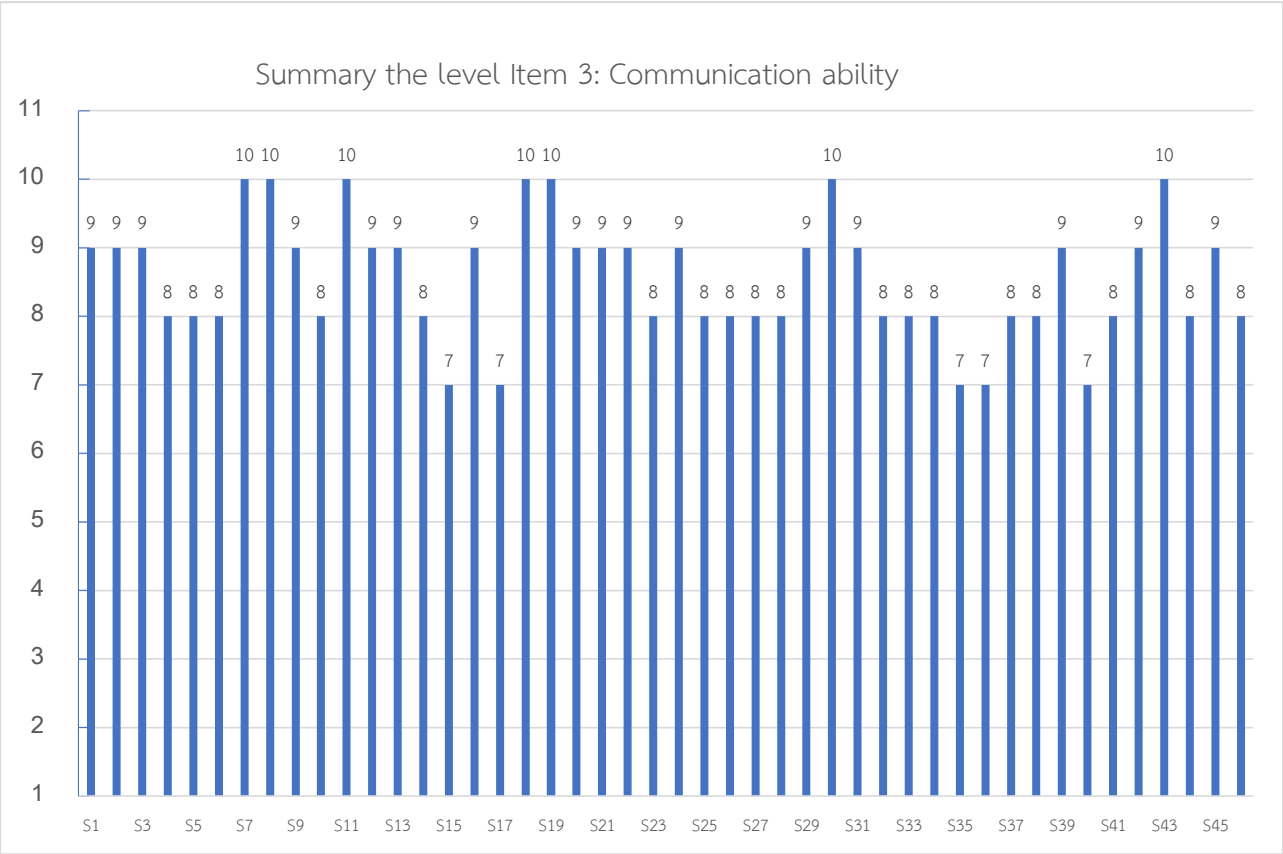

Figure 4.5 Summary the level Item 3: Communication ability

Develop the flipped classroom teaching instructional model to improve students' research ability. Item 4: Communication ability, student scores and summary level, data analysis as shown in table 4.17.

Table 4.17 Item4: Communication ability scores grading and summary level

Item3: Communication ability		Standard 1: Be able to write a literature review. Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others.	
Summary the level item 3			
Score	**Grade/Development level**	**Frequency**	**Percentage**
9-10	Excellent	23	50.00%
7-8	Good	23	50.00%
5-6	Medium	0	0.00%
3-4	Pass	0	0.00%
Less than 3	Poor	0	0.00%

Table 4.17 shows that 100.00% of students have good Communication ability in the educational research methods Course. Among them, 23 were excellent (50.00%), 23 were good (50.00%). No student below medium level. This fully proves that flipped classroom teaching instructional model plays an important role in improving students' communication ability, which is consistent with the total data.

Through the above research, it is found that the flipped classroom teaching instructional model implemented in Yulin Normal University has improved the research ability of 46 experimental students in four dimensions, among which 100.00% of the students' research ability is at a good level, no students below medium or pass level. The results are consistent with the study hypothesis that more than 80% of participants will have a good level of research ability after learning through flipped classroom teaching instructional model. The specific implementation process is shown in Figure 4.6:

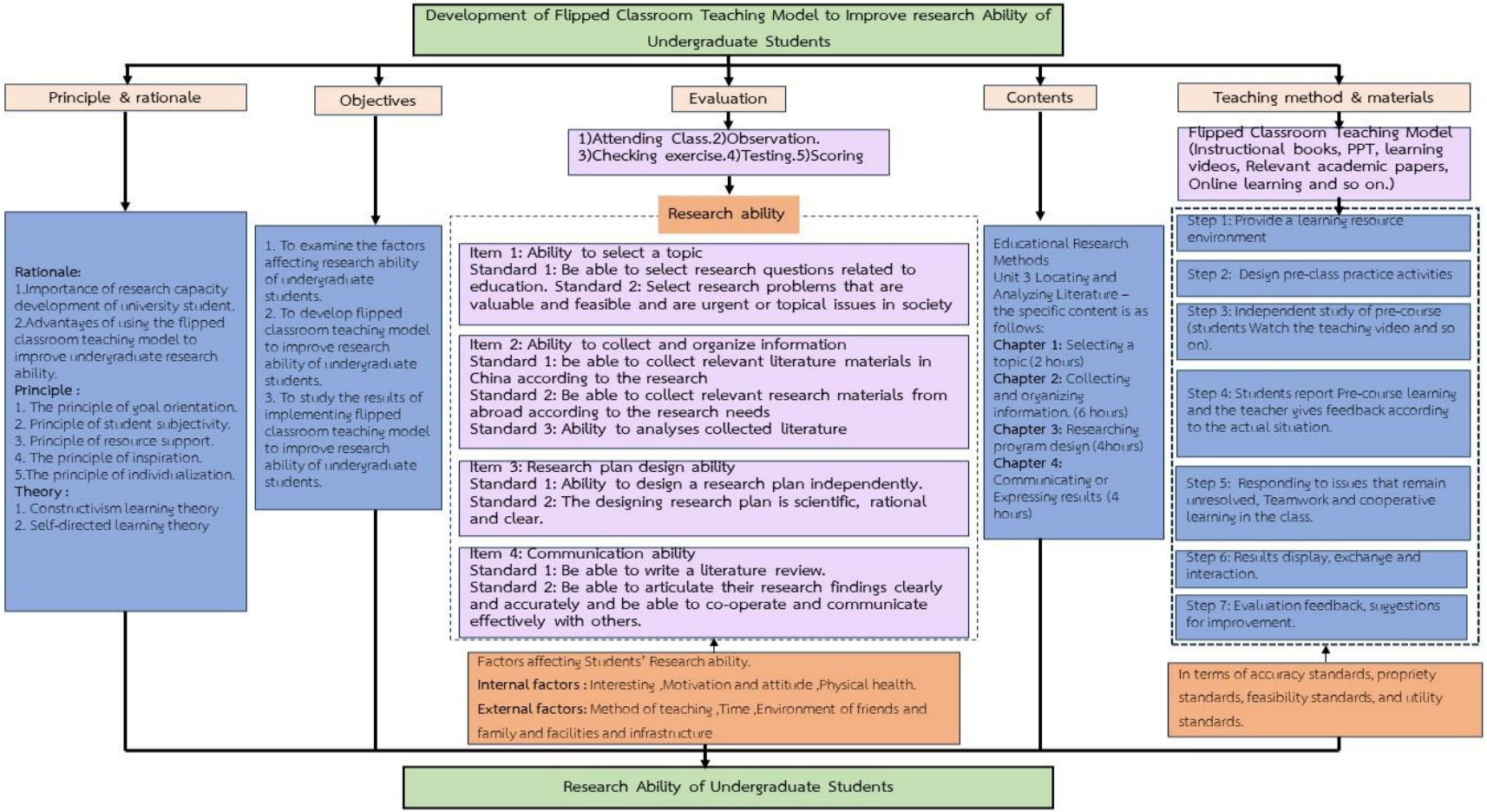

Figure 4.6 Flipped classroom teaching instructional model implementation for improving students' research ability flowchart

Chapter 5
Conclusion Discussions and Recommendations

After analyzing and presenting data analysis results in chapter 4 as serving all research 4 research objectives of the present study “Development of flipped classroom teaching model to improve research ability of undergraduate students”, it can be concluded and discussed as follows. Further, some approaches are recommended on basis of the findings.

Research Objectives

1. To examine the factors affecting research ability of undergraduate students.

2. To develop flipped classroom teaching model to improve research ability of undergraduate students.

3. To study the results of flipped classroom teaching model to improve research ability of undergraduate students.

Conclusion

1. The results of the data analysis of the students’ questionnaire and lecturers’ interviews indicated that the factors affecting research ability in educational research methods course include two aspects: internal factors and external factors. The former included 1) Interesting 2) Motivation and attitude 3) Physical health, while the latter involved 1) Method of teaching 2) Time 3) Environment of friends and family and facilities and infrastructure, both of which work together to effect students’ research ability in educational research methods course.

2. The flipped classroom teaching model to improve research ability in educational research methods course of vocational undergraduate students was 100% as assessed by 3 specialists conformed to utility, feasibility, propriety, and accuracy standards. The model developed by 5 components: 1) Principle and rationale, study the course and students’

problem about research ability and take the result from objective 1 to do model, 2) Objectives, take from objective 2 in research 3) Contents, take from the

structure of course to experiment 4) Method of teaching & materials, take from the steps to teach by flipped classroom teaching model and 5) Evaluation, by scoring rubric form research ability.

3. The results showed that the implementation of the flipped classroom teaching model to improve research ability for 46 students had been improved in 4 Items. In addition, the overall developmental scores of individual students' research ability was generally found at excellent level. There were 39students or 84.78% of all students at "Excellent" developmental level of research ability of total Items.; 7 students or 15.22.% at "Good" developmental level; No student or 0.00% at "Medium", "Pass" and "Poor" developmental level.

Discussions

In the "Development of flipped classroom teaching model to improve research ability of undergraduate students" study, The researchers provided the following information:

1. Internal and external factors that affect students' research ability.

Through researching and consulting data, 150 students from Yulin Normal University and five Instructor of the Educational Research Methods course were interviewed. There are internal factors and external factors that affect the research ability of undergraduate students. The discussion is as follows:

The internal factors that affect the research ability of undergraduate students include the learners' research motivation, self-efficacy, scientific research interest, achievement motivation, cognitive level, etc. (Gong Liang, 2014), The research conclusion of Fu (Fu, D. Q, 2023) shows that research interest has a more obvious impact on research ability, and students with research interest have better research ability than students without research interest.

The external factors that affect the research ability of undergraduate students mainly include Teacher guidance, teacher level, teacher-student interaction, environmental factors such as academic atmosphere, etc. (Gong Liang, 2014.) The research conclusion of Fu (Fu, D. Q, 2023) shows that students who invest more time in scientific research have better research ability than students who invest less time in scientific research, which shows that time investment is also very important for improving research ability.

(Cao, H.M. 2020) shows that Students' research ability is influenced by a variety of factors, and according to the theory of internal and external factors, it is known that research ability is influenced by internal as well as external factors. Internal factors are the fundamental reasons for the development of things, while external factors are the necessary conditions for the development of things. Therefore, teachers should maximize the combination of internal and external factors to stimulate students. Promote the growth and development of students.

2. The flipped classroom teaching model is 100% compliant with the standards of practicality, feasibility, appropriateness and accuracy. There are 5 components: 1) Principles and reasons, 2) Objectives, 3) Content, 4) Teaching methods & Materials, and 5) assessment. The discussion is as follows.

The practicality, feasibility, appropriateness and accuracy of the flipped classroom teaching model have been unanimously recognized by three experts from Thailand and China. It shows that the principles and principles of this instructional model are robust and have a solid theoretical foundation. The application of this instructional model in Educational Research Methods course is conducive to improving students' research ability and provides scientific and effective theoretical support. The goals of the flipped classroom teaching model were 100% endorsed by 3 experts. A clear teaching goal is the premise of achieving teaching effect. The teaching goal of this model is clear and clear, and the implementation of this model can really improve the research ability of undergraduate students.

The content section of the flipped classroom teaching model has also been unanimously confirmed by all experts. According to the Yulin Normal University students to choose the appropriate teaching content, the instructional model to do elaborate design. (Yulin Normal University, 2024) The teaching methods and teaching materials of the flipped classroom teaching model have been unanimously recognized by experts. The carefully designed flipped classroom teaching activities and teaching models have good adaptability and can effectively promote the improvement of research capabilities. The evaluation of the flipped classroom teaching model has also been unanimously recognized by experts. The selected evaluation methods and contents reflect the effectiveness and appropriateness of the research ability evaluation and can effectively provide feedback on students' research ability.

In conclusion, the unanimous confirmation by experts in terms of practicality, feasibility, appropriateness and accuracy is a testament to the robustness of the flipped classroom teaching model. It strongly indicates that the instructional model and its components can improve the research ability in Yulin Normal University by concrete implementation.

3. Through The implementation of the flipped classroom teaching model, 100% of students' research ability is at a good level.

Through the experiment on the first-year students of Elementary Education Major in Yulin Normal University, the results show that the research ability of 46 students has been improved from four dimensions and 9 standards by implementing flipped classroom teaching model. 100.00% of the students' research ability is at a good level. No students' research ability is at a medium or pass level. The discussion is as follows:

First, the ability to select a topic is the most fundamental manifestation of research ability.

Topic selection is to choose a scientific research topic, that is, to raise a question, to propose a valuable topic that is suitable for the researcher's personal ability and objective conditions. It is the first link of every scientific research work, that is, the starting point of the work. The scientific research topic is a summary of the researcher's theoretical understanding and practical means of a certain problem. The topic is proposed after sufficient ideological and practical preparation. It concentrates on the scientific thinking, theoretical depth and practical ability of the topic selection, and reflects the wisdom, experience and skills of the opositioner and practitioner The scientific research topic is the main line throughout the scientific research work and the guiding ideology of the entire scientific research work. The correctness of the topic selection determines the success or failure of the scientific research work. The key to topic selection is to clarify whether the topic is important and whether it is advanced. (China Modern Medicine Journal, 2019)

Second, the ability to search and analyze literature is the key to research ability. A systematic, thorough and organized review may ultimately produce high-quality work that will benefit students in achieving course objectives and developing their research. (Timmins, F., McCabe, C. 2005)

It can be seen that the cultivation of literature search and analysis ability is very important in the teaching of educational research methods. Finding appropriate literature and analyzing it is the key to the next step of research.

Third, The Research plan design ability is an important manifestation of research ability.

A good research plan design is an important guarantee for the success of a research project. It can not only provide guidance and support for the implementation of the research project, but also pave the way for the success of the entire project and avoid errors and cost losses in the later stages. Of course, the design of the research plan is based on the basic analysis and investigation in the early stages, so as to find the most suitable and feasible solution for the research and promote the research project in a more efficient way. Therefore, the ability to design a research plan is an important manifestation of research ability.

Fourth, communication ability is the ultimate embodiment of research ability.

Communication skills include written expression skills and verbal expression skills. Written expression skills refer to the ability to write research results. In this study, it mainly refers to the ability to write literature reviews. Verbal expression skills refer to the ability to cooperate and communicate in the process of research, and to clearly express one's own ideas and research results to others. No matter who conducts a research, cooperation, communication, exchange, and expression of results are required. This means that written expression skills or verbal expression skills are very important for doing research. Therefore, communication skills are extremely important and are the ultimate embodiment of research ability.

In conclusion, the design of a research ability evaluation system with four dimensions and nine standards is of great significance to improving students' research ability. According to the implementation of the flipped classroom teaching model, 100.00% of the students' comprehensive calligraphy ability is at a good level, which is consistent with the research hypothesis. It fully proves that the selection and implementation of the teaching model is effective and reasonable.

Recommendations

The results of this study lead to dual recommendations: applicability of the results and future research.

Applicability of results

Based on the summary and analysis of the research objectives and conclusions, relevant suggestions are elaborated from three aspects according to the results of this study:

1. By choosing the flipped classroom teaching model, students have achieved remarkable results in improving their research ability. Students have acquired new learning methods and learning experience in scientific research. They have selected research topics, read academic literature, written research plans, and reported research results according to their actual situation, and truly put what they have learned into practice. At the same time, the following suggestions are made to students in the process of learning educational research methods: First, continue to maintain interest in educational research and a positive learning attitude, actively participate in the school's educational research projects, and persevere in practical learning to make continuous progress. Second, improve students' autonomous learning ability, independent planning ability, and research practice ability, and set their own learning goals. Third, maintain effective communication with teachers and students, and devote enough time to practice, so as to further consolidate and improve their research ability. Lay a solid foundation for the study of other courses and future employment.

2. In the context of implementing the flipped classroom teaching model to improve students' research ability, several suggestions are made to the teachers of the educational research methods course. First, teachers are required to have a comprehensive and in-depth understanding of the principles, methods, and steps of the flipped classroom teaching model in order to better apply and implement it. Second, teachers should improve their own educational research capabilities and accurately define the dimensions and standards of research capabilities. Use modern information technology and platforms to create a good environment for students to improve their research capabilities. Third, teachers should change their teaching concepts and actively transform their roles from traditional knowledge disseminators to promoters and collaborators in the learning process. Fourth, teachers should

constantly innovate teaching models. As the saying goes, there are methods for teaching, but there is no fixed method for teaching. Teachers should not be too superstitious about fixed teaching models or teaching steps. They should constantly innovate teaching models and teaching methods, and constantly innovate and improve on the basis of existing models. As long as it is conducive to students' learning and growth, they can consider adopting or absorbing it.

3. For normal colleges, teachers should be provided with comprehensive professional training and various guarantees so that they can have a deep understanding of and master the flipped classroom teaching model. At the same time, the college should provide necessary resources and actively cooperate with the demonstration to ensure that the teaching environment based on the flipped classroom teaching model is effectively established and operated. Finally, cooperation and exchanges between various majors, schools, and relevant beneficiary units should be encouraged to comprehensively improve the teaching quality.

Future Study

In order to optimize and improve the flipped classroom teaching model, in-depth practice and potential research are needed to expand the width and depth of its use by answering the following questions.

1. *Can the flipped classroom teaching model be applied to other courses, combined with more courses, to expand the intensity and depth of research?* For example, the school-based curriculum development courses, teacher professional ethics courses, painting courses and other courses of primary education majors in normal colleges can apply this teaching model to achieve teaching goals, improve classroom efficiency and teaching level, and promote the reform and innovation of traditional classroom teaching.

2. *What other abilities can the flipped classroom teaching model improve students?* In the 21st century, students need a variety of core skills. After the widespread application of this student-centered teaching model, whether it can improve the various necessary skills of contemporary college students will be the focus of our future research.

3. *What teaching model can better improve students' research ability?* At present, the teaching models adopted by the educational research method course

include project-based teaching model and hybrid teaching model. What is the relationship between the flipped classroom teaching model and them? What are the similarities and differences? What are the advantages of each? How to combine different advantages together to innovate teaching models and improve teaching quality and teaching efficiency is a topic worthy of our continued in-depth research.

4. *How to choose an appropriate teaching model based on the characteristics of the course and the actual situation of the students?* How to combine two or more teaching models? How to continuously innovate teaching models? These are all things that need further exploration and improvement, and can be used as one of the directions for our future research.

In summary, this study provides a better choice for improving the research ability of undergraduate students in normal universities. The flipped classroom teaching model is an important factor in improving the ability to select topics, search for literature and analyze it, design research plans, and cooperate and communicate. At the same time, this study also provides new ideas for the future research on the teaching model of educational research methods courses. Verify and affirm the applicability and universality of the flipped classroom teaching model, thereby improving its sustainability and effectiveness in educational practice

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Appendices

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

List name the specialist to check research instruments for IOC

1.Assistant Professor Tanaput Chancharoen	Educational Management and learning Management Innovation Program Bansomdejchaopraya Rajabhat University
2. Professor Dr.Tang Dehai	Philosphy of Curriculum and Instruction GuangXi University for Nationalities
3. Professor Dr. Jiang Shihui	Curriculum and Instruction Guangxi Normal University

List name the specialist to evaluate the Instructional Model

1. Assistant Professor Dr.Wanida Ploysangwal	English Program University of the Thai Chamber of Commerce
2. Dr.Panas Jansritong	Admistration Program Burapa University
3. Professor Dr. Chen Qingwen	Higher Education Program Yulin Normal University

Appendix B

Official Letter

Ref.No. MHESI 0643.14/562

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Invitation to be the expertise for research instruments' quality

Dear Assistant Professor Dr. Tanaput Chancharoen

Attachment Questionnaire 1 set

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The Curriculum Management Committee considered that you are an expertise who has the knowledge and ability to provide useful advice on constructing research instruments for students.

Please be respected as an expert to examine such research instruments. Thank you very much for your concern.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Ref.No. MHESI 0643.14/563

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Invitation to be the expertise for research instruments' quality

Dear Professor Dr.Tang Dehai

Attachment Questionnaire 1 set

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The Curriculum Management Committee considered that you are an expertise who has the knowledge and ability to provide useful advice on constructing research instruments for students.

Please be respected as an expert to examine such research instruments. Thank you very much for your concern.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Ref.No. MHESI 0643.14/564

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Invitation to be the expertise for research instruments' quality

Dear Professor. Dr. Jiang Shihui

Attachment Questionnaire 1 set

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The Curriculum Management Committee considered that you are an expertise who has the knowledge and ability to provide useful advice on constructing research instruments for students.

Please be respected as an expert to examine such research instruments. Thank you very much for your concern.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Ref.No. MHESI 0643.14/565

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Invitation to be the expertise for instructional model's quality

Dear Assistant Professor Dr. Wanida Ploysangwal

Attachment Evaluation sheets

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The Curriculum Management Committee considered that you are an expertise who has the knowledge and ability to provide useful advice on constructing instructional model for students.

Please be respected as an expert to examine such research instruments. Thank you very much for your concern.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Ref.No. MHESI 0643.14/566

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Invitation to be the expertise for instructional model's quality

Dear Dr. Panas Jansritong

Attachment Evaluation sheets

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The Curriculum Management Committee considered that you are an expertise who has the knowledge and ability to provide useful advice on constructing instructional model for students.

Please be respected as an expert to examine such research instruments. Thank you very much for your concern.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Ref.No. MHESI 0643.14/567

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Invitation to be the expertise for instructional model's quality

Dear Professor. Dr. Chen Qingwen

Attachment Evaluation sheets

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The Curriculum Management Committee considered that you are an expertise who has the knowledge and ability to provide useful advice on constructing instructional model for students.

Please be respected as an expert to examine such research instruments. Thank you very much for your concern.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Ref.No. MHESI 0643.14/568

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Request for data collection

Dear President of Yulin Normal University
Attachment 150copy of questionnaires

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The researcher needs to collect data using questionnaire in terms of factors undergraduate student's Research Ability from 150 students majoring in Primary Education at Yulin Normal University , I'm formally requesting your assistance in distributing the attached questionnaire to the informants as referred above and please send the completed ones back to the researcher via email to 506033045@qq.com.

The researcher plans to use this data for his thesis completion and further necessary publication as required by the Ph.D. course.

I am grateful for your consideration of my request. I pledge to adhere to any stipulations you deem fit. You may reach me at the phone number or email address provided below in case of any related questions. I look forward to your response.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Ref.No. MHESI 0643.14/569

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsaraparb 15 Hirunrujee
Thonburi Bangkok 10600

11 March 2024

Subject Request for permission to implement experiment

Dear President of Yulin Normal University

Regarding the thesis entitled "Development of Flipped Classroom Teaching Model to Improving Research Ability of Undergraduate Students" of Mr. Qin Jianrong, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University code number 6373103206, Thailand under the supervision of Associate Professor Dr. Areewan Iamsa-ard as major advisor, The Associate Professor. Dr.Sarayuth Sethakajorn and Assistant Professor Dr.Wapee Kong -In as co-advisor.

The researcher needs to implement an experiment in compliance with approved methodology and collect data in terms of undergraduate student's Research Ability from Primary Education majoring students from class 1 who enroll in Educational research methods Course at Yulin Normal University during the 1st semester of academic year 2024. Hence, I'm formally requesting permission to implement the experiment and access the aforementioned data. The researcher plans to use this data for her thesis completion and further necessary publication as required by the Ph.D. course.

The researcher plans to use this data for his thesis completion and further necessary publication as required by the Ph.D. course. I am grateful for your consideration of my request. I pledge to adhere to any stipulations you deem fit. You may reach me at the phone number or email address provided below in case of any related questions. I look forward to your response.

Sincerely,

(Assistant Professor Akaranun Asavarutpokin)
Vice Dean Acting for Dean of Graduate School

Graduate School
Tel.+662-473-7000 ext. 1814

Appendix C

Research Instrument

- Evaluation Results of lOC for Questionnaire for Students
- Evaluation Results of lOC for Interview for Lectures
- Assessment of confirm the quality of Flipped Classroom Teaching Model
- Assessment form IOC for Validity of Instructional Model Questionnaire
- Assessment form for Validity of Rubric students' research Ability
- Assessment form for Validity of Lesson plan

Questionnaire for students

Directions:

These questionnaires are the instruments for collecting data in 1st phase of the research entitled "Questionnaire on factors affecting research ability of Yulin Normal University students" conducted by Qin Jianrong, a Ph.D. student in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University under the supervision of Associate Professor Dr. Areewan Iamsa-ard Associate majoring advisor, and Assistant Professor Dr. Wapee Kong-In & Assistant Professor Dr. Sarayuth Sethakajorn co-advisor.

This questionnaire is divided into 3 sections i.e.

Section 1 Common data of the respondent.

Section 2 Section 2 Information on the factor research ability of Yulin Normal University students.

The questionnaire type is the Closed-ended questions that can only be answered by selecting from provided number to summated rating scale, 5 scales.

The important issues of the items consist of two groups of the factors: Internal factors (respondents) and External factors (teachers, circumstances, etc.)

Section 3 Further suggestions

Data obtained from this questionnaire are only used for the purpose of conducting aforementioned research and remain confidential. Individual or personal data presentation will be avoided.

Answer the questionnaire:

Section 1 Common data of the respondent.

Directions*: Please put ✓into the ❑ according to your own personal data.*

Gender is ❑ Male ❑ Female

2. Students from

❑ A. Class A in Primary Education

❑ B. Class B in Primary Education

❑ C. Class C in Primary Education

3. Age ❑ A. below 18 yrs. ❑ B. 18-19 yrs.

❑ C. 20-21yrs. ❑ D. over 21 yrs.

Section 2 Questionnaire on factors Research Ability ability of Yulin Normal University students.

Directions*: Please rate the following factors affecting* Outcomes-Based Education and Flipped Classroom Teaching Model *by putting ✓into the attitude level column based on the criteria given below. Each question can select only one answer.*

5 means the highest

4 means high

3 means moderate

2 means few

1 means the fewest

Questions	Answers				
	5	4	3	2	1
Internal Factors (Interesting No. 1-2, Motivation and attitude No. 3-4, No. 5-6 Physical health)					
1.Do you think educational research methods course is very interesting for my education and can improve research ability?					
2. Do you think educational research methods course will help you to study in higher education and can do research?					
3. Do you think the lecturers have the way to motivate you to study educational research methods course and make you like to study this course?					
4. Do you think if you have a positive attitude that make you are successful in studying in this course and having good research ability?					
5. Do you think if you are well – being, brain health to study educational research methods course, make you improve research ability and to find a better job after graduation?					
6. Do you think better heath , the absence of sickness and disease can improve quality of studying in educational research methods course?					
External factors (No. 1-2 Method of teaching No.3-4 Time No. 5-6 Environment of friends and family and facilities and infrastructure)					
1.Do you think if the lecturers have the difference instructional model to teach in educational research methods course can improve students' research ability?					
2.Do you think if the lecturers finish education by major or have the high or experience to teach educational research methods course can improve students' research ability?					
3.Do you think if the students manage the time to study educational research methods course both inside and outside the classroom can improve students' research ability?					
4.Do you think if the students manage the time to discuss with the lecturers and friends , have the participating together inside and outside the classroom can improve students' research ability?					

Questions	Answers				
	5	4	3	2	1
5.Do you think that the teaching environment (including class size, classroom environment, facilities, teacher-student interaction, relatively fixed and quiet teaching place) of the educational research methods course affects students' research ability?					
6.Do you think the facilities and infrastructure outside the classroom (including internet at home, attending from your parents, and , society 's friendship and membership) affects students' research ability?					

Section 3 Suggestions for improving the better instruction

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Thank you for your kind cooperation for completing the questionnaire!

Researcher

Qin jianrong

Interview for Lecturers

Directions:

This interview is a part of research entitled “Questionnaire on factors affecting research ability of Yulin Normal University students”.

Research Objectives:

To examine the factors affecting students’ research ability.

It is conducted by Qin Jianrong, a Ph.D. student in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University under the supervision of.

1. Associate Professor Dr.Areewan Iamsa-ard

2. Assistant Professor Dr. Wapee Kong-In

3. Assistant Professor Dr. Sarayuth Sethakajorn

The following open questions are the instrument for collecting data in 1st phase of the research, concerning about factors to improve research ability of Yulin Normal University students.

Please write down your own opinion for each question. Data obtained from this questionnaire are only used for the purpose of conducting aforementioned research and remain confidential. Individual or personal data presentation will be avoided.

These questions are the instrument for collecting data in 1st phase of the research.

1. Gender is

❑ A. Male ❑ B. Female

2. What College did you come to?

❑ A. Yulin Normal University

3. Experience teaching

❑ A. Below 3 yrs. ❑ B. 3-6 yrs. ❑ C. 7- 9 yrs. ❑D. Over 9 yrs.

4. Age

❑ A. Below 25 yrs. ❑ B. 25-35yrs ❑ C. 36-49yrs. ❑D. Over 49 yrs.

Section 2 Interview on factors research ability of Yulin Normal University.

Directions: *The type of question is open-ended questions; you can answer according to your actual situation. Your answers will only be used in this research and will not be disclosed individually.*

1. Does the availability of some research experience for students have any impact on improving research skills? If yes, please give reasons.

2. Research methods courses play an important role in developing students' research skills. If you agree, please give reasons.

3. Teachers' research literacy affects the improvement of students' research ability. If you agree, please give reasons.

4. Teachers' understanding of educational research methods courses can affect the development of students' research skills.

5. Teachers' attitudes can affect the development of students' research skills. If you agree, please write your reasons.

6. Effective classroom teaching (including group teaching, organizing activities, planning content, etc.) during research methods classroom teaching can affect the development of students' research skills. If you agree, please write your reasons.

7. What instructional models do you use to improve students' research skills in teaching research methods courses?

8. Do you think the use of appropriate research methods course materials (e.g., online videos) can improve students' research skills?

9. What kind of environment (including school environment, home environment, etc.) do you think is conducive for students to write high-quality research proposals and research reports?

10. What do you think needs to be improved in teaching the educational methods course at Yulin Normal College?

Comment and recommendation for improving the better instruction.

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Thank you for your kind cooperation for completing the questions.

Researcher

Qin Jianrong

Development of Flipped Classroom Teaching Model to Improve Research Ability of Undergraduate Students

Dear assessors,

The present study is conducted by Qin Jianrong a Ph.D. student in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University, Thailand, under the supervision of the following advisors.

1. **Major Advisor:** Associate Professor Dr. Areewan Iamsa-ard

1. **Co-advisor:** Assistant Professor Dr. Wapee Kong-In

2. **Co-advisor:** Associate Professor Dr. Sarayuth Sethakajorn

The attached open questions are the instrument for collecting data in phase 2 of the research, the objective of which is to confirm instructional model.

Please write down your own opinion for each question. Data obtained from this questionnaire are only used for the purpose of conducting aforementioned research and remain confidential. Individual or personal data presentation will be avoided.

These questions involve 3 parts as follows.

Part 1: Assessor's information

Part 2: Assessment of the quality of instructional model on 5-point rating scale basis in 4 aspects 1) Utility Standards 2) Feasibility Standards 3) Propriety Standards and 4) Accuracy Standards.

Part 3: Suggestion

The researcher certifies that all information obtained from this questionnaire will be used for academic purposes and to generate maximum benefit meeting objectives.

Thank you very much for dedicating your valuable time and providing useful information to this research for the benefit of further research and development.

Qin Jianrong

Ph.D. student

Curriculum and Instruction Program

Bansomdejchaopraya Rajabhat University

Assessment of confirm the quality of Flipped Classroom Teaching Model

Assessor:

Position:

Workplace:

Direction: Assessment of confirm the quality of instructional model. Please answer all questions by making in the answer box that corresponds to your opinion or the truth using the following criteria.

Table

Assessment Items	Assessment Results		Remarks
	Agree	Disagree	
Utility Standards			
1. Flipped classroom teaching model to improve research ability of undergraduate students is useful to students to improve research ability.			
2. Flipped classroom teaching model is useful to lecturers to improve research ability of undergraduate students.			
3. Flipped classroom teaching model includes necessary and enough contents.			
4. Flipped classroom teaching model promotes to improve research ability more compared to traditional teaching.			
5. Flipped classroom teaching model increases the learning achievement of students and improve research ability.			

Table (Continued)

Assessment Items	Assessment Results		Remarks
	Agree	Disagree	
Feasibility Standards			
1.The lecturer can apply flipped classroom teaching model to improve research ability of undergraduate students to their work and it is worth the time for actual use.			
2. The lecturer can develop the students to improve research ability of flipped classroom teaching model**.**			
3. Flipped classroom teaching model to lecturer is easy to use.			
4. The students always develop their learning all time by flipped classroom teaching model to improve research ability.			
5. The students are comfortable in learning by themselves with flipped classroom teaching model to improve research ability.			
Propriety Standards			
1. Flipped classroom teaching model to improve research ability is appropriate for lecturers to use assessment results to improve the students' research ability.			
2. Flipped classroom teaching model to improve research ability is appropriateness for students to create knowledge by themselves.			
3. Flipped classroom teaching model to improve research ability is convenient to use.			
4. Flipped classroom teaching model to improve research ability is a systematic process to use.			

Table (Continued)

Assessment Items	Assessment Results		Remarks
	Agree	Disagree	
5. Flipped classroom teaching model to improve research ability is clear and suitable for use in learning and students' development.			
Accuracy Standards			
1. Flipped classroom teaching model to improve research ability is comprehensively analyzed from different contexts and sufficient for the synthesis of patterns.			
2. Flipped classroom teaching model to improve research ability has a clear process.			
3. Flipped classroom teaching model to improve research ability are described and the acquisition is clear.			
4. Flipped classroom teaching model to improve research ability uses the burgeoning techniques and tools which acquires accurate information and communication.			
5. Flipped classroom teaching model to improve research ability is a correct and comprehensive learning system.			

Suggestions

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Sign.....Assessor

Date...../...../.....

Assessment Form for Validity of Rubric Students' research ability

Research Title: Development of Flipped Classroom Teaching Model to Improve Research Ability of Undergraduate Students

Research Objectives: 3. To study the results of Flipped Classroom Teaching Model to enhance research ability of undergraduate students.

Assessor: Assistant Professor Dr. Tanaput Chancharoen

Position: Educational management and Learning Management Innovation Program

Workplace: Bansomdejchaopraya Rajabhat University

Directions: Please assess the validity of the attached lesson plans regarding the given issues by putting ✓ in the box according to the following criteria.

+1 if you think the issues CAN measure the appropriateness of the instructional model

0 if you are NOT SURE the issues can measure the appropriateness of the instructional model

-1 if you think the issues CANNOT measure the appropriateness of the instructional model

5 means the highest

4 means high

3 means moderate

2 means few

1 means the fewest

Table Scoring rubric form

Item	5	4	3	2	1
Item 1: Ability to select a topic					
Standard 1: Be able to select research questions related to education.	Able to consider various factors when selecting a topic. The topic is highly relevant to the education industry and fully meets the requirements of the primary education major.	Be able to consider various factors when selecting topics that are relevant to the education industry and meet the requirements of primary education majors.	Have the ability to select topics that are relevant to the education industry and basically meet the requirements for primary education majors.	Have the ability to select topics that are not highly relevant to the education industry and basically do not meet the requirements for primary education majors.	Do not have the ability to select topics, the topic selection is completely unrelated to the education industry, and does not meet the requirements of the primary education major.
Standard 2: Select research problems that are valuable and feasible, and are	The topic selection is of great significance, high research value and strong feasibility,	he selected topics are of high value and feasibility, and are hot issues that need to be	The topic has a certain value, the feasibility is not strong, and it is not a	The topic selection is basically worthless and not very feasible. It is not a hot issue	The topic selection is completely worthless and not feasible. It is not a hot issue that

Item	5	4	3	2	1
urgent or topical issues in society.	which is a hot issue that needs to be solved urgently in the field of education.	addressed urgently in the field of education.	research problem in the field of education.	that urgently needs to be solved in the field of education.	urgently needs to be solved in the field of education.
Item 2: Ability to collect and organize information					
Standard 1: be able to collect relevant literature materials in China according to the research.	Ability to locate appropriate national literature based on research needs. Proficiency in methods and techniques for locating domestic literature.	Be able to locate appropriate national literature according to research needs, and master some methods and techniques for locating national literature.	Know some methods and techniques for locating national literature.	Basic lack of knowledge of methods and techniques for locating national literature.	There is a complete lack of mastery of methods and techniques for locating national literature.
Standard 2: Be able to collect relevant research materials	Ability to locate appropriate foreign literature based on	Be able to find appropriate foreign literature according	Know some methods and techniques for	Basic lack of knowledge of methods and	There is a complete lack of mastery of methods and

Item	5	4	3	2	1
from abroad according to the research needs. topical issues in society.	research needs. Proficiency in methods and techniques for locating foreign literature.	to the research needs, and master some methods and techniques of finding foreign literature.	finding foreign literature.	techniques for finding foreign literature.	techniques for finding foreign literature.
Standard 3: Ability to analyses collected literature.	Proficiency in techniques and methods for reading literature and determining the quality of literature, and proficiency in the use of literature management software and literature analysis software.	Master the skills and methods of reading literature and judging the quality of literature, and master the use of literature management software and literature analysis software.	Basic mastery of the methods and techniques of reading literature and judging the quality of literature, and basic mastery of the use of literature management software and literature analysis software.	Basic lack of knowledge of methods and techniques for reading literature and determining the quality of literature. Basically do not master the use of literature management software and	Completely failed to master the methods and techniques of reading literature, judging the quality of literature, and completely failed to master the use of literature management software and literature analysis

Item	5	4	3	2	1
				literature analysis software.	software.
Item 3: Research plan design ability					
Standard 1: Ability to design a research plan independently.	Ability to skillfully design a well-developed research program. Selection of methods is appropriate and well justified.	Ability to design a relatively well-developed research design with appropriate and well-argued prior methodology.	Basic knowledge of the methodology and content of research program design.	Basic lack of mastery of the methodology and content of research program design.	A complete lack of mastery of the methodology and content of research program design.
Standard 2: The designing research plan is scientific, rational and clear.	Ability to skillfully design a research proposal that is complete, clear, and scientifically sound.	Be able to design a research program that is more complete, clearer, and scientifically sound.	Barely able to carry out the design of a research program, but the designed research program is partially problematic.	Designs a research program that is incomplete and poorly thought out.Notsufficiently scientific.	The designed research program is incomplete and poorly thought out.Completely unscientific.

Item	5	4	3	2	1
Item 4: Communication ability					
Standard 1: Be able to write a literature review.	The literature review is of high quality. The information is detailed, well thought out and well argued.	The literature review is generally of good quality, but there are a few minor issues.	The literature review is well structured but has many problems.	The literature review is problematic, poorly thought out and poorly argued.	Completely unable to write a complete literature review.
Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others	Strong written and verbal skills, clear thinking, and the ability to accurately articulate your results.	Good written and verbal skills, and overall ability to accurately articulate his/her research findings.	Average documentation skills, average verbal skills, and overall ability to articulate his/her research findings to others.	Largely unable to accurately articulate their ideas and findings to others.	Poor written and verbal skills to accurately articulate their results.

Table Assessment form

	Item	Assessment Results			Remarks
		+1	0	-1	
1	**Item 1: Ability to select a topic**				
	Standard 1: Be able to select research questions related to education.				
	Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society.				
2	**Item 2: Ability to collect and organize information**				
	Standard 1: be able to collect relevant literature materials in China according to the research.				
	Standard 2: Be able to collect relevant research materials from abroad according to the research needs. topical issues in society.				
	Standard 3: Ability to analyses collected literature.				
3	**Item 3: Research plan design ability**				
	Standard 1: Ability to design a research plan independently.				
	Standard 2: The designing research plan is scientific, rational and clear.				
4	**Item 4: Communication ability**				

Item	Assessment Results			Remarks
	+1	0	-1	
Standard 1: Be able to write a literature review. Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others				

Criteria to evaluate Item 1 Ability to select a topic 2 Standards

Score	Grade
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Criteria to evaluate Item 2 Ability to collect and organize information 3 Standards

Score	Grade
13-15	Excellent
10-12	Good
7-9	Medium
4-6	Pass
Less than 4	Poor

Criteria to evaluate Item 3 Research plan design ability 2 Standards

Score	Grade
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Criteria to evaluate Item 4 Communication ability 2 Standards

Score	Grade
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Criteria to evaluate research ability over all

Score	Grade
37-45	Excellent
28-36	Good
19-27	Medium
10-18	Pass
Less than 10	Poor

Suggestions

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Sign.....Assessor

Date...../...../.....

Assessment form for Validity of Lesson Plan (Objectives: 3)

Research Title: Development of Flipped Classroom Teaching Model to Improve Research Ability of Undergraduate Students

Research Objectives: 3. To study the results of flipped classroom teaching model to improve research ability of undergraduate students.

Assessor:

Position:

Workplace:

Directions: Please assess the congruence between components of project-based learning instructional model by putting ✓ in the box according to the following criteria.

+1 if you think the issues CAN measure the appropriateness of the instructional model

0 if you are NOT SURE the issues can measure the appropriateness of the instructional model

-1 if you think the issues CANNOT measure the appropriateness of the instructional model

No.	Items	Assessment Results			Remarks
		+1	0	-1	
Learning Objective					
1	Complying with content of the course				
2	Covering knowledge, process, and attitude				
3	Being measurable in knowledge, process, and attitude				
Contents					
4	Complying with learning objective				
5	Being appropriate in terms of time management				
Flipped classroom teaching model					
6	Complying with the designed instructional model				
7	Supporting students' learning				
8	Including various activities				
Learning materials					
9	Complying with the learning objectives				
10	Complying with the contents				
Evaluation and Assessment					
11	Complying with the learning objectives				
12	Including various methods and instruments				

Suggestions

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Sign.....Assessor

Date...../...../.....

Lesson plan

General Overview of Lesson Plans

Preface

The objective of this handout is mainly introduced the frame and system, the core points of research and the major research methods of my research work. Meanwhile, it facilitates readers, students, experts to carry out a clear understanding of the thesis and facilitates the development of research work in the university. Therefore, My handout is divided into 5 parts,

The first part is about principles and rational, the researcher studied about education research course and chose chapter 3: Finding and analyzing literature to develop flipped classroom teaching model to improve research ability of undergraduate students and took the result of affecting research ability from students and lecturers to do.

The second part is about objectives no.2 from the research.

The third part is about content chapter 3: Finding and analyzing literature

The fourth part is about method of teaching flipped classroom teaching model and materials to teach in chapter 3: Finding and analyzing literature.

Finally is about evaluation the flipped classroom teaching model by confirming the model in 4 aspects: (1) Utility standards, (2) Feasibility standards, (3) Propriety standards and (4) Accuracy standards.

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The components to develop flipped classroom teaching instructional mode

There are 5 components to develop flipped classroom teaching instructional model to enhance research ability of undergraduate students in Yulin Normal University.

1) Principle & rationale

2) Objectives

3) Contents

4) Methods of teaching & materials

5) Evaluation

Principle & rational

Principle

The curriculum is the center of educational and teaching activities, which directly affects the learning outcomes of students and the quality of teachers' teaching. A good curriculum should have some basic principles to ensure that students are provided with effective instruction and good learning experiences during the learning process. Integration Implementation process. This course is an educational research methods course offered by the School of Educational Sciences of Yulin Normal College. It is a required course for undergraduate students majoring in elementary education. The Educational research methods course in this study will follow the following principles in order to improve the quality and effectiveness of the course, promote the overall development of students, and cultivate students' learning ability and research ability.

1. The principle of goal orientation. Clarifying the learning objectives of the course helps students to clarify their learning directions and goals, and is conducive to teachers' targeted design and evaluation of students' learning. The objectives of this course are to enable students to understand and master the basic knowledge of educational research, while improving students' self-learning ability, improving students' ability to find problems and solve them, improving students' thinking ability, and improving students' language expression ability. Improve students' data

processing ability. To lay a solid foundation for future study and work. Cultivate teachers with strong scientific research ability to meet the needs of primary education in the 21st century.

2. Principle of student subjectivity. Respect the subjectivity of students and cultivate their learning ability and independent learning capacity. Starting from the actual needs of students, paying attention to their interests and specialties, designing diversified learning activities, stimulating students' motivation to learn, and cultivating their independent learning ability and innovative spirit.

3. Principle of resource support. Consider the supporting resources that students need for the course, such as videos, multimedia materials, PPTs, online and offline teaching resources, reference books, etc. These resources should be easily accessible and supportive of the learning process and the achievement of the objectives. These resources should be easily accessible and support the learning process and achievement of student goals.

4. The principle of inspiration. Attaching importance to the cultivation of students' thinking ability and innovation ability encourages students to actively think about inquiry, independent exploration, independent creation, problem solving, In the teaching methodology, the use of heuristic teaching methods, guiding students to inquiry-based learning, cultivating students' creative thinking, and improving students' problem-solving ability and innovation ability.

5.The principle of individualization. Pay full attention to the individual differences of students focus on cultivating students' personality development. In teaching, use different teaching methods and means to meet students' individualized learning needs, help each student discover his or her own potential and interest, and achieve individualized learning goals. (Yulin Normal University, 2020).

Objectives

To develop flipped classroom teaching model to improve research ability of undergraduate students.

Contents

Table 1 Chapters and Contents Used in the Present Stud

Unit	Chapter	Contents	Times (32 hrs.)
1. Overview of Research Methods in Education.	1.1 Basic knowledge of educational research methods	Foundations, characteristics, types and processes of educational research methods.	**2 hrs.**
2. Selection of Educational Research Topics.	2.1 Finding research questions	Tips and tricks for topic selection. Hot issues in education research	2 hrs.
3. Finding and analyzing literature	3.1 select a topic 3.2 collect and organize information. 3.3Research program design 3.4.Communication or Expression of results	Selecting a topic, conducting a literature search, literature management, bibliographic analysis and synthesis.	16 hrs.
4. Educational Research Design.	4.1 Methodology and content of educational research design	Writing the application form for the project	4 hrs.
5. Introduction to Commonly Used Research Methods	5.1 Questionnaire method, interview method, observation method, etc.	Questionnaire method, interview method, experimental method, observation method.	4 hrs.
6.Writing Research Results.	6.1 Presentation of research results. 6.2 Techniques, methods, specifications for writing research results	Research paper writing, investigation report writing, conducting research reports	4 hrs.

Unit 3 is chosen by the research for implementing the developed model in the present study.

Table 2 Contents of Unit 3

Unit	Chapter	Contents	Times (32 hrs.)
3. Finding and analyzing literature	3.1 select a topic 3.2 collect and organize information. 3.3Research program design 3.4.Communication or Expression of results	Selecting a topic, conducting a literature search, literature management, bibliographic analysis and synthesis.	16 hrs.

Methods of teaching & materials

Flipped classroom teaching model. Important references include: Deng (2022), Guo (2019), Zhang et *al.* (2012), Guo (2019), Sams (2013). Based on the analysis and combing of numerous implementation steps, 7 key steps of flipped classroom teaching model implementation are obtained:

Step 1 Provide a learning resource environment.

Step 2 Design pre-course practice activities

Step 3 Independent study of pre-course (students Watch the teaching video and so on),

Step 4 students report Pre-course learning and the teacher gives feedback according to the actual situation.

Step 5 Responding to issues that remain unresolved, Teamwork and cooperative learning in the class.

Step 6 Results display, exchange and interaction.

Step 7 Evaluation feedback, suggestions for improvement.

Materials

1. Textbooks
2. PPT
3. Multimedia.
4. Lesson plans
5. Workbooks
6. Cases analysis
7.Evaluation scale
8. Network learning platform (Bilibili client, Mooc)
9. Learning APP for mobile phone
10. Learning videos

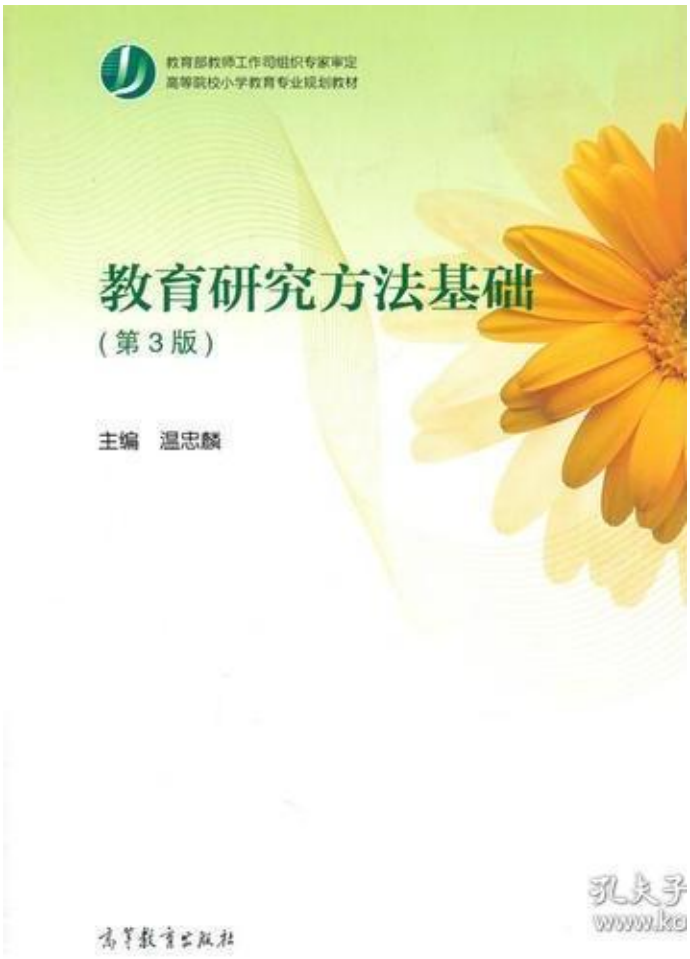


Figure 2 Textbook for Educational research methods

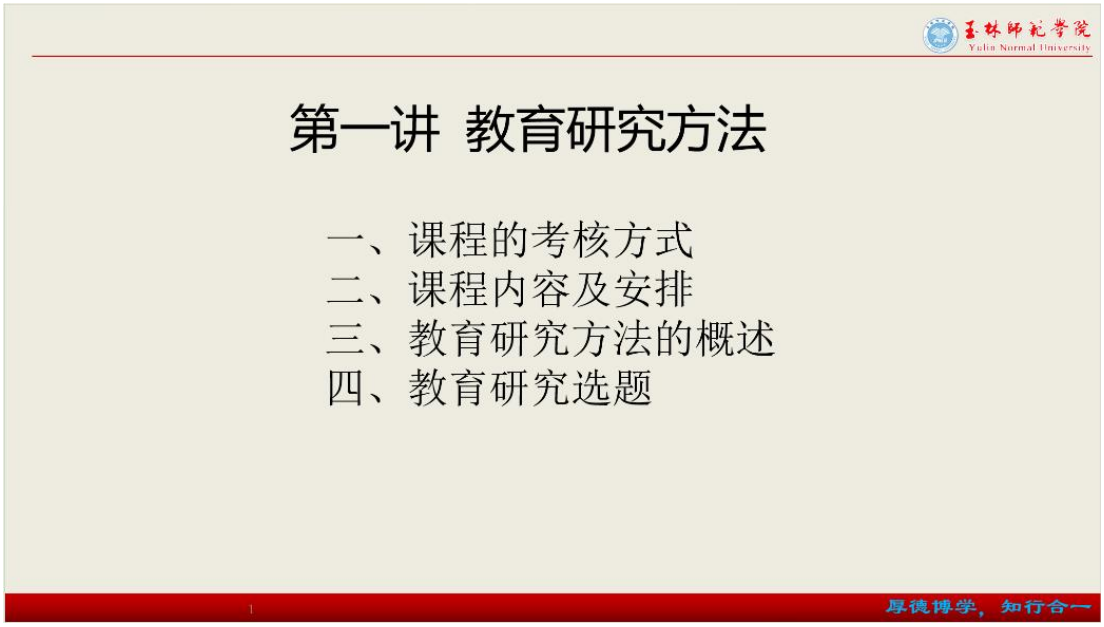


Figure 3 Home page of PPT

Figure 4 Mooc learning platform

Figure 5 Multimedia classroom

The researcher use 4 standards to evaluate flipped classroom teaching instructional model is confirmed by the experts in 4 aspects: (1) Utility standards, (2) Feasibility standards, (3) Propriety standards and (4) Accuracy standards (Stufflebeam, 2012) as the follows:

Utility standards are intended to ensure that the developed instructional model will serve the information needs of intended users.

Feasibility standards are intended to ensure that the developed instructional model will be realistic, prudent, flexible, and frugal.

Propriety standards are intended to ensure that the developed instructional model will be conducted in conformity to teaching principles and provide positive results.

Accuracy standards are intended to ensure that the developed instructional model shows a measure of closeness to a true value.

Table 3 Summary for Content, Method, Flipped classroom teaching, research ability and Instruments/Activities

Chapter	Content/Time	Method	Flipped classroom teaching /Step							Research ability				Instruments/ Activities
			S.1	S.2	S.3	S.4	S.5	S.6	S.7	D.1	D.2	D.3	D.4	
3. Finding and Analyzing Literature	3.1 select a topic (2 hrs.)	Flipped classroom teaching	T	T	L	T+L	T+L	T+L	T+L	√				1.Attending Class 2.Observation 3.Checking exercise 4.Testing 5.Scoring
	3.2 collect and organize information. (6 hrs.)		T	T	L	T+L	T+L	T+L	T+L		√			
	3.3 Research program design. (4 hrs.)		T	T	L	T+L	T+L	T+L	T+L			√		

Table 3 (Continued)

Chapter	Content/Time	Method	Flipped classroom teaching /Step							Research ability				Instruments/ Activities
			S.1	S.2	S.3	S.4	S.5	S.6	S.7	D.1	D.2	D.3	D.4	
3. Finding and Analyzing Literature	3.4. Communication or Expression of results. (4hrs.)	Flipped classroom teaching	T	T	L	T+L	T+L	T+L	T+L				√	1.Attending Class 2.Observation 3.Checking exercise 4.Testing 5.Scoring

S.1: Provide a learning resource environment.

S.2: Design pre-class practice activities.

S.3: Independent study of pre-course (students Watch the teaching video and so on).

S.4: students report Pre-class learning and the teacher gives feedback according to the actual situation.

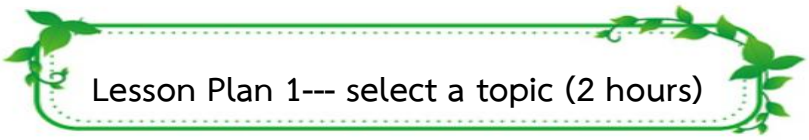
S.5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class.

S.6: Results display, exchange and interaction.

S.7: Evaluation feedback, suggestions for improvement.

D.1: Ability to select a topic. D.2: Ability to collect and organize information
D.3: Research plan design ability D.4 Communication ability

S is Step D is Dimension T is Teacher L is Learner



Learning objectives

Item 1 : Ability to select a topic

1. Mastering the methods and techniques of topic selection.

   (Standard 1: Be able to select research questions related to education.)

2. Ability to select meaningful, valuable and feasible research topics.

(Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society)

Contents

3.1 select a topic

Method of teaching

Flipped classroom teaching instructional model refers to an integrated teaching model that is taught in 7 steps in the classroom.

Step 1: Provide a learning resource environment.

Students are provided with learning resources and environments. For example, web-based video courses, academic articles, relevant e-documented learning materials, or pre-class learning videos for students.

Step 2: Design pre-class practice activities

This part of the lesson focuses on the teacher's planning of students' pre-lesson learning based on the content and objectives. Students will be asked to think about the following questions during their pre-lesson study.

2.1 What are the areas of research you are interested in?

2.2 What do you usually base your research selection on?

2.3 What are your primary considerations when making your research selection?

2.4 In what ways do you learn about current hot issues in education?

2.5 How do you judge the significance, value, etc. of your research topic?

In the design of pre-class practical activities of the flipped classroom teaching model, teachers need to design problems and tasks that meet the teaching needs according to the teaching objectives and students' levels. So that students can conduct self-learning, try to solve problems and answer questions in Step 3.

Step 3: Independent study of pre-course

Students in this section are expected to learn independently and freely, based on the learning resources provided by the teacher in Step 1 and the questions or requirements designed by the teacher in Step 2.

3.1 Students engage in free exploration based on problem tasks assigned by the teacher.

3.2 Students gain an initial understanding of how to select a research topic.

3.3 Record their own thinking about the research topic.

3.4 Record their confusion about their research choice.

3.5 Pre-course study tasks are achieved.

S.4: students report Pre-class learning and the teacher gives feedback according to the actual situation. (0.5 hours)

This part consists of two aspects, the first is the students' individual debriefing of their pre-class learning, including the contents of Step 4.The second is the teacher's feedback and evaluation of the students' debriefing.

Students report on their pre-class learning

The content of the students' report is mainly to respond to the questions and requirements in Step 2 and Step 3, and secondly, to report the problems or confusion they still have in the selection of research topics.

Teacher's feedback and evaluation of the students' debriefing

Teachers mainly evaluate students' pre-class learning and basically understand the students' mastery of knowledge. In addition, the students' unsolved problems are classified and counted in order to proceed to the next step.

S.5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class. (0.5 hours)

This part includes two aspects. First, teachers respond to students' unsolved problems during their pre-class learning process, use courseware to teach new knowledge, and raise representative questions based on actual practice. The second is that students conduct group discussions based on the questions raised by the teacher in this part and study cooperatively in groups.

Teachers respond to students' unsolved problems, teach new knowledge

5.1 Explain the meaning, type, methods, techniques, etc. of the research topic.

5.2 Research topic selection and professional relevance, feasibility and value analysis.

5.3 The source and orientation of the research topic.

5.4 Judgment in selecting research topics.

5.5 Improve the relevant questions of research topic selection for students to think.

students conduct group discussions based on the questions raised by the teacher

Students discuss and analyze the problem in small groups in response to new questions posed by the instructor.

S.6: Results display, exchange and interaction. (0.5 hours)

Students Activities

(1) Formulate a discussion based on the discussion in the previous step.

(2) Students work in small groups to report on the results of their discussions.

Lecturer Activities

(1) Listen to the students' presentations and sharing

(2) Comment on student presentations and sharing

S.7: Evaluation feedback, suggestions for improvement. (0.5 hours)

(1) Teachers summarize and evaluate learning and task completion based on students' reported performance.

(2) Teacher assigns homework based on students' learning.

(3) Assignment: Students share the methods and techniques of choosing a topic based on their course learning.

(4) Evaluation: Students' self-assessment, group mutual evaluation and teacher's evaluation.

(5) Let the students find out the topic concerning education.

(6) The teacher will evaluate Item 1 : Ability to select a topic **in** 2 standards by scoring rubric.

Learning materials

(1) Instructional books on educational research methods

(2) Pictures of teaching scenes

(3) PPT

(4) Course experiments on learning videos

(5) Relevant academic papers

(6) Online learning

PPT pictures

Online learning:

https://www.icourse163.org/course/SWU1002533013?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.icourse163.org/course/ZJU1206404806?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.bilibili.com/video/BV1s34y1n7Q7/?spm_id_from=333.337.search-card.all.click

https://www.bilibili.com/video/BV114411z71y/?spm_id_from=333.337.search-card.all.click

Homework and Discussion

1.Based on what you have learned in this lesson, choose a research option and explain your reasoning.

2. How many aspects should we think about when choosing a research topic?

Evaluation

Table 4 The scoring of ability to select a topic

Item	5	4	3	2	1
item 1 ; Ability to select a topic					
Standard 1: Be able to select research questions related to education.	Able to consider various factors when selecting a topic. The topic is highly relevant to the education industry and fully meets the requirements of the primary education major.	Be able to consider various factors when selecting topics that are relevant to the education industry and meet the requirements of primary education majors.	Have the ability to select topics that are relevant to the education industry and basically meet the requirements for primary education majors.	Have the ability to select topics that are not highly relevant to the education industry and basically do not meet the requirements for primary education majors.	Do not have the ability to select topics, the topic selection is completely unrelated to the education industry, and does not meet the requirements of the primary education major.
Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society.	The topic selection is of great significance, high research value and strong feasibility, which is a hot issue that needs to be solved urgently in the field of education.	he selected topics are of high value and feasibility, and are hot issues that need to be addressed urgently in the field of education.	The topic has a certain value, the feasibility is not strong, and it is not a research problem in the field of education.	The topic selection is basically worthless and not very feasible. It is not a hot issue that urgently needs to be solved in the field of education.	The topic selection is completely worthless and not feasible. It is not a hot issue that urgently needs to be solved in the field of education.

Table 5 Criteria to evaluate **item 1 ; Ability to select a topic**

item 1 ; Ability to select a topic	Standard 1: Be able to select research questions related to education. Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society

Score	Grade
9- 10	Excellent
7 - 8	Good
5 -6	Moderate
3 – 4	Pass
Less than 3	Poor

Lesson Plan 2--- Collection and collation of literature (6 hours)

Learning objectives

Item: Ability to Collection and collation of literature

1. Master the methods and techniques of finding National literature. (Standard 1: be able to collect relevant literature materials in China according to the research)

2. Master the methods and techniques of finding foreign literature. (Standard 2: Be able to collect relevant research materials from abroad according to the research needs.)

3. Acquire methods and skills to judge the quality of literature, handle and analyze literature, read literature and manage literature. (Standard 3: Ability to analyze collected literature)

Contents

3.2 collect and organize information

Method of teaching

Flipped classroom teaching instructional model refers to an integrated teaching model that is taught in 7 steps in the classroom.

Step 1: Provide a learning resource environment.

Students are provided with learning resources and environments. For example, web-based video courses, academic articles, relevant e-documented learning materials, or pre-class learning videos for students.

Step 2: Design pre-class practice activities

This part of the lesson focuses on the teacher's planning of students' pre-lesson learning based on the content and objectives. Students will be asked to think about the following questions during their pre-lesson study.

2.1 How to find domestic literature such as academic articles, newspapers, books, etc.?

2.2 How to find foreign literature, such as academic articles, e-books, etc.?

2.3 How do you determine the quality of the literature?

2.4 How to read literature and what are the methods and techniques?

2.5 How do you analyze and organize the literature and what is the literature management software used?

In the design of pre-class practical activities of the flipped classroom teaching model, teachers need to design problems and tasks that meet the teaching needs according to the teaching objectives and students' levels. So that students can conduct self-learning, try to solve problems and answer questions in Step 3.

Step 3: Independent study of pre-course

Students in this section are expected to learn independently and freely, based on the learning resources provided by the teacher in Step 1 and the questions or requirements designed by the teacher in Step 2.

3.1 Students engage in free exploration based on problem tasks assigned by the teacher.

3.2 Students gain an initial understanding of how to Collection and collation of literature.

3.3 Record their own thinking about the Collection and collation of literature

3.4 Record their confusion about their research choice.

3.5 Pre-course study tasks are achieved.

S.4: students report Pre-class learning and the teacher gives feedback according to the actual situation. (1 hours)

This part consists of two aspects, the first is the students' individual debriefing of their pre-class learning, including the contents of Step 4.The second is the teacher's feedback and evaluation of the students' debriefing.

Students report on their pre-class learning

The content of the students' report is mainly to respond to the questions and requirements in Step 2 and Step 3, and secondly, to report the problems or confusion they still have in the Collection and collation of literature.

Teacher's feedback and evaluation of the students' debriefing

Teachers mainly evaluate students' pre-class learning and basically understand the students' mastery of knowledge. In addition, the students' unsolved problems are classified and counted in order to proceed to the next step.

S.5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class. (2.5 hours)

This part includes two aspects. First, teachers respond to students' unsolved problems during their pre-class learning process, use courseware to teach new knowledge, and raise representative questions based on actual practice. The second is that students conduct group discussions based on the questions raised by the teacher in this part and study cooperatively in groups.

Teachers respond to students' unsolved problems, teach new knowledge

5.1 Demonstrate methods, techniques and academic platforms for finding academic literature at home and abroad.

5.2 Teach methods of determining the quality of scholarly documentation.

5.3 Teach methods and techniques for reading and organizing academic literature.

5.4 Lecture on software for managing academic literature.

5.5 Lecture on software for analyzing academic literature.

students conduct group discussions based on the questions raised by the teacher

Students discuss and analyze the problem in small groups in response to new questions posed by the instructor.

S.6: Results display, exchange and interaction. (1.5hours)

Students Activities

(1) Formulate a discussion based on the discussion in the previous step.

(2) Students work in small groups to report on the results of their discussions.

Lecturer Activities

(1) Listen to the students' presentations and sharing

(2) Comment on student presentations and sharing

S.7: Evaluation feedback, suggestions for improvement. (1 hours)

(1) Teachers summarize and evaluate learning and task completion based on students' reported performance.

(2) Teacher assigns homework based on students' learning.

(3) Assignment: Students share the methods and techniques of choosing a topic based on their course learning.

(4) Evaluation: Students' self-assessment, group mutual evaluation and teacher's evaluation.

(5) Let the students collection and collation of literature

(6) The teacher will evaluate Item 2 : Ability to collect and organize information in 3 standards by scoring rubric.

Learning materials

(1) Instructional books on educational research methods

(2) Pictures of teaching scenes

(3) PPT

(4) Course experiments on learning videos

(5) Relevant academic papers

(6) Online learning

PPT pictures

Online learning:

https://www.icourse163.org/course/SWU1002533013?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.icourse163.org/course/ZJU1206404806?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.bilibili.com/video/BV1s34y1n7Q7/?spm_id_from=333.337.search-card.all.click

https://www.bilibili.com/video/BV114411z71y/?spm_id_from=333.337.search-card.all.click

Homework and Discussion

1.Develop a research topic and search for national and international literature based on the research topic.

2. Try literature analysis software to analyze the literature found.

Evaluation

Table 6 The scoring of Ability to collect and organize information

Item	5	4	3	2	1
item 2 : Ability to collect and organize information					
Standard 1: be able to collect relevant literature materials in China according to the research.	Ability to locate appropriate national literature based on research needs. Proficiency in methods and techniques for locating domestic literature.	Be able to locate appropriate national literature according to research needs, and master some methods and techniques for locating national literature.	Know some methods and techniques for locating national literature.	Basic lack of knowledge of methods and techniques for locating national literature.	There is a complete lack of mastery of methods and techniques for locating national literature.
Standard 2: Be able to collect relevant research materials from abroad according to the research needs.	Ability to locate appropriate foreign literature based on research needs. Proficiency in methods and techniques for locating foreign literature.	Be able to find appropriate foreign literature according to the research needs, and master some methods and techniques of finding foreign literature.	Know some methods and techniques for finding foreign literature.	Basic lack of knowledge of methods and techniques for finding foreign literature.	There is a complete lack of mastery of methods and techniques for finding foreign literature.

Table 6 (Continued)

Item	5	4	3	2	1
item 2 ; Ability to collect and organize information					
Standard 3: Ability to analyses collected literature.	Proficiency in techniques and methods for reading literature and determining the quality of literature, and proficiency in the use of literature management software and literature analysis software.	Master the skills and methods of reading literature and judging the quality of literature, and master the use of literature management software and literature analysis software.	Basic mastery of the methods and techniques of reading literature and judging the quality of literature, and basic mastery of the use of literature management software and literature analysis software.	Basic lack of knowledge of methods and techniques for reading literature and determining the quality of literature. Basically do not master the use of literature management software and literature analysis software.	Completely failed to master the methods and techniques of reading literature, judging the quality of literature, and completely failed to master the use of literature management software and literature analysis software.

Table 7 Criteria to evaluate item 2. Ability to collect and organize information

Item 2: Ability to collect and organize information	Standard 1: be able to collect relevant literature materials in China according to the research. Standard 2: Be able to collect relevant research materials from abroad according to the research needs. Standard 3: Ability to analyses collected literature
Score	**Grade**
13-15	Excellent
10-12	Good
7-9	Moderate
4-6	Pass
Less than 4	Poor

Lesson Plan 3 Designing research plans (4hours)

Learning objectives

Item 3 : Research plan design ability

1. Knowledge of the basic elements, methods and techniques of research plan design. (Standard 1: Ability to design a research plan independently.)

2. Able to scientifically designed research program, research plan content is detailed, well-documented, clear thinking. (Standard 2: The designing research plan is scientific, rational and clear.)

Contents

3.3 Research program design

Method of teaching

Flipped classroom teaching instructional model refers to an integrated teaching model that is taught in 7 steps in the classroom.

Step 1: Provide a learning resource environment.

Students are provided with learning resources and environments. For example, web-based video courses, academic articles, relevant e-documented learning materials, or pre-class learning videos for students.

Step 2: Design pre-class practice activities

This part of the lesson focuses on the teacher's planning of students' pre-lesson learning based on the content and objectives. Students will be asked to think about the following questions during their pre-lesson study.

2.1 What are the specific components of the core of the research plan?

2.2 What is the specific process for research plan design?

2.3 How do you argue that your research program is sound and scientific?

2.4 What is the role of the research program in the implementation of the study?

In the design of pre-class practical activities of the flipped classroom teaching model, teachers need to design problems and tasks that meet the teaching needs according to the teaching objectives and students' levels. So that students can conduct self-learning, try to solve problems and answer questions in Step 3.

Step 3: Independent study of pre-course

Students in this section are expected to learn independently and freely, based on the learning resources provided by the teacher in Step 1 and the questions or requirements designed by the teacher in Step 2.

3.1 Students engage in free exploration based on problem tasks assigned by the teacher.

3.2 Students gain an initial understanding of how to design research plan.

3.3 Record their own thinking about the design research plan.

3.4 Record their confusion about their research choice.

3.5 Pre-course study tasks are achieved.

S.4: students report Pre-class learning and the teacher gives feedback according to the actual situation. (1 hours)

This part consists of two aspects, the first is the students' individual debriefing of their pre-class learning, including the contents of Step 4.The second is the teacher's feedback and evaluation of the students' debriefing.

Students report on their pre-class learning

The content of the students' report is mainly to respond to the questions and requirements in Step 2 and Step 3, and secondly, to report the problems or confusion they still have in the selection of research topics.

Teacher's feedback and evaluation of the students' debriefing

Teachers mainly evaluate students' pre-class learning and basically understand the students' mastery of knowledge. In addition, the students' unsolved problems are classified and counted in order to proceed to the next step.

S.5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class. (1hours)

This part includes two aspects. First, teachers respond to students' unsolved problems during their pre-class learning process, use courseware to teach new knowledge, and raise representative questions based on actual practice. The second is that students conduct group discussions based on the questions raised by the teacher in this part and study cooperatively in groups.

Teachers respond to students' unsolved problems, teach new knowledge

5.1Students are presented with a complete research proposal to give them an overall idea of the research proposal.

5.2 Teaching the core components of a research program.

5.3 Teach the general process and protocols for research program design.

5.4 Teach research protocol optimization techniques.

5.5 Ask questions related to the design of the research program for students to explore and discuss in the course.

students conduct group discussions based on the questions raised by the teacher

Students discuss and analyze the problem in small groups in response to new questions posed by the instructor.

S.6: Results display, exchange and interaction. (1hours)

Students Activities

(1) Formulate a discussion based on the discussion in the previous step.

(2) Students work in small groups to report on the results of their discussions.

Lecturer Activities

(1) Listen to the students' presentations and sharing

(2) Comment on student presentations and sharing

S.7: Evaluation feedback, suggestions for improvement. (1 hours)

(1) Teachers summarize and evaluate learning and task completion based on students' reported performance.

(2) Teacher assigns homework based on students' learning.

(3) Assignment: Students share the methods and techniques of Designing research plans based on their course learning.

(4) Evaluation: Students' self-assessment, group mutual evaluation and teacher's evaluation.

(5) Let the students design research plan

(6) The teacher will evaluate Item 3 : research plan design ability in 2 standards by scoring rubric.

Learning materials

(1) Instructional books on educational research methods

(2) Pictures of teaching scenes

(3) PPT

(4) Course experiments on learning videos

(5) Relevant academic papers

(6) Online learning

PPT pictures

Online learning:

https://www.icourse163.org/course/SWU1002533013?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.icourse163.org/course/ZJU1206404806?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.bilibili.com/video/BV1s34y1n7Q7/?spm_id_from=333.337.search-card.all.click

https://www.bilibili.com/video/BV114411z71y/?spm_id_from=333.337.search-card.all.click

Homework and Discussion

1.Based on the study of the last two themes, develop a research plan based on a self-developed research topic.

Evaluation

Table 8 The scoring of Research plan design ability

Item	5	4	3	2	1
item 3 Research plan design ability					
Standard 1: Ability to design a research plan independently.	Ability to skillfully design a well-developed research program. Selection of methods is appropriate and well justified.	Ability to design a relatively well-developed research design with appropriate and well-argued prior methodology.	Basic knowledge of the methodology and content of research program design.	Basic lack of mastery of the methodology and content of research program design.	A complete lack of mastery of the methodology and content of research program design.
Standard 2: The designing research plan is scientific, rational and clear.	Ability to skillfully design a research proposal that is complete, clear, and scientifically sound.	Be able to design a research program that is more complete, clearer, and scientifically sound.	Barely able to carry out the design of a research program, but the designed research program is partially problematic.	Designs a research program that is incomplete and poorly thought out. Not sufficiently scientific.	The designed research program is incomplete and poorly thought out. Completely unscientific.

Table 9 Criteria to evaluate item 3: Research plan design ability

Item 3: Research plan design ability	Standard 1: Ability to design a research plan independently. Standard 2: The designing research plan is scientific, rational and clear.
Score	**Grade**
9-10	Excellent
7-8	Good
5-6	Moderate
3-4	Pass
Less than 3	Poor

Lesson Plan 4 Literature Review and Academic Presentation (4hours)

Learning objectives

Item 4: Communication ability

1.Master the methods and techniques of writing a literature review. (Standard 1: Be able to write a literature review.)

2. Acquire skills and methods of reporting research results and skills and methods of academic communication with others. (Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others)

Contents

3.4 Communication of Expression of results

Method of teaching

Flipped classroom teaching instructional model refers to an integrated teaching model that is taught in 7 steps in the classroom.

Step 1: Provide a learning resource environment.

Students are provided with learning resources and environments. For example, web-based video courses, academic articles, relevant e-documented learning materials, or pre-class learning videos for students.

Step 2: Design pre-class practice activities

This part of the lesson focuses on the teacher's planning of students' pre-lesson learning based on the content and objectives. Students will be asked to think about the following questions during their pre-lesson study.

2.1 How to write a quality literature review?

2.2 How do you determine the quality of a literature review?

2.3 How do I conduct an academic debriefing?

2.4 What are the core elements of academic reporting?

2.5 General methods and techniques of scholarly communication.

In the design of pre-class practical activities of the flipped classroom teaching model, teachers need to design problems and tasks that meet the teaching needs according to the teaching objectives and students' levels. So that students can conduct self-learning, try to solve problems and answer questions in Step 3.

Step 3: Independent study of pre-course

Students in this section are expected to learn independently and freely, based on the learning resources provided by the teacher in Step 1 and the questions or requirements designed by the teacher in Step 2.

3.1 Students engage in free exploration based on problem tasks assigned by the teacher.

3.2 Students gain an initial understanding of Literature Review and Academic Presentation.

3.3 Record their own thinking about the Literature Review and Academic Presentation.

3.4 Record their confusion about Record their confusion about their research choice.

3.5 Pre-course study tasks are achieved.

S.4: students report Pre-class learning and the teacher gives feedback according to the actual situation. (1 hours)

This part consists of two aspects, the first is the students' individual debriefing of their pre-class learning, including the contents of Step 4.The second is the teacher's feedback and evaluation of the students' debriefing.

Students report on their pre-class learning

The content of the students' report is mainly to respond to the questions and requirements in Step 2 and Step 3, and secondly, to report the problems or confusion they still have in the selection of research topics.

Teacher's feedback and evaluation of the students' debriefing

Teachers mainly evaluate students' pre-class learning and basically understand the students' mastery of knowledge. In addition, the students' unsolved problems are classified and counted in order to proceed to the next step.

S.5: Responding to issues that remain unresolved, Teamwork and cooperative learning in the class. (1hours)

This part includes two aspects. First, teachers respond to students' unsolved problems during their pre-class learning process, use courseware to teach new knowledge, and raise representative questions based on actual practice. The second is that students conduct group discussions based on the questions raised by the teacher in this part and study cooperatively in groups.

Teachers respond to students' unsolved problems, teach new knowledge

5.1 Students are shown examples of literature reviews to give them an initial understanding of literature reviews.

5.2 Teaches the basic methods and techniques of writing a literature review.

5.3 Students are taught the methods and techniques of academic presentations.

5.4 Students are taught the do's and don'ts of academic presentations and scholarly communication.

students conduct group discussions based on the questions raised by the teacher

Students discuss and analyze the problem in small groups in response to new questions posed by the instructor.

S.6: Results display, exchange and interaction. (1hours)

Students Activities

(1) Formulate a discussion based on the discussion in the previous step.

(2) Students work in small groups to report on the results of their discussions.

Lecturer Activities

(1) Listen to the students' presentations and sharing

(2) Comment on student presentations and sharing

S.7: Evaluation feedback, suggestions for improvement. (1 hours)

(1) Teachers summarize and evaluate learning and task completion based on students' reported performance.

(2) Teacher assigns homework based on students' learning.

(3) Assignment: Students share the methods and techniques of writing Literature Review and Academic Presentation.

(4) Evaluation: Students' self-assessment, group mutual evaluation and teacher's evaluation.

(5) Let the students write a literature review and conduct an academic presentation

(6) The teacher will evaluate Item 4 : Communication ability in 2 standards by scoring rubric.

Learning materials

(1) Instructional books on educational research methods

(2) Pictures of teaching scenes

(3) PPT

(4) Course experiments on learning videos

(5) Relevant academic papers

(6) Online learning

PPT pictures

Online learning:

https://www.icourse163.org/course/SWU1002533013?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.icourse163.org/course/ZJU1206404806?from=searchPage&outVendor=zw_mooc_pcssjg_

https://www.bilibili.com/video/BV1s34y1n7Q7/?spm_id_from=333.337.search-card.all.click

https://www.bilibili.com/video/BV114411z71y/?spm_id_from=333.337.search-card.all.click

Homework and Discussion

1.Write a literature review on your own topic.

2.Report on a literature review written by yourself. ...

Evaluation

Table 10 The scoring of Communication ability

Item	5	4	3	2	1
Item 4: Communication ability					
Standard 1: Be able to write a literature review..	The literature review is of high quality. The information is detailed, well thought out and well argued.	The literature review is generally of good quality, but there are a few minor issues.	The literature review is well structured but has many problems.	The literature review is problematic, poorly thought out and poorly argued.	Completely unable to write a complete literature review.
Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others	Strong written and verbal skills, clear thinking, and the ability to accurately articulate your results.	Good written and verbal skills, and overall ability to accurately articulate his/her research findings.	Average documentation skills, average verbal skills, and overall ability to articulate his/her research findings to others.	Largely unable to accurately articulate their ideas and findings to others.	Poor written and verbal skills to accurately articulate their results.

Table 11 Criteria to evaluate item 4: Communication ability

Item 4: Communication ability	Standard 1: Be able to write a literature review. Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others
Score	**Grade**
9-10	Excellent
7-8	Good
5-6	Moderate
3-4	Pass
Less than 3	Poor

How to do Rubric scoring form

Designing rubric scoring form to improve research ability of undergraduate students.

1. Study the rubric scoring criteria aligned with research ability.

2. Design 5-point range rubric scoring criteria (From Appendix D).

3. Present the developed rubric scoring criteria to the advisors for checking correctness, completion and improvement.

4. Assess the validity of the designed rubric scoring criteria by 3 the IOC values not less than 0.5. The IOC calculated from the validation measures 1.00.

Data Collection

1. Ask for permission of data collection

2. Collect students' performance by using rubric scoring before assessment by external raters.

Data Analysis

Categorize students' performance according to rubric scoring criteria into their levels descriptor.

The IOC calculated from the validation measures X.00. Criteria to evaluate Item: research ability by Table 3.4, Table 3.5, Table 3.6, Table 3.7, Table 3.8, Table 3.9and Table 3.10.

This is my scoring rubric form, divided into 4 items and 9 standards.

The first item is Ability to select a topic, which included two Standard: Be able to select research questions related to education and Select research problems that are valuable and feasible, and are urgent or topical issues in society.

The second item is Ability to collect and organize information, which included three standard: be able to collect relevant literature materials in China according to the research , Be able to collect relevant research materials from abroad according to the research needs and Ability to analyze collected literature.

The third item is Research plan design ability, which included two standard: Ability to design a research plan independently and The designing research plan is scientific, rational and clear.

The fourth item is Communication ability, which included two standard: Standard: Be able to write a literature review and Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others.

Students assessed on each standard and marked scoring, with a maximum score of 5, a minimum score of 1, and a maximum total score of 9 standards for the 4 items.

Score rating criteria is shown as follow.

5 means the highest

4 means high

3 means moderate

2 means few

1 means the fewest

Table 12 Criteria to evaluate Item 1: Ability to select a topic in 2 Standards

Score	Grade
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Table 13 Criteria to evaluate Item 2 : Ability to collect and organize information in 3 Standards

Score	Grade
13-15	Excellent
10-12	Good
7-9	Medium
4-6	Pass
Less than 4	Poor

Table 14 Criteria to evaluate Item 3 : Research plan design ability in 2 Standards

Score	Grade
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Table 15 Criteria to evaluate Item 4 : Communication ability in 2 Standards

Score	Grade
9-10	Excellent
7-8	Good
5-6	Medium
3-4	Pass
Less than 3	Poor

Table 16 Criteria to evaluate Item 1-4 in 9 Standards

Score	Grade
37-45	Excellent
28-36	Good
19-27	Medium
10-18	Pass
Less than 10	Poor

Table 16 Scoring rubric form

Item	5	4	3	2	1
Item 1: Ability to select a topic					
Standard 1: Be able to select research questions related to education.	Able to consider various factors when selecting a topic. The topic is highly relevant to the education industry and fully meets the requirements of the primary education major.	Be able to consider various factors when selecting topics that are relevant to the education industry and meet the requirements of primary education majors.	Have the ability to select topics that are relevant to the education industry and basically meet the requirements for primary education majors.	Have the ability to select topics that are not highly relevant to the education industry and basically do not meet the requirements for primary education majors.	Do not have the ability to select topics, the topic selection is completely unrelated to the education industry, and does not meet the requirements of the primary education major.

Table 16 (Continued)

Item	5	4	3	2	1
Standard 2: Select research problems that are valuable and feasible, and are urgent or topical issues in society.	The topic selection is of great significance, high research value and strong feasibility, which is a hot issue that needs to be solved urgently in the field of education.	he selected topics are of high value and feasibility, and are hot issues that need to be addressed urgently in the field of education.	The topic has a certain value, the feasibility is not strong, and it is not a research problem in the field of education.	The topic selection is basically worthless and not very feasible. It is not a hot issue that urgently needs to be solved in the field of education.	The topic selection is completely worthless and not feasible. It is not a hot issue that urgently needs to be solved in the field of education.
Item 2: Ability to collect and organize information					
Standard 1: be able to collect relevant literature materials in China according to the	Ability to locate appropriate national literature based on research needs.	Be able to locate appropriate national literature according to research needs,	Know some methods and techniques for locating national	Basic lack of knowledge of methods and techniques for	There is a complete lack of mastery of methods and techniques for locating

Table 16 (Continued)

Item	5	4	3	2	1
research.	Proficiency in methods and techniques for locating domestic literature.	and master some methods and techniques for locating national literature.	literature.	locating national literature.	national literature.
Standard 2: Be able to collect relevant research materials from abroad according to the research needs. topical issues in society.	Ability to locate appropriate foreign literature based on research needs. Proficiency in methods and techniques for locating foreign literature.	Be able to find appropriate foreign literature according to the research needs, and master some methods and techniques of finding foreign literature.	Know some methods and techniques for finding foreign literature.	Basic lack of knowledge of methods and techniques for finding foreign literature.	There is a complete lack of mastery of methods and techniques for finding foreign literature.

Table 16 (Continued)

Item	5	4	3	2	1
Item 3: Research plan design ability					
Standard 3: Ability to analyses collected literature.	Proficiency in techniques and methods for reading literature and determining the quality of literature, and proficiency in the use of literature management software and literature analysis software.	Master the skills and methods of reading literature and judging the quality of literature, and master the use of literature management software and literature analysis software.	Basic mastery of the methods and techniques of reading literature and judging the quality of literature, and basic mastery of the use of literature management software and literature analysis software.	Basic lack of knowledge of methods and techniques for reading literature and determining the quality of literature. Basically do not master the use of literature management software and literature analysis software.	Completely failed to master the methods and techniques of reading literature, judging the quality of literature, and completely failed to master the use of literature management software and literature analysis software.

Table 16 (Continued)

Item	5	4	3	2	1
Standard 1: Ability to design a research plan independently.	Ability to skillfully design a well-developed research program. Selection of methods is appropriate and well justified.	Ability to design a relatively well-developed research design with appropriate and well-argued prior methodology.	Basic knowledge of the methodology and content of research program design.	Basic lack of mastery of the methodology and content of research program design.	A complete lack of mastery of the methodology and content of research program design.
Standard 2: The designing research plan is scientific, rational and clear.	Ability to skillfully design a research proposal that is complete, clear, and scientifically sound.	Be able to design a research program that is more complete, clearer, and scientifically sound.	Barely able to carry out the design of a research program, but the designed research program is partially problematic.	Designs a research program that is incomplete and poorly thought out.Notsufficiently scientific.	The designed research program is incomplete and poorly thought out.Completely unscientific.

Table 16 (Continued)

Item	5	4	3	2	1
Item 4: Communication ability					
Standard 1: Be able to write a literature review..	The literature review is of high quality. The information is detailed, well thought out and well argued.	The literature review is generally of good quality, but there are a few minor issues.	The literature review is well structured but has many problems.	The literature review is problematic, poorly thought out and poorly argued.	Completely unable to write a complete literature review.
Standard 2: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others	Strong written and verbal skills, clear thinking, and the ability to accurately articulate your results.	Good written and verbal skills, and overall ability to accurately articulate his/her research findings.	Average documentation skills, average verbal skills, and overall ability to articulate his/her research findings to others.	Largely unable to accurately articulate their ideas and findings to others.	Poor written and verbal skills to accurately articulate their results.

Appendix D

The Results of the Quality Analysis of Research Instruments

- Evaluation Results of lOC for Questionnaire for Students
- Evaluation Results of lOC for Interview for Lectures
- Evaluation Results of lOC for Validity of instructional Model
- Evaluation Results of Instructional Model Appropriateness Evaluation
- Evaluation Results of lOC for Lesson Plans by 3 experts
- Evaluation Results of lOC for Validity of Scoring Rubric

Evaluation Results of lOC for Questionnaire for Students

NO	Item	Experts' rating			Total	IOC	Results
		1	2	3			
Internal factors							
1	Do you think educational research methods course is very interesting for my education and can improve research ability?	+1	+1	+1	3	1	Valid
2	You believe that practicing calligraphy is the process Do you think educational research methods course will help you to study in higher education and can do research?	+1	+1	+1	3	1	Valid
3	Do you think the lecturers have the way to motivate you to study educational research methods course and make you like to study this course?	+1	+1	+1	3	1	Valid
4	Do you think if you have a positive attitude that make you are successful in studying in this course and having good research ability?	+1	+1	+1	3	1	Valid
5	Do you think if you are well – being, brain health to study educational research methods course, make you improve research ability and to find a better job after graduation?	+1	+1	+1	3	1	Valid
6	Do you think better heath , the absence of sickness and disease can improve quality of studying in educational research methods course?	+1	+1	+1	3	1	Valid
External factors							
7	Do you think if the lecturers have the difference instructional model to teach in educational research methods course	+1	+1	+1	3	1	Valid

NO	Item	Experts' rating			Total	IOC	Results
		1	2	3			
	can improve students' research ability?						
8	Do you think if the lecturers finish education by major or have the high or experience to teach educational research methods course can improve students' research ability?	+1	+1	+1	3	1	Valid
External factors							
9	Do you think if the students manage the time to study educational research methods course both inside and outside the classroom can improve students' research ability?	+1	+1	+1	3	1	Valid
10	Do you think if the students manage the time to discuss with the lecturers and friends , have the participating together inside and outside the classroom can improve students' research ability?	+1	+1	+1	3	1	Valid
11	Do you think that the teaching environment (including class size, classroom environment, facilities, teacher-student interaction, relatively fixed and quiet teaching place) of the educational research methods course affects students' research ability?	+1	+1	+1	3	1	Valid
12	Do you think the facilities and infrastructure outside the classroom (including internet at home, attending from your parents, and , society 's friendship and membership) affects students' research ability?	+1	+1	+1	3	1	Valid
Total (In Overview)					36	1	Valid

Note: Valid when ≥ 0.60

Evaluation Results of lOC for Interview for Lectures

NO	Item	Experts' rating			Total	IOC	Results
		1	2	3			
Internal factors							
1	Does the availability of some research experience for students have any impact on improving research skills? If yes, please give reasons.	+1	+1	+1	3	1	Valid
2	Research methods courses play an important role in developing students' research skills. If you agree, please give reasons.	+1	+1	+1	3	1	Valid
3	Teachers' research literacy affects the improvement of students' research ability. If you agree, please give reasons.	+1	+1	+1	3	1	Valid
4	Teachers' understanding of educational research methods courses can affect the development of students' research skills.	+1	+1	+1	3	1	Valid
5	Teachers' attitudes can affect the development of students' research skills. If you agree, please write your reasons.	+1	+1	+1	3	1	Valid
External factors							
6	Effective classroom teaching (including group teaching, organizing activities, planning content, etc.) during research methods classroom teaching can affect the development of students' research skills. If you agree, please write your reasons.	+1	+1	+1	3	1	Valid
7	What instructional models do you use to improve students' research skills in teaching research methods courses?	+1	+1	+1	3	1	Valid

NO	Item	Experts' rating			Total	IOC	Results
		1	2	3			
8	Do you think the use of appropriate research methods course materials (e.g., online videos) can improve students' research skills?	+1	+1	+1	3	1	Valid
9	What kind of environment (including school environment, home environment, etc.) do you think is conducive for students to write high-quality research proposals and research reports?	+1	+1	+1	3	1	Valid
10	What do you think needs to be improved in teaching the educational methods course at Yulin Normal College?	+1	+1	+1	3	1	Valid
	Total (In Overview)				**30**	**1**	**Valid**

Note: Valid when ≥ 0.60

Evaluation Results of Instructional Model Appropriateness Evaluation

NO	Components of flipped classroom teaching model	Opinion of the Specialists															
		Utility				Feasibility				Propriety				Accuracy			
		Agree		Disagree		Agree		Disagree		Agree		Disagree		Agree		Disagree	
		F	P	F	P	F	P	F	P	F	P	F	P	F	P	F	P
1	Principle and Rationale	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
2	Objectives	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
3	Contents	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
4	Methods of Teaching &Materials	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0
5	Evaluation	3	100	3	0	3	100	3	0	3	100	3	0	3	100	3	0

F is frequency, P is percent.

Evaluation Results of lOC for Lesson Plans by 3 experts

NO	Item	Experts' rating			Total	IOC	results
		1	2	3			
	Learning Objective						
1	Complying with content of the course	+1	+1	+1	3	1	Valid
2	Covering knowledge, process, and attitude	+1	+1	+1	3	1	Valid
3	Being measurable in knowledge, process, and attitude	+1	+1	+1	3	1	Valid
	Contents						
4	Complying with learning objective	+1	+1	+1	3	1	Valid
5	Being appropriate in terms of time management	+1	+1	+1	3	1	Valid
6	Outcomes-Based Education and Creativity-Based Learning instructional models	+1	+1	+1	3	1	Valid
7	Complying with the designed instructional model	+1	+1	+1	3	1	Valid
8	Supporting students' learning	+1	+1	+1	3	1	Valid
9	Including various activities	+1	+1	+1	3	1	Valid
	Learning materials						
10	Complying with the learning objectives	+1	+1	+1	3	1	Valid
11	Complying with the contents	+1	+1	+1	3	1	Valid
	Evaluation and Assessment						
12	Complying with the learning objectives	+1	+1	+1	3	1	Valid
13	Including various methods and instruments	+1	+1	+1	3	1	Valid
	Total (In Overview)				**39**	**1**	**Valid**

Note: Valid when ≥ 0.60

Evaluation Results of lOC for Validity of Scoring Rubric

NO	Item	Experts' rating			Total	IOC	Results
		1	2	3			
	Ability to select a topic						
1	Standard 1: Be able to select research questions related to education.	+1	+1	+1	3	1	Valid
2	Standard 2:Select research problems that are valuable and feasible, and are urgent or topical issues in society.	+1	+1	+1	3	1	Valid
	Ability to collect and organize information						
3	Standard 1: be able to collect relevant literature materials in China according to the research.	+1	+1	+1	3	1	Valid
4	Standard 2: Be able to collect relevant research materials from abroad according to the research needs. topical issues in society.	+1	+1	+1	3	1	Valid
5	Standard 3: Ability to analyses collected literature.	+1	+1	+1	3	1	Valid
	Research plan design ability						
6	Standard 1: Ability to design a research plan independently.	+1	+1	+1	3	1	Valid
7	Standard 2: The designing research plan is scientific, rational and clear.	+1	+1	+1	3	1	Valid
	Communication ability						
8	Standard 4: Be able to write a literature review.	+1	+1	+1	3	1	Valid
9	Standard 5: Be able to articulate their research findings clearly and accurately and be able to co-operate and communicate effectively with others.	+1	+1	+1	3	1	Valid
	Total (In Overview)				**27**	**1**	**Valid**

Note: Valid when ≥ 0.60

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mr. Qin Jianrong

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C1

Given on 25th January 2021

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Acceptance Research

MHESI 8038.1/15

JOURNAL OF MCU UBON REVIEW
Mahachulalongkornrajavidyalaya
University, Ubon Ratchathani Campus

RESPONSE FOR PUBLICATION OF THE ARTICLE

31st March, 2024

The Editorial Department of the Journal of MCU Ubon Review (TCI) of MCU, Ubon Ratchathani Campus has considered the article.

Title DEVELOPMENT OF FLIPPED CLASSROOM TEACHING MODEL TO IMPROVE RESEARCH ABILITY OF UNDERGRADUATE STUDENTS

Writer Qin Jianrong, Areewan Iamsa-ard, Wapee Kong – In and Sarayuth Sethakajorn

Publication Approval: The Journal of MCU Ubon Review (ISSN : 2697-4150 (Online))
Mahachulalongkornrajavidyalaya University, Ubon Ratchathani Campus

Period of Publication : 9th Year, Volume I (January-April 2024)

Your article has been sent to 3 experts for peer review and found that its quality is at a "**Good**" level and academically useful.

Please be informed accordingly.

(Assoc.Prof, Dr.Phrakhruwutthidhampandit)

Editor of the Journal of MCU Ubon Review (TCI)
Mahachulalongkornrajavidyalaya University, Ubon Ratchathani Campus

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