DEVELOPMENT OF PROJECT-BASED LEARNING INSTRUCTIONAL MODEL TO IMPROVE PROBLEM-SOLVING ABILITY FOR UNDERGRADUATE STUDENTS

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Thesis Title Development of Project-Based Learning Instructional Model to Improve Problem- solving Ability for Undergraduate Students

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ABSTRACT

The objectives of this research were 1) to examine the factors affecting problem-solving ability for undergraduate students in Guangxi Province, 2) to develop project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University, and 3) to study the results of project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University. The population of Phase 1 were 150 former students of the Kindergarten Course in the 1st semester of the academic year 2022 and 3 lecturers from 3 universities who taught the Kindergarten Course in Guangxi Province. The target groups of Phase 2 were 3 experts, and the sample group of Phase 3 were 45 students who enrolled in the Kindergarten Course in the 1st semester of the academic year 2023 in Beibu Gulf University. The research instruments were 1) a set of questionnaires for students and interviews for lecturers, 2) a set of questionnaires for conformity instructional model, 3) lesson plans using project-based learning model, and 4) scoring rubric from. Data analyzed by percentage, mean, and standard deviation.

The results revealed the following:

1) The factors to improve undergraduate students' problem-solving ability of undergraduate students in Guangxi Province were internal and external factors. The former included earning interest, learning attitude, self-efficacy and metacognitive ability. while the latter involved teaching methods, teaching environment, learning resources and opportunities, collaboration and exchange, and challenging tasks provided with course .

2) The project-based learning Instructional model to improve students' problem-solving ability in Beibu Gulf University included 5 components 1) Principle and rationale, 2) Objectives, 3) Contents, 4) Method of teaching & materials and 5) Evaluation. The model was 100% conformed to utility, feasibility, propriety, and accuracy standards as assessed by 5 specialists.

3) It was found that 84. 44% of 45 students who enrolled in the Kindgarten Course in Beibu Gulf University whose problem-solving ability was at good level while another 15. 55% of them were assessed to be at Medium and Pass level. The result was consistent with the research hypothesis that 80. 00% upwards of the participants would have problem-solving performance ability at Good level after learning through project-based learning instructional model.

Keywords: Project-Based Learning Instructional Model; Problem-Solving Ability; Undergraduate Students

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Chapter 1
Introduction

Rationale

Kindergarten Course is a compulsory course for the preschool education major of Beibu Gulf University, with 2 credits. As an important part of preschool education, it is committed to improving the quality of training talents for preschool education majors in University. This course aims to help students of preschool education majors deeply understand and master the basic knowledge of curriculum theory, cultivate their ability to dialectically look at problems, analyze problems and problem-solve ability, and lay a foundation for students to participate in kindergarten course preparation and kindergarten-based course reform practice in the future. (Beibu Gulf University, 2022)

Poor problem-solve ability in kindergarten course with the students. Lack of ability to observe and analyze problems; Lack of ability to design and adjust the curriculum, students lack experience in designing and organizing the kindergarten curriculum, and do not know how to adjust and optimize the problem appropriately to promote the development of young children (Xi, 2017); Lack of communication and collaboration skills, and students encounter difficulties in communication and cooperation with kindergarten teachers, parents or other relevant personnel, resulting in poor problem solving effect; Lack of awareness of reflection and improvement: students have not formed the habit of continuous reflection and improvement, and can not find problems in time and take effective improvement measures (Wu & Xie, 2013). The problem-solving ability is crucial for undergraduate students studying in the Kindergarten Courses. The educational environment and educational philosophy are constantly changing, and having problem-solving ability can help undergraduates better adapt to changes, cope with challenges, and prepare for their future careers and become excellent kindergarten teachers. However, one-way transfer of symbolic knowledge and mechanical training based on symbolic logic calculus leaded to obstacles for students in solving problems (Liang, 2012). In order to bridge this gap, appropriate teaching modes are introduced, including completion of project assignments, through which students are encouraged to integrate

multidisciplinary knowledge, read extensively and make full use of various relevant information and materials. Through division of labor, repeated discussions, the final results are formed, and the project results are presented in other forms to improve students' problem-solving ability (Wang et al., 2012).

Using Augmented project-based learning as solution. The teaching effect of problem solving ability can be further brought into play, and the project-based teaching mode focusing on cultivating students' problem solving ability is proposed. The project-based teaching mode takes the project as the core and has a clear and easy to use teaching process. With strong operational advantages, Curriculum teaching is the most core educational activity for universities to promote student development and respond to the needs of national talent training, and students' experience and feedback should be an important information source for the evaluation of curriculum teaching quality (Huang et al., 2021). The implementation of project-based teaching has been proved to be necessary and feasible both in theory and practice it is effective to improve learners' problem-solving ability.

1. Project-based teaching focuses on arousing students' learning enthusiasm, using driving problems to stimulate students' learning interest, combining abstract and boring theory with vivid practice, and solving problems with innovative thinking and application ability (Wang et al., 2012).

2. Project-based teaching focus on the learning outcomes that students experience during the learning process. In addition to the evaluation of the project results, we should pay more attention to the performance evaluation during the completion of the project. Guide students to carry out extensive cooperative learning in project-based learning to improve students' problem-solving ability.

3. Project based learning focuses on a real-world problem, learner must assume responsibility for their own learning, the teacher’s role becomes that of a guide or facilitator, and the deliverable must relate the learner’s life and /or career (Jalinus et al., 2017). This is very effective in cultivating students' independent learning ability and creative thinking ability.

4. Project-based teaching emphasize project were an ideal vehicle for inviting students to demonstration their understanding through a broad-based assessment approach Assessment for (process of learning), as (learner-critical reflection) and of (summative) learning are integral to project-based learning. This is crucial to students'

problem-solving ability. Project-based learning has been considered capable of involving students in developing 21st century skills. These skills such as critical thinking, problem solving, communication skills, collaboration skills, and creativity (Ramadhan et al., 2020).

So the researchers were interested in" Development of Project-Based Learning Instructional Model to Improve Problem-Solving Ability for Undergraduate Students".

Research Questions

1. What are the factors affecting problem-solving ability for undergraduate students in Guangxi Province?

2. Is project-based learning instructional model to improve problem-solving ability for undergraduate students appropriate for further implementation and how in Beibu Gulf University?

3. What are the results of implementing project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University?

Research Objectives

1. To examine the factors affecting problem-solving ability for undergraduate students in Guangxi Province.

2. To develop project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

3. To study the results of project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

Research Hypothesis

After implementing project-based learning instructional model, students' problem-solving ability will be overall improved at 80% (Good Level).

Scope of the Research

Population and the Sample Group

Population

The total of 180 freshmen from 4 classes of students with different levels of learning achievement, who enrolled in Kindergarten Course at Beibu Gulf University in semester 1st academic year 2023. Those sections involve the following.

45 students in class A

45 students in class B

45 students in class C

45 student in class D

The sample group

The 45 students who enrolled in Kindergarten Course from class section B are obtained by simple random sampling.

The variables

Independent variable

Project-based learning instructional model

Dependent variable

Problem-solving ability

Contents

There are 3 Units, 32 hours in Kindergarten Course. The contents are shown below:

Unit 1: Curriculum Theory (8 hours)

Unit 2: Kindergarten-based curriculum theory (16 hours)

Unit 3: Curriculum practice (8 hours)

According to the problem-solving ability in this study, the researcher chosed Unit 2 for the experiment. The contents are shown below:

Chapter 1: Overview of kindergarten-based coursetheory (3. 5 hours)

Chapter 2: Kindergarten-based course development (3. 5 hours)

Chapter 3: Preparation of kindergarten-based course program (6 hours)

Chapter 4: Kindergarten-based c course evaluation (3 hours)

Time frame

The 1st semester of academic year 2023 (September - December 2023)

Advantages

Regarding the advantages of the project-based learning instructional model, taking Beibu Gulf University as an example, it can be expounded from three aspects.

1. To the students: The project-based Learning model expand students' learning space, improve students' learning enthusiasm and initiative and creativity. In project-based learning, students should think independently and creatively, pay attention to the cultivation of students' learning ability, and guide students to improve their problem-solving ability through project-based learning.

2. To the lecturers: Compared with the traditional role of teacher, teacher is the imparting of knowledge and the superior authority in the field. Based on the project-based teaching model, teachers It has become the designer and implementer of the curriculum system and the leader and new learner of students' learning. Teachers are exploring teaching strategies and teaching methods, providing differentiated guidance to students at different levels, improving teaching quality and classroom efficiency, which is conducive to the growth of creative talents.

3. To the institute: Changes in classroom management. After the implementation of the model, project-based teaching leads group cooperative learning, explores and practices to improve students' learning efficiency, and at the same time, classroom teaching management has been greatly improved. Provide effective teaching model and practical experience for other courses of the school.

Definition of Terms

The factors affecting problem-solving ability of undergraduate students at Guangxi Province refers to the internal and external factors collected from students using questionnaire and interviews for lecturers designed by the researcher. The internal factors involve the information about students while external factors consist of information about the teacher and circumstances. In addition, the factors will be obtained by structured interviews with the lecturers.

Development of project-based Learning instructional model refers to a relatively stable teaching activity structure framework and activity procedure established under the guidance of certain teaching ideas or teaching theories. The process to develop instructional model to improve instructional ability of

undergraduate students of Beibu Gulf University from 5 components 1) Principle & Rational, 2) Objectives, 3) Contents, 4) Methods of teaching & Materials and 5) Evaluation. It will also be evaluated by the experts from 4 aspects: 1) Utility standards, 2) Feasibility standards, 3) Propriety standards and 4) Accuracy standards as the followias the follows: standards (Stufflebeam, 2012).

Utility standards are intended to the model can be manufactured or used and can produce positive results.

Feasibility standards are intended to the teaching model is what teachers need and pursue.

Propriety standards are intended to the model has characteristics that are suitable for teaching and learning situations.

Accuracy standards are intended to the degree of conformity with a standard or a measure of closeness to a true value.

Project-Based Learning Instructional Model refers to the teaching activities in which students select projects, plan and implement project tasks, and present their own products after completing project tasks. Throughout the implementation of the project, students will fully develop their potential, gain the required knowledge, and improve their problem-solving ability. Lai & Xing (2020), Ramadhan et al. (2020), Rahmania (2021), Jalinus et al. (2017), they summed it up the instruction is divided into 4 steps:

Step 1: Project preparation stage. Teachers clearly define teaching objectives, formulate project teaching plans, prepare project resources, create project learning environments, etc., and release them to students one week in advance for project preparation and learning.

Step 2 : Project implementation stage. Teachers focus on teaching, students plan the project process, teachers provide learning scaffolding to help learning activities to solve problems of the project.

Step 3 : Project presentation stage. Students solve problems and complete project tasks with the help of teachers and teachers to demonstrate learning outcomes.

Step 4 : Project evaluation stage. Teachers use a variety of methods to evaluate students'achievements through the grading criteria, the attitude of students to participate in activities, the process, and the results displayed.

Problem-solving ability refers to the students to can analyze, evaluate and solve problems effectively when facing problems. It involves the ability to identify a problem, gather the necessary information to analyze the problem, develop a solution to solve the problem, assess feasibility, make decisions and implement the solution, and the ability to reflect. The students have 4 ability in below: 1) Ability to identify problems; 2) Ability to analyze problems; 3) Ability to provide solutions 4) Evaluation and reflection ability. (Retno et al., 2019; Susanti & Makiyah, 2021; Wu & Xie, 2013; Kartini et al. , 2021; Zhu, 2023).

Item 1: Ability to identify problems

Standard 1: Obtain effective information on project activities

Standard 2: Attitude towards problems

Item 2: Ability to analyze problems

Standard 1: Able to accurately grasp driving issues

Standard 2: Able to propose problem-solving ideas

Item 3: Ability to provide solutions

Standard 1: Able to collaborate to solve problems

Standard 2: Able to correctly apply methods to solve problems

Item 4: Evaluation and Reflection Ability

Standard 1: Evaluate the effectiveness of the solution

Standard 2: Reflection and learning

Undergraduate students refer to the first-year students majoring preschool education who enroll Kindergarten Course in the semester 1st academic year 2023 at Beibu Gulf University.

Beibu Gulf University refers to is Located in Qinzhou City, Guangxi Zhuang Autonomous Region, it is a full-time higher education institution specializing in engineering, science and management. It is a university co-built by the People's Government of Guangxi Zhuang Autonomous Region and the State Oceanic Administration, an application-oriented undergraduate university project unit under the national“13th Five-Year Plan”, a base university of “Production-Education Integration Innovation Project” of the School Planning, Construction and Development Center of the Ministry of Education, a pilot university for the overall transformation and development of newly built undergraduate colleges in Guangxi,

and one of the first governing universities of the National Alliance of Applied Technology Universities. The campus is a 3 A scenic spot.

Research Framework

Based on the research objectives, relevant theories are compiled and studied, roject-Based Learning theory and Problem-solving ability. These thoughts and principles are employed as the foundation of the following research framework as shown in figure 1.1

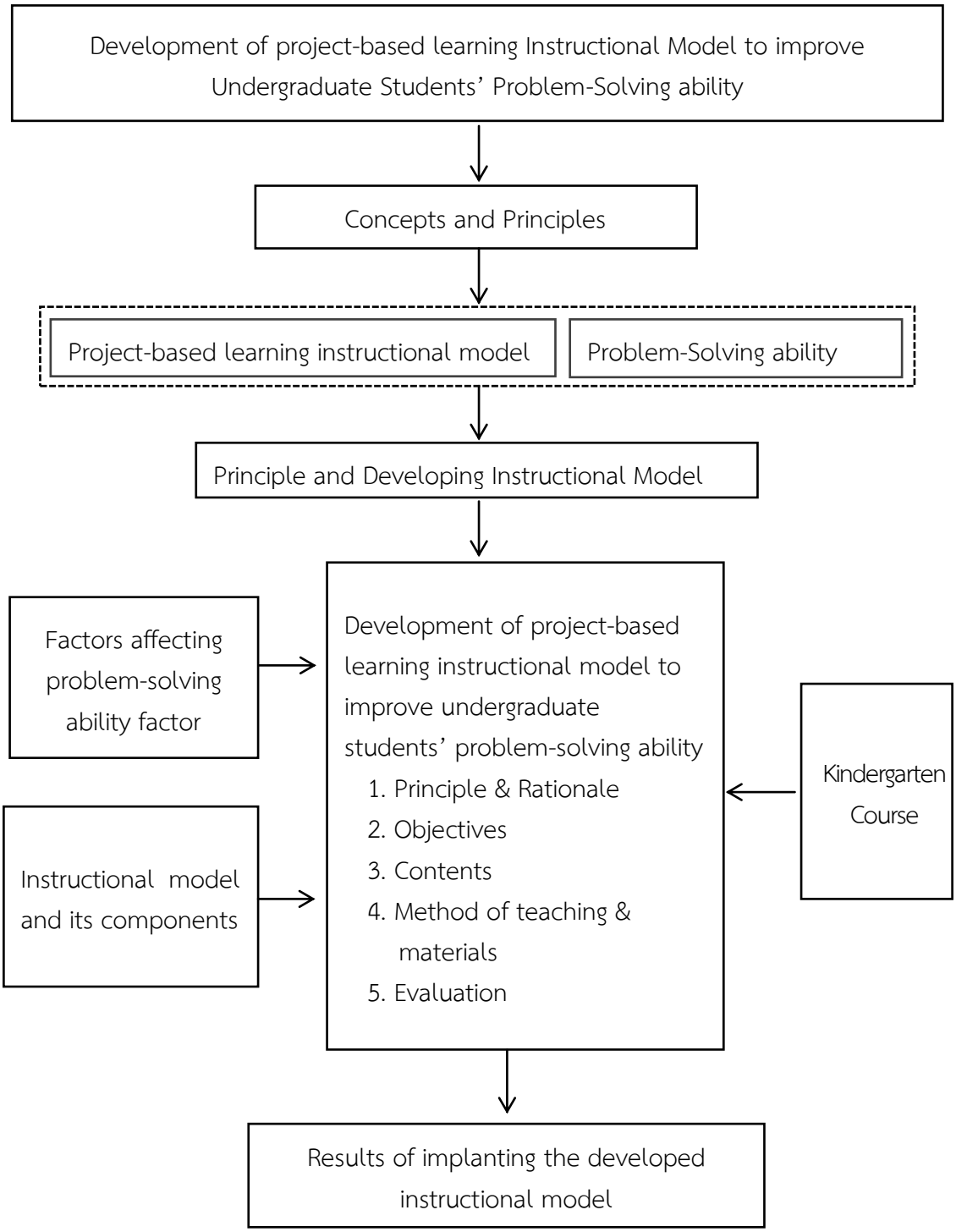

Figure 1.1 Research Framework

Chapter 2
Literature Review

In the study of “Development of project-based learning instructional model to improve problem-solving ability for undergraduate students”, the researcher studied the documents concerning the following.

1. Kindergarten Course in Beibu Gulf University
2. Development instructional model
3. Project-based learning
4. Problem-solving ability
5. Rubric scores
6. Related research

The details are as follows.

Kindergarten Courses in Beibu Gulf University

Kindergarten Course is a core course of preschool education for teaching problem-solving ability. This course includes implementation principles, dimensions of problem-solving ability, curriculum objectives, curriculum structure, etc. , as well as relevant literature on factors affecting problem-solving ability.

Principle

This course is “Kindergarten Course”, offered by Beibu Gulf University. This is a core course for undergraduates. The use of project-based learning mode is a breakthrough in teaching mode.

1. The principle of problem-driven. By carrying out project-based teaching mode, the course is broken down into various problems to promote students' learning. Cultivate the habit and ability of students to study independently, and be able to find ways to solve problems independently, so as to guide students to better develop. courses and improve students' interest and effectiveness in learning. Achieve the development of each person's problem-solving ability in the project.

2. The principle of encouraging cooperative learning. In the project cooperation, we pay attention to every student. While cultivating students' independent learning ability, we encourage students to cooperate with their peers

and kindergarten teachers to broaden the ways to solve problems, improve their ability to solve problems, effectively solve problems encountered in curriculum development, and realize common learning and common growth.

3. The principle of cultivate of higher order thinking. In the course of project task orientation, students are guided to learn to find problems, analyze problems, solve problems innovatively and learn to reflect through projects, which is conducive to the cultivation of higher-order thinking ability. At the same time, students' interdisciplinary knowledge and integration ability are focused on training, so as to better cope with complex and changeable practical problems, and effectively improve the problem-solving ability of college students. So that students in the future life better learn to survive and change their lives.

Objectives

This course aims to cultivate students' problem-solving ability to use educational knowledge, skills and experience to effectively analyze and solve various practical problems in education and teaching through project-based teaching mode; Emphasize teamwork ability to complete project tasks together; Encourage students to use their imagination and creativity to come up with novel solutions in the process of problem solving; At the same time, it also emphasizes that students' independent learning ability lays the foundation for future lifelong learning.

Curriculum structures

Kindergarten Course teaching offered by preschool education majors in universities play an important role in the curriculum system of preschool education majors. Kindergarten Courses is a combination of theory and practice. At present, the teaching of this course is to enable students to master the theoretical knowledge of kindergarten course and improve students' problem-solving ability. Through in-depth study and research of the content and practical experience of the kindergarten course, students are able to develop the ability to observe, analyze and solve problems. This includes identifying possible challenges and problems in early childhood education, finding appropriate solutions, and effectively implemen-ting these solutions to promote the overall development of young children. So as to train students to become excellent pre-school education professionals to lay a solid foundation (Li, 2012). There are 3 Units, 32 hours in Kindergarten Course of university. The contents are as follows :

Table 2.1 Chapters and contents used in the present study

Unit	Chapter	Contents	Times (32hrs.)
1. Curriculum Theory	1.1:Basic knowledge of curriculum theory	Course definition; course type; brief history of curriculum theory development	4 hrs
	1.2:New curriculum theory basic knowledge	Introduction to the new course; management system of the new curriculum; structure of the new curriculum; the latest progress of the new curriculum	4 hrs
2. Kindergarten-based curriculum theory	2.1:Overview of kindergarten-based course theory	Kindergarten-based coursetheory: definitions and features; types and functions;current status; reflections	3. 5hrs
	2.2: Kindergarten-based course development	Kindergarten-based course development: Definition; Practice. the Process; Reflections	3. 5 hrs.
	2.3 Preparation of kindergarten-based course program	Preparation of kindergarten-based course plan; case Sharing and management of kindergarten-based courses; kindergarten-based course management; think and evaluate	6 hrs.
	2.4. Kindergarten-based course evaluation	Definition of course;evaluation elements of course evaluation; content of course evaluation; reflection and development of kindergarten-based courses;think and evaluate	3 hrs.
3. Curriculum practice	3.1. Educational practice	Course plan practice;reflection on curriculum practice	4 hrs
	3.2. Educational research	Students' research on curriculum practice; teachers' research on curriculum practice; lead the research on curriculum practice	4 hrs

The researcher chose Unit 2 to experiment through the project-based learning instructional model.

The factors of promoting students' problem-solving ability. The factors to promote the problem-solving ability of undergraduate students, we need to consider a series of internal and external factors. Internal factors include basic information about the students (age, gender, major, grade, etc.), their understanding of problem-solving ability (awareness of problem-solving ability, degree of emphasis, willingness to invest time and energy to improve the ability), and their understanding of teaching modes. These factors can be collected through questionnaires and expert interviews. External factors include information about teaching tools, methods, teacher guidance, and environment. These factors can also be captured through structured teacher interviews. By taking these factors into account, we can better promote students' problem-solving ability.

The implications of internal and external factors. According to Lin et al. (2017) learning motivation has a significant positive impact on learning outcomes. Modern teaching methods and digital learning have more advantages over traditional teaching, and teachers can improve the effectiveness of their instruction by formulating reasonable teaching strategies. Aisha et al. (2018) point that "problem-solving belief, natural usefulness belief, self-regulated learning (SRL) strategy, and goal orientation" are four factors that influence the enhancement of problem-solving ability. Pimta (2009) considers both direct and indirect factors that affect problem-solving ability. Direct factors are manifested as external factors, such as teachers' teaching behavior and attitude; indirect factors include motivation and self-efficacy.

To sum up, the factors that affect problem-solving ability are mainly teaching methods, teaching strategies, teaching materials and environment. The internal cause is mainly learning motivation, attitude, self-learning strategy and so on.

Development of Instructional Model

Instructional models are an important area of educational research that focuses on how teachers organize and carry out teaching activities, and how students participate in and learn from them. This teaching mode has the characteristics of integrity standardization, purpose, exploration, imitation and operability. In order to develop an effective teaching model, five experts evaluated the teaching model. We

comprehensively consider educational ideas, teaching theories, learning theories, teaching objectives, learning characteristics and other factors, as well as curriculum design research, through analysis, discussion and reflection, jointly design a teaching model to guide teaching practice, effectively improve students' learning outcomes and improve teaching quality. Based on the latest educational research results, the model aims to guide and optimize the framework of teaching activities to support student learning and development to meet the needs of talent cultivation in the 21st century, specifically as follows:

Pipattanasuk & Songsriwittaya (2020) said that instructional model development means a theoretical teaching of self directed learning process by having students encounter the problem that causes intellectual conflict. In order to achieve a new problem-solving intellectual structure, which requires a concept idea and creativity integrated with modern technology and proper media to build a concrete knowledge. Hence, this learning model methodology depends on the student's behaviour development from the basic to the expected level. It will also help students to build a cognitive ability in order to achieve the learning objectives effectively.

Vong & Kaewurai (2017) said that the development of instructional models involves continuously updating and improving teaching methods and strategies to adapt to changing educational environments and learners' needs. It consisted of six components: principle, learning objective, learning content, learning instruction, learning material, and evaluation of effectiveness. In researching teaching models, it is important to support them with principles from various teaching theories, such as constructivist learning theory, cognitive learning theory, social-cognitive theory, cognitive information processing theory, and adult learning theory. These principles should be considered in terms of objectives, learning content, and instructional strategies. By optimizing teaching models through this consideration, we can enhance learners' learning experiences and satisfaction, and better meet their needs and expectations for learning.

Petchtone (2014) means that developmental instructional model is an innovative approach that addresses the limitations of traditional teaching models. These limitations include teachers 'inability to meet students' interests and needs, the lack of integration among knowledge fields, and the failure to prepare students for practical behaviors and problem-solving ability. The proposed developmental

teaching model consists of six components: rationale, objectives, content structure, task analysis, teaching units, and measurement and evaluation. This unit-integrated teaching model aims to enhance students' knowledge construction and improve learning outcomes, as evidenced by solid research findings.

Therefore, the development of teaching mode is based on the specialized teaching of “research guiding practice”. From the insights of the five researchers, it is found that the development of teaching mode needs the combination of various elements, and the concept, goal, process, teaching strategy or evaluation method of teaching mode can be adapted to deal with. Each expert put forward their own unique views, and jointly stressed that in terms of learning and teaching strategies, personalized teaching behaviors can be designed according to needs to improve the effectiveness or operability of some aspects of the teaching model. The adaptability and effectiveness of the model need to be based on research evidence to promote students' learning development.

Project-Based Learning Instructional Model

Background

Project-based learning can be traced back to progressive educational thought in the late 19th century, of which John Dewey was one of the most important advocates. He believes that students should gain knowledge and skills from practical problems and projects, not just passively accept abstract concepts. The theoretical basis of project-based learning is mainly constructivist learning theory, Dewey's pragmatic education theory and Bruner's discovery learning theory (Liu & Zhong, 2002). Project-based learning is an educational method that promotes students' learning and development by engaging them in real-world projects, which is characterized by history and times. At the beginning of the 20th century, project-based learning began to be widely used in practice. This style of learning focuses on developing students' critical thinking, problem-solving skills and a spirit of cooperation. Students learn by participating in real-world projects and tasks, such as community service, engineering design, or scientific research (Yang, 2021). In the second half of the 20th century, project-based learning became one of the core ideas of several educational reform movements. Computers, the Internet and multimedia tools provide students with a wider range of resources and creative ways

of expression. Students can use technology to present and share the results of their projects, as well as real-time collaboration and feedback (Tamim et al. , 2013) . From early education to primary and secondary education to higher education, project-based learning has been explored in various contexts and at different stages of schooling, which is believed to cultivate students' ability to solve practical problems, innovative thinking and teamwork. Many schools and educational institutions are actively adopting project-based learning models, designing interdisciplinary programs that enable students to apply their acquired knowledge and skills to the real world (Kokotsaki, et al. , 2016).

In summary, project-based learning models have been developed since the 19th century and are widely used in the field of education. It emphasizes active learning, critical thinking and collaboration skills, develops students' problem-solving skills in the real world, and uses technology as a learning tool.

The meaning of Project-Based Learning as follows: Lai & Xing (2023) defines the project-based learning model as a form of active learning. A teaching method that enables students to acquire knowledge and skills by responding to real, interesting and complex questions, problems, or challenges through a period of investigation and research, and by openly presenting the results of their projects. Ramadhan et al. (2020) defines the project-based learning model as a structured approach to learning that focuses on acquiring knowledge and skills through inquiry. It involves designing products or completing tasks, which should be challenging and problem-driven. This method allows students to work independently or collaboratively over an extended period of time, giving them the opportunity to develop their problem-solving abilities. Rahmania (2021) defines the project-based learning model as a teaching method that emphasize practical learning in real-life situations, allowing students to apply their knowledge to solve real-world problems. In this model, students are encouraged to take charge of their learning process by engaging in challenging problems and projects. They are required to design solutions, analyze problems, develop plans, implement actions, and evaluate results. Finally, they demonstrate their learning by completing a tangible product or project. Yang (2021) defines the project-based learning model is a constructive way of teaching and learning, in which teachers project students' learning tasks, guide students to raise questions based on real situations, and use relevant knowledge and information to

carry out research, design and practical operations, and finally solve problems and display and analyze project results. Liu & Zhong (2002) defines the project-based learning model is a new type of inquiry-based learning model that focuses on the concepts and principles of the discipline, with the purpose of producing and selling works to customers, carrying out exploration activities with the help of various resources, and solving a series of interrelated problems within a certain period of time. Jalinus, N., Nabawi, R. A., & Mardin, A. (2017) Project-based learning is a constructivist pedagogy that emphasizes that learners build their own body of knowledge by engaging in projects and problems that are authentic, rich, and relevant to the topic under study.

Through literature research, we find that the academic circles at home and abroad have the following definitions of project-based learning. The first is to think that item-based learning is a way of learning. The second is to think that item-based learning is a teaching mode, emphasizing the interpretation of this model from the Angle of the students 'learning. Third, item-based learning is a way of curriculum design and a more integrated teaching practice.

Steps to teach in project-based Learning instructional model

The origins of project-based learning can be traced back to Dewey. It was then that one of Dewey's students, Koboko, first proposed and practiced the project approach. In recent years, with the deepening of the research on" literacy" in the world, project-based learning as an important means to cultivate literacy has been widely valued. Scholars in the field of education have also provided different steps to teach as follows:

According to Lai & Xing (2023), project-based learning is a form of active learning that promotes cooperation among students. the following steps for implementing the Project-Based Learning model :

Step 1: Determine project tasks

Step 2: Plan

Step 3: Implementation

Step 4: Check and evaluate

Step 5: Archive or result application.

According to Ramadhan et al. (2020) project-Based Learning allows students to work independently or collaboratively over an extended period of time, giving

them the opportunity to develop their problem-solving abilities. The following steps for implementing the Project-Based Learning model:

Step 1 : Determination of Basic Questions

Step 2 : Project Determination

Step 3 : Develop Project Planning

Step 4 : Schedule Arrangement

Step 5 : Project Implementation with Teacher Facilitation and Monitoring

Step 6 : Report Preparation and Presentation

Step 7 : Evaluation of Project Process and Results

According to Rahmania (2021) project-based learning emphasis is placed on students learning and problem solving in real life situations. The steps of project-based learning included :

Step 1: Open the lesson with a challenging question

Step 2: Planning the project

Step 3: Develop a schedule of activities

Step 4: Oversee the course of the project

Step 5: Assessment of the resulting product

Step 6: Evaluation

According to Liu & Zhong (2002), project-based learning mainly is mainly composed of four elements : content, activity, context and outcome. Liu & Zhong outlines the following steps for implementing the project-based learning model:

Step 1: Project selection.

Step 2: Planning.

Step 3: Activity exploration.

Step 4: Work output.

Step 5: Exchange results.

Step 6: Activity evaluation.

According to Jalinus et al. (2017) Project-based learning encourages students to apply inquiry-based learning methods to gain a deep understanding of concepts and skills through practice, collaboration and reflection. In project-based learning, students need to research around a specific problem or challenge, and complete the task by collecting information, analyzing data, solving problems, and other steps to

achieve deep learning. According to the steps of the Project-based learning model are as follows:

Step 1: The formulating the expected learning outcome

Step 2: Understanding the concept of the teaching materials

Step 3: Skills training

Step 4: Designing the project

Step 5: Making the project proposal

Step 6: Executing the tasks of projects

Step 7: Presentation of the project report.

As for the personal steps, they involve:

To sum up, these different views on project-based learning provide support for us to better understand the project-based instruction model. Clearly, the success of this model depends on designing deep learning experiences for learners, training students to transfer what they have learned to the real world, and ultimately helping students achieve improved literacy.

Summary steps to teach in project-based learning as follows, the contents were as follows in table 2. 2.

Table 2.2 Summary steps to teach in project-based learning

Lai & Xing (2023)	**Ramadhan et al. (2020)**	**Rahmania (2021)**	**Liu & Zhong (2002)**	**Jalinus et al. (2017)**
Step 1 : Determine project tasks Step 2 : Plan Step 3 : Implementation Step 4: Check and evaluate the students	Step 1 : Determination of Basic Questions Step2 : Project Determination Step 3 : Develop Project Planning	Step 1: Open the lesson with a challenging Question Step 2: Planning the project Step3: Develop a schedule of activities	Step 1: Open the lesson with a challenging Question Step 2: Planning the project Step 3: Develop a schedule of activities	Step 1: The formulating the expected learning outcome Step 2: Understanding the concept of the teaching materials

Table 2.2 (Continued)

Lai & Xing (2023)	Ramadhan et al. (2020)	Rahmania (2021)	Liu & Zhong (2002)	Jalinus et al. (2017)
Step 5: Archive or result application	Step 4 : Schedule Arrangement Step5 : Project Implementation with teacher facilitation and monitoring Step6 : Report Preparation and Presentation Step 7 : Evaluation of Project Process and Results	Step 4: Oversee the course of the project Step5: Assessment of the resulting product Step 6: Evaluation	Step 4: Oversee the course of the project Step 5: Assessment of the resulting product Step 6: Evaluation	Step 3: Skills training Step 4: Designing the project theme Step 5: Making the project proposal Step 6: Executing the tasks of projects Step 7: Presentation of the project report.

As for the personal steps, the researcher integrated steps to teach in project-based learning as follow: Lai & Xing, 2023; Ramadhan et al., 2020; Rahmania, 2021; Liu & Zhong, 2002; Jalinus et al., 2017.

Step 1: Project preparation stage

Step 2: Project implementation stage

Step 3: Project presentation stage

Step 4: Project evaluation stage

The strength in project-based learning

In recent years, project-based learning has been widely used and promoted in the world, and is considered as an effective education reform strategy. Citing the views and research results of relevant experts, the advantages of project-based learning are summarized as follows:

Improve students' interest and motivation

1) Students are more likely to develop interest and motivation when they participate in project-based learning (Zheng et al., 2021). This is because project-based learning combines learning content with practical problems, enabling students to experience the joy of learning while solving problems. In addition, project-based learning encourages students to work with their peers to solve problems together, which helps to develop students 'team spirit and responsibility (Thomas, 2000).

2) Cultivate students' innovation ability and problem solving ability

Project-based learning requires students to use their knowledge and skills, imagination and creativity in problem-solving (Hmelo-Silver, 2004). Students need to analyze, evaluate and solve problems, which helps to develop their innovative and critical thinking skills. At the same time, project-based learning emphasizes students' continuous reflection and adjustment in practice, thereby improving their problem-solving ability (Lai & Xing, 2023).

3) Promote students' interdisciplinary learning

Project-based learning typically involves multiple subject areas and requires students to integrate and apply knowledge from different disciplines in their projects (Ernest, 2005). This helps break down disciplinary boundaries and promotes interdisciplinary learning for students. Through project-based learning, students can better understand the links among various disciplines and form a systematic knowledge system (Thomas, 2000).

4) Develop students 'communication and collaboration skills

Project-based learning emphasizes communication and collaboration between students and peers, teachers, and community members (Wong & New, 2009). Students are required to share their ideas, perspectives and solutions with others in the project, which helps to develop their communication skills. At the same time, project-based learning requires students to work together to complete tasks, which helps to cultivate their collaborative ability and team spirit (Thomas, 2000).

Improve students' ability of independent learning and self-management

Project-based learning requires students to choose project topics, make plans, assign tasks, monitor progress and evaluate results. This helps to develop students' ability of independent learning and self-management. Through project-based

learning, students can learn how to arrange time reasonably, set goals, and solve problems, thus laying a solid foundation for future study and work (La i & Xing, 2023).

Enhance students' practical application ability

Project-based learning focuses on students applying acquired knowledge and skills in real situations to solve real problems (Ernest, 2005). This helps to enhance students' practical application ability. Through project-based learning, students can combine theoretical knowledge with practical operation to improve their practical ability and comprehensive quality (Thomas, 2000).

The role of teacher and students

The role of teachers

Jalinus & Mardin (2017) said that the teacher's role is student-centered, acting as a facilitator or facilitator. The focus of project-based learning is to encourage students to work individually or in groups to identify ways to solve practical problems with the project being studied. Assessments are conducted by teachers during learning activities and assess the end of each step model of project-based learning, with the aim of measuring student progress, competence and reflection as the next step. Teachers' guidance and support can help students overcome difficulties and challenges and improve their self-confidence and problem-solving ability.

Tamim & Grant (2013) said that the teacher's role is to play a supporter in project-based learning. They provide different places for students to do their own research and, in the process, frame their learning for students. At the same time, teachers will also add elements of reflection to the project activities to guide students to explore and discover critical thinking. By supporting students to build their own knowledge system through research, teachers can help students better master subject knowledge and skills, and at the same time stimulate students' interest and motivation in learning. In addition, the support of teachers can also make it easier for students to be attracted to the project and gain more from it and grow. Therefore, the role of teachers as supporters is crucial. They need to constantly pay attention to the learning needs and development of students, actively guide and support the process of inquiry and creation of students, and help students realize the improvement of self-cognition and personal value.

Lai & Xing (2023) said that the teacher's role are diverse and complex, and they need to play multiple roles such as facilitator, resource finder, progress supervisor and content expert. Specifically, teachers need to design and plan projects based on classroom and student foundations, and use lesson markers to ensure that the project addresses the core knowledge of the subject. At the same time, teachers also need to establish a classroom culture, encourage students to explore openly, cultivate team spirit, and improve the quality of their work.

In order to support students in achieving project goals, teachers need to build learning scaffolding and provide the necessary resources and support. In addition, teachers need to manage teaching activities, find and mobilize resources, and create and display works in public. Finally, teachers need to evaluate students' learning in order to adjust teaching strategies and methods in time.

The role of students

1) Project-based learning is a student-centered teaching method that emphasizes students' active participation and practical operation. Under this teaching model, the role of students has changed significantly.

2) In project-based learning, the role of students as active participant in project-based learning environment, the change of classroom role activates students' control over learning, and students actively participate in the learning process, which makes learning more effective. Teachers act as facilitators of inquiry and reflection, establishing a positive environment that ensures students have access to carefully selected resources and meaningful experiences to promote active learning (Huang & Ma, 2022).

In project-based learning, the role of students as active explorers (Yang, 2021). Through project practice, students take the initiative to use knowledge to solve practical problems and complete project tasks. This process encourages students to discover the nature of knowledge and to construct new knowledge and understanding on this basis. From the perspective of learning status, project-based learning transforms students from passive recipients to active explorers, and truly stimulates students' intrinsic motivation. In terms of learning content, the value of project-based learning lies in integrating learning content within disciplines or even across disciplines around a challenging topic to promote students' comprehensive understanding and realize their comprehensive development. In terms of learning

style, project-based learning requires more real and comprehensive projects to guide students to carry out learning, so that students can realize the integration of learning and application in problem solving. Therefore, project-based learning is not only a way of learning that emphasizes creativity, but also a way of deep learning.

3) In project-based learning, the role of students as effective collaborators (Hmelo-Silver, 2004). The premise of implementing project-based learning teaching is to ensure that students have formed" internal guidelines". The formation of this" internal guidance" is an important basis for them to act as effective collaborators in project-based learning (Kirschner, 2004). In addition, most projects consider a certain degree of teamwork in the design stage. Even if students complete their own individual works independently, they will participate in the learning activities of their peers and provide feedback to each other. This is about getting the most out of teamwork, so project-based learning is not only a way to emphasize creativity and active learning, but also a way to focus on teamwork and interactivity.

4) In project-based learning, the role of students as actively solve problems (Kokotsaki & Wiggins, 2016). In project-based learning, students need self-planning, self-monitoring and self-evaluation to complete project tasks and achieve learning goals. Project-based learning emphasizes the initiative and autonomy of students and enables them to play the role of self-manager in the learning process. This role not only helps to improve their learning ability, but also helps to cultivate their self-management ability and social adaptability.

5) In project-based learning, the student' s role is as lifelong learners. Project-based learning is a student-centered teaching method designed to develop students' broad competencies within lifelong learning. Can promote the development of attitudes related to participation and lifelong learning. Improving the links between interdisciplinary technical studies and social contexts helps motivate students to participate in activities (Stolk & Martello, 2015). Project-based learning is based on constructivist learning and teaching methodology. Constructivism believes that everyone's learning is built on the basis of their own knowledge and experience, so learning projects can help students build a richer and more flexible knowledge structure, laying a solid foundation for their future learning and career development. At the same time, project-based learning emphasizes deep learning and understanding, not just knowledge accumulation. Students need to constantly

explore and learn to meet changing learning needs. This helps to cultivate their lifelong learning ability and self-development ability.

Problem-Solving ability

There were many academic educators defined the meaning of Problem-solving ability as follows:

Retno et al. (2019) said that problem-solving ability is a dynamic process that involves individuals effectively identifying and implementing problem solutions through the application of cognitive strategies. In this study, problem solving ability is divided into four stages: 1) Problem understanding, that is, analyzing the essence and needs of the problem; 2) Plan solutions, including gathering information, evaluating options and developing plans; 3) Problem solving, that is, implementing solutions and adjusting strategies to deal with possible difficulties; 4) Review the results obtained (review) to ensure that the problem has been properly resolved and to provide experience for similar problems in the future. As an innovative educational method, modern project-based learning can be used as an effective alternative way for teachers to teach. Through project-based learning, students can cultivate their problem-solving ability in practical operation, while creating a positive learning atmosphere and improving students' learning interest and motivation.

Susanti & Makiyah (2021) said that Problem-solving ability is a person's ability to find solutions through a process that involves obtaining and organizing information. In the problem-solving process, students need to find solutions based on concepts/laws rationally and reflect on the problem-solving process and solutions. Stages and Indicators of Physics Problem Solving Ability are Recognizing the problem Planning strategy; Implementing strategy; Evaluating solution. STEM-based project-based learning model proposed by the authors. Confirm by research, it helps develop students' abilities in planning, communicating, solving problems, and making the right decisions from the problems given. This learning can train students' skills in planning, organizing, negotiating, and making conventions about the issues of the task to be done.

Wu & Xie (2013) said that problem solving ability is the ability of students to use multidisciplinary knowledge to solve problems in specific situations, and it is a basic ability of students to participate in social life. The process of student problem

solving includes six stages: understanding problem, describing problem, demonstrating problem, solving problem, reflecting solution and communicating solution. Therefore, understanding, analysis, reasoning, practice, reflection and expression constitute the basic elements of students' understanding ability. The suggestions for the cultivation of students' problem-solving ability are as follows : students' problem-solving ability can only be developed in the process of solving problems. Classroom teaching and extracurricular practice are both important ways for students to solve problems. Meanwhile, guiding students to reflect on the process of solving problems is also a channel that cannot be ignored to improve their ability. The process of student problem solving is the process in which students apply what they know in different situations, integrate the subject content, and combine different ideas, knowledge and thinking. School education should take students' problem-solving ability as the focus of training, and really promote the development of students' problem-solving ability through various strategies.

Kartini et al. (2021) said that problem solving refers to the ability to apply a cognitive-emotion-behavioral approach that involves finding the right way to deal with problems in everyday life and leading people to solutions to problems. The core aspect that affects problem solving is the ability to promote students' ability to interpret problems and analyze solutions. The Problem Solving ability Test (PSAT) is used to assess students' problem-solving ability, including the following four stages of the problem solving process; 1) Finding the fact stage ; 2) Finding the problem stage; 3) The idea discovery stage; 4) The solution finding stage. In researchers, STEM-based learning is divided into five stages: preparation, implementation, presentation, assessment, and correction. Implementing STEM project-based learning can effectively cultivate students' problem-solving ability.

Zhu (2023) said that problem-solving ability is the ability to have curiosity about problems, to actively think about problems, to integrate relevant resources and methods, to seek solutions, and to effectively solve problems. Evaluation of problem-solving ability in the application of training students' problem-solving ability based on project-based learning model. The value is carried out from four dimensions: 1) Raising and understanding the problem; 2) Ability to find problems; 3) Ability to raise questions; 4) Ability to sort out information. Construct project-based learning model, which includes three stages and six implementation links. The three

stages are project design, project implementation and project evaluation. The six implementation links are related to each other and all cultivate students' problem-solving ability. The research shows that students' problem-solving ability has a remarkable effect.

Summary Problem-solving ability in project-based learning as follows in table 2.3.

Table 2.3 Summary problem-solving ability in project-based learning

Retno et al. (2019)	**Susanti & Makiyah (2021)**	**Wu & Xie (2013)**	**Kartini etal. (2021)**	**Zhu (2023)**
Stage 1: Problem understanding Stage 2: Plan solutions Stage 3: Problem solving Stage 4: Review the results	Stage 1: Recognizing the problem Stage 2: Planning the strategy Stage 3: Implementing the strategy Stage 4: Evaluating the solution	Stage1: Understanding problem Stage 2: Describing problem Stage 3: Demonstrating problem Stage 4: Solving Problem Stage 5: Reflecting solution Stage 6: Communicating solution	Stage 1: Finding the fact ; Stage 2: Finding the problem ; Stage 3: The idea discovery Stage 4: The solution finding	Stage 1: Raising and understanding the problem Stage 2: Ability to find problems Stage 3: Ability to raise questions Stage 4 : Ability to sort out information

Summary: from the above research situation, most researchers' research on problem-solving ability mainly focuses on the dimensions of "finding problems, analyzing problems and solving problems". In this study, the dimensions of problem

solving ability were divided into: 1) the ability to find problems 2) the ability to analyze problems 3) the ability to raise problems 4) the ability to evaluate and reflect, which was scored by the researchers.

Rubric Scores

There are many academics persons define rubric scores as follows:

Egoda watte (2010) said that rubric scores are a set of criteria used to evaluate student work performance, which are contained in various scales in continuous quality grading. Students who perform well usually receive high marks. To achieve more reliable and unbiased scoring, each performance level is given a title along with an accompanying descriptor (Wiggins, 1998). Many problem-solving tasks require common skills such as problem-solving, conceptual understanding, etc. Evaluators should classify the corresponding skills and determine the corresponding evaluation criteria. It should be noted that how to improve the effectiveness of the scoring criteria must be considered when constructing the evaluation tool, which can be carried out in the following ways: 1) Train the evaluator before actual operation. This helps ensure they understand the scoring criteria and how to apply them properly. 2) Design a student attitude questionnaire to understand students' satisfaction with the assessment process. This will help improve assessment tools and methods. 3) In the absence of a specific time point for assessment, a formative and ongoing assessment approach may be more appropriate. This means that assessment will take place throughout the learning process, not just at the final stage. 4) When assigning marks to each topic, provide some evidence and future plans to help learners improve their weaknesses. This will help stimulate students' learning motivation and self-improvement awareness.

Docktor et al. (2016) focused on the application of scoring guidelines in evaluating complex tasks, such as problem solving. They noted that scoring guidelines can be holistic or analytical. The overall rating guide is an overall judgment of the quality of the work, while the analytical rating guide assesses the multiple dimensions of the work separately. In the course of their study, raters were asked to make judgments about the meaning of terms such as "major" versus "minor" and "majority" versus "minority" while also understanding the meaning of other terms such as "unorganized "difficult to understand" and "supportive". These processes of

judgment and understanding are carried out in the scoring description. In addition, they have developed standard scores to evaluate written solutions to problems given in undergraduate introductory physics courses. The scoring criteria include the organization of the problem information, the selection of appropriate principles, the application of those principles to the particular conditions of the problem, the appropriate use of the process, and evidence showing an organized pattern of reasoning. Finally, they mentioned that the categorical score can be used as an absolute or relative measure to determine the difference between the baseline and treatment groups. This scoring method can help researchers more accurately understand and compare the performance of different groups.

Moskal & Leydens (2000) pointed outscoring rubrics are descriptive scoring schemes that are developed by teachers or other evaluators to guide the analysis of the products and/or processes of students' efforts. the framework should focus on issues of validity and reliability. If a grading scale is used to guide the assessment of a student's response to the task, then the grading scale should include criteria that address the product and process. Reliability refers to the consistency of assessment scores. A statistical method used to establish consistency in student performance on a given test or across multiple tests. Neither validity nor reliability is dependent upon the type of rubric. This study is aimed at the assessment of problem solving ability, and it should be noted that the validity and reliability are not dependent on the type of title when formulating the scoring criteria and scoring. Carefully designed analytic, holistic, task specific, and general scoring rubrics have the potential to produce valid and reliable results.

Fan (2023) pointed outs rubric score is a process of assessing their development level based on course standards. The scoring criteria serve as the concrete and operationalized form of the evaluation criteria and methods. For each course in the curriculum system, specific target content and implementation processes are assessed through various topics or practical exercises, resulting in students' academic evaluation results. This process serves to demonstrate the level of students' vocational ability. At the same time, students gain a clear understanding of how their professional competence is reflected through final exams, quizzes, homework assignments, group presentations, and course papers. In the academic evaluation of "Kindergarten Course", we divide the evaluation content into theoretical

knowledge and practical ability assessments. We distinguish assessment points at the consciousness level, knowledge level, and ability level to promote the development of preschool normal university students in emotional attitude, knowledge, and ability aspects. Assessment methods include both process assessment and final assessment. The process assessment mainly includes in-class tests and practical ability assessments related to kindergarten curriculum knowledge content. The end-of-class assessment employs closed-book examinations.

Researchers have different views on the definition of Rubric Score. There are more than ten ways to measure problem solving ability, such as the scale to measure mathematical problem solving ability and the scale to measure physical problem solving ability. However, these scales are used to measure problems in different disciplines, but they also have reference value. The connection between project-based learning teaching mode and problem-solving ability of college students is a problem worth studying, but how to design and implement effective project-based learning courses still needs more attention and exploration in practice.

Table 2.4 The connecting about Unit, Project-Based Learning Instructional Model, Problem-Solving Ability and Instruments /Activities

Unit/Chapter	Method	Project-Based Learning Instructional Model/Step				Problem-Solving Ability				Instruments /Activities
		S.1	S.2	S.3	S.4	It.1	It.2	It.3	It.4	
Unit 2/Chapter 1:Overview of kindergarten-based curriculum theory	Project-based learning instructional model	T	L	L	T & L	√	√	√	√	1. Attending Class 2. Observation 3. Checking exercise 4. Testing 5. Scoring rubric
Unit 2/Chapter 2:Kindergarten-based curriculum development	Project-based learning instructional model	T	L	L	T & L	√	√	√	√	1. Attending Class 2. Observation 3. Checking exercise 4. Testing 5. Scoring rubric

Table 2.4 (Continued)

Unit/Chapter	Method	Project-Based Learning Instructional Model/Step				Problem-Solving Ability				Instruments /Activities
		S.1	S.2	S.3	S.4	It.1	It.2	It.3	It.4	
Unit2/Chapter 3:Preparation of kindergarten-based curriculum program	Project-based learning instructional model	T	L	L	T & L	√	√	√	√	1. Attending Class 2. Observation 3. Checking exercise 4. Testing 5. Scoring rubric
Unit2/Chapter 4:Kindergarten-based curriculum evaluation	Project-based learning instructional model	T	L	L	T & L	√	√	√	√	1. Attending Class 2. Observation 3. Checking exercise 4. Testing 5. Scoring rubric

(S means Step, T means Teacher, L means Learner, Item 1 means ability to identify problems; Item 2 means ability to analyze problems ; Item 3 means ability to provide problems ; Item 4 means evaluation and reflection ability)

Related research

Liu et al. (2023) studied “Research on the teaching practice of ship testing and diagnosis course based on project-based learning”The result showed that the project-based learning are helpful to improve students' learning initiative, initiative and creativity, enhance students' learning experience and the effectiveness of teaching and learning, promote students' problem-solving ability, and promote higher education teaching reform.

Balemen & Keskin (2018) studied“The effectiveness of Project-Based Learning on science education: A metaanalysis search”, the result had found that project-based learning can produce positive outcomes regardless of subject area, grade level, and sample size. project-based learning is more effective than traditional learning methods. It can not only improve students' academic performance, but also cultivate students 'practical ability, problem-solving ability and teamwork spirit.

Zheng et al. (2021) studied“In the Improvement of students' problem-solving Ability through the practice of project-based Learning in outdoor ecological Education”, The results show that students can exercise their ability of observation, analysis and judgment in the project practice, so as to improve their ability to solve problems. By participating in project-based learning activities, students can cultivate their ability of independent learning and cooperative learning, and improve the efficiency and quality of problem-solving. Students who adopt a project-based approach to learning perform better in terms of interest, motivation and grades, while it also develops students' teamwork and communication skills, laying a solid foundation for their future career development.

Zheng & Wang (2022) studied “An experimental study on the influence of project-based learning on problem-solving ability in 5-6-year-old children”, used project-based learning takes problem as the core and provides an opportunity for the development of children's problem-solving ability. The result had found that project-based learning can effectively promote the development of 5-6 year old children's problem-solving ability, which is mainly due to the characteristics of the project itself and the supportive strategies of teachers.

Retno (2019) studied“Influence of physics problem-solving ability through the project-based learning towards vocational high school students’learning outcomes” Project-based learning is used to assess students' physical problem solving ability

through test questions. The result had found that the interaction between learning methods and problem-solving ability had a significant impact on cognitive learning outcomes, with a value of 0. 043≤ 0. 05.

Chen (2023) studied “The Impact of Project-Based Learning on the Collaborative Problem-Solving Ability of Science and Technology Pre-Service Teacher”. The result had found that after a month of project-based learning, the cooperative problem-solving ability of science and technology prospective teachers has been improved, and the overall average ability has increased by 10. 5%. Moreover, there are significant differences in the paired sample T-test of cooperative problem-solving ability of science and technology prospective teachers before and after the course.

Chapter 3
Research Methodology

In the study of "Development of Project-Based Learning Instructional Model to Improve Problem-solving Ability for Undergraduate Students" the researcher used Mixed Method of Research. This research is divided into 3 phases.

Phase 1 was conducted to answer research objective 1: To examine the factors affecting problem-solving ability for undergraduate students in Guangxi Province.

Phase 2 was conducted to answer research objective 2: To develop project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

Phase 3 was conducted to answer research objective 3: To study the results of project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University .

The details are as follows.

Phase 1 was conducted to answer research objective 1: To examine the factors affecting problem-solving ability for undergraduate students in Guangxi Province.

The population

Group 1: 150 former students of Kindergarten Course in semester 1st academic year 2022, 3 Colleges in Guangxi.

50 students, Major in Preschool education from Hechi College

50 students, Major in Preschool education from Yulin Normal College,

50 students, Major in Preschool education from Beibu Gulf University.

Research instrument

The questionnaire for students

Designing instrument 1

1. Study literatures on problem-solving ability, and factors affecting the development of problem-solving ability of students.

2. Design a questionnaire on factors to improve problem-solving ability for undergraduate students at 3 Colleges. There were 3 Parts: Part 1 is about Common data of the respondent in overall (N=150) ; Part 2 Internal factors 15 numbers, external factors 15 numbers and Part 3 suggestion.

3. Present the draft of questionnaire to the advisors for checking correctness and completion.

4. Assess the validity of questionnaire on factors to improve Problem-solving ability of undergraduate students by 5 experts (List name in Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria shown below (Phongsri, 2011).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents are related to the topics

-1 = The contents are not Guangxi Province related to the topics

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures 1.00.

5. Design Likert 5-point rating scale questionnaire on the following score rating criteria.

Score rating criteria

5 means the highest

4 means high

3 means moderate

2 means few

1 means the fewest

The factors affecting problem-solving ability obtained from the students are interpreted using MEAN interpretation criteria proposed by Phongsri (2011).

4. 51-5. 00 means the highest

3. 51-4. 50 means high

2. 51-3. 50 means moderate

1. 51-2. 50 means few

1. 00-1. 50 means the fewest

Data Collection

1. Ask for permission for data collection.

2.Collect data from the assigned students using the developed questionnaire.

Data Analysis

Descriptive Statistics i. e. , Frequency, MEAN (μ), Standard Deviation (σ)

Group 2 : 3 lecturers who teach the Kindergarten Course at 3 colleges in Guangxi Province.

1 Lecturer from Hechi College

1 Lecturer from Yulin Normal College

1 Lecturer from Beibu Gulf University

Designing instrument 2 (The interview for the lecturers)

1. Study literature on factors affecting problem-solving ability.

2. Design 10 questions of open-ended interview on factors affecting problem-solving ability to 3 colleges in Guangxi. There were 3 Parts: Part 1 is about Common data of the respondent in overall(N=3) Part 2 both Internal factors and external factors and Part 3 suggestion.

3. Present the draft of open-ended interview to the advisors for checking correctness and completion.

4. Assess the validity of open-end interview on factors affecting problem-solving ability for the students by 5 experts (List name in Appendix A) through Index of Item - Objective Congruence (IOC) according to the criteria shown below (Phongsri, 2011).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents are related to the topics

-1 = Sure that the contents are not related to the topics

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures 1.00.

Data Collection

1. Ask for permission for data collection.

2. Collect data from the assigned lecturers using the developed interview.

Data Analysis

Content analysis

Output Phase

Factors affecting are internal and external factors to improve students' problem-solving ability of undergraduate students by table 3.1

Table 3.1 Summary how to conduct research from Phase 1

Topics	Details
Research process	Analyzed both internal and external factors
Research objective 1	To examine the factors to enhance undergraduate students' problem-solving ability
Conduct research	Design internal and external factors that influence the problem-solving ability of university undergraduates. Design questionnaires and lecturer interview outlines
Target Group Key informants	1) 180 former undergraduate students of Kindergarten Course in the 1st semester on academic year 2022 from 3 colleges in Guangxi province 2) 3 lecturers who are teaching Kindergarten Course from 3 colleges in Guangxi province
Instrument	Questionnaires 30 items. 2) Interview by 10 questions
Data analysis	Descriptive Statistics i. e. , Frequency, mean (μ) standard deviation (σ) for questionnaires Content analysis for interview
Output	The result of the factors to enhance undergraduate students' problem-solving ability. The internal factors such as external factors such as teaching methods, teaching materials and environment etc.

Phase 2 was conducted to answer research objective 2: To develop project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

Research instrument

Conformity Assessment Form of project-based learning instructional model in terms of accuracy standard, propriety standard, feasibility standard, and utility standard.

Designing instrument (the questionnaire for IOC)

1. Study related concepts, principles, process about developing instructional model, including results in terms of factors affecting problem-solving ability from research objective 1.

2. Design the development of project-based learning instructional model to Improve problem-solving ability for Undergraduate Students to be the handout which consists of the stable teaching activities and procedures. Such a developed instructional model with 5 components: 1) Principle & rationale, 2) Objectives, 3) Contents, 4) Methods of teaching & materials and 5) Evaluation, is in 4 aspects standards: 1) Utility standards, 2) Feasibility standards, 3) Propriety standards and 4) Accuracy standards.

3. Designed a questionnaire on confirming the appropriateness of the instructional model in terms of accuracy standards, propriety standards, feasibility standards, and utility standards.

4. Presented the draft of open-ended interview to the advisors for checking correctness and completion.

5. Assess the validity of the questionnaire of the appropriateness of the instructional model by 5 experts (List name in Appendix A) through Item-Objective Congruence (IOC) according to the criteria as shown below (Phongsri, 2011).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents related to the topics

-1 = Sure that the contents are not related to the topics

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures 1.00.

Research instrument

Designing instrument about the questionnaire on confirming the model

1. Design a questionnaire on confirming the appropriateness of the model in terms of accuracy standards, propriety standards, feasibility standards, and utility standards. Present the draft of open-ended interview to the advisors for checking correctness and completion. Assess the validity of the questionnaire on confirming the appropriateness of the instructional model by 5 experts through frequency and percentage.

Data Collection

1. Ask for permission of data collection

2. Collect appropriateness of the instructional model in terms of accuracy standards, propriety standard, feasibility standard, and utility standard from the 5 experts including, (List name in Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria shown below (Phongsri, 2011).

Data Analysis

Descriptive analysis i. e. frequency and percentage.

The acceptable items must not be less than 100%.

Output Phase 2

The project-based learning instructional model the appropriateness of which is confirmed by experts for further implementation. The acceptable items 100% by table 3.2

Table 3.2 Summary how to conduct research from Phase 2

Topics	Details
Research process	Develop project-based learning instructional model in terms of accuracy standard, propriety standard, feasibility standard, and utility
Research objective	To develop project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University
Research Method	Study the component for development of project-based learning instructional model
Target group/Key informants	5 experts through Item-Objective Congruence (IOC) according to the criteria.
Instrument	The questionnaire
Data analysis	Frequency and percentage
Output	Project-based learning instructional model the appropriateness of which is confirmed by experts for further implementation. The acceptable items 100%.

Summary handout of project-based learning instructional model by figure 3.1

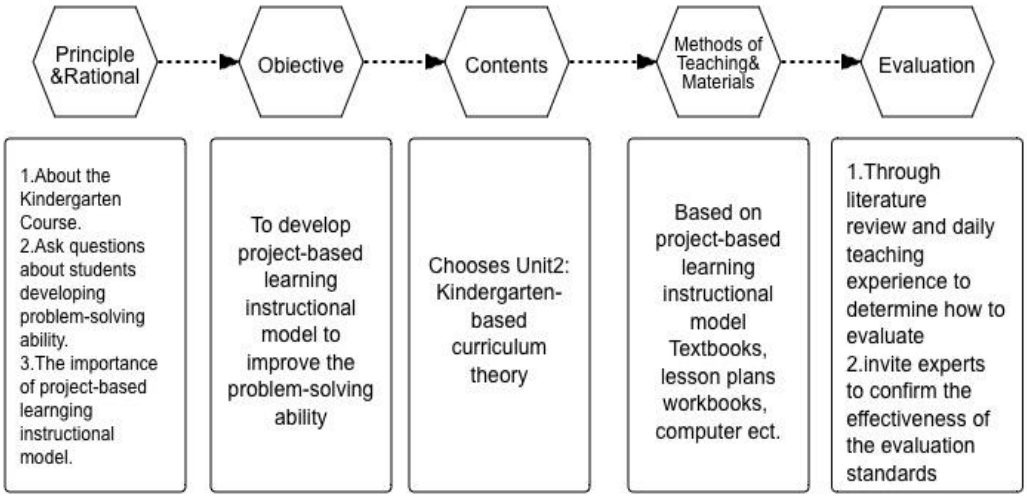

Figure 3.1 Summary handout of project-based learning instructional model

Phase 3 was conducted to answer research objective 3: To study the results of project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

Population

The total of 180 freshmen from 4 classes of students with different levels of learning achievement, who enrolled in Kindergarten Course at Beibu Gulf University in semester 1st academic year 2023. Those sections involve the following.

45 students in class A

45 students in class B

45 students in class C

45 student in class D

The sample group

The 45 students who enrolled in Kindergarten Course from class section B are obtained by simple random sampling.

Table 3.3 Posttest Only Experimental Design

Group	X	T1
Sample group	Project-based learning instructional model	Problem-Solving ability

X = Project-based learning instructional model

T1 = Problem-Solving ability

Research instruments

1. Lesson plans using project-based learning instructional model

2. Rubric scoring

Designing instrument 1

1. Studied and design lesson plans with the following components: contents objectives, methods of teaching, materials and evaluation.

2. Presented the lesson plan to the advisors for checking correctness, completion and improvement.

3. Assessed the validity of the designed lesson plans by 5 experts through Item-Objective Congruence (IOC) according to the criteria as shown below (Phongsri, 2011).

+1 = Sure that the contents are related to the topics

0 = Not sure that the contents are related to the topics

-1 = Sure that the contents are not related to the topics

The acceptable items must have the IOC values not less than 0.5. The IOC calculated from the validation measures 1.00.

4. Conducted a try-out of the developed lessons plans with another group of samples for further improvements and implementation with the sample group.

Designing instrument 2

Rubric scoring form

1. Studied the rubric scoring criteria aligned with problem-solving ability and design 5-point range rubric scoring within 4 items consist of item 1 ability to identify problems, item 2 ability to analyze problems, item 3 ability to provide problems, and item 4 evaluation and reflection ability (Table Appendix 6: Evaluation Results of IOC for Leaning Report Scoring Criteria).

2. Presented the developed rubric scoring criteria to the advisors for checking correctness, completion and improvement.

3. Assessed the validity of the designed rubric scoring criteria by 5 experts through Item-Objective Congruence (IOC) according to the criteria as shown below (Phongsri, 2011).

+1 = Sure that the descriptors are related to the issue of assessment

0 = Not sure that the descriptors are related to the issue of assessment

-1 = Sure that the descriptors are not related to the issue of assessment

The acceptable items must have the IOC values not less than 0. 5. The IOC calculated from the validation measures 1.00.

Table 3.4 Criteria to evaluate Item 1: ability to identify problems

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

Table 3.5 Criteria to evaluate Item 2: ability to analyze problems

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

Table 3.6 Criteria to evaluate Item 3: ability to provide problems

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 4 : evaluation and reflection ability

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

Table 3.8 The criteria from item 1-4 overall

Score	Grade
33-40	Excellent
25-32	Good
17-24	Medium
9-16	Pass
Less than 9	Poor

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.

Output Phase 3 (Rubric Scoring Criteria)

Results of implementing project-based Learning instructional model– students' performance according to rubric scoring criteria into their levels descriptor by table 3.9

Table 3.9 Summary how to conduct research from Phase 3

Topics	Details
Research process	1. Deign lesson plan 2. Design scoring rubric form
Research objective 3	To study the results of project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University .
Research Method	Designing instrument 1 (Lesson plan) Designing instrument 2 (Rubric evaluation form)
Conduct research	Designing instrument 1 (Lesson plan) Designing instrument 2 (Rubric evaluation form)
Target group/Key informants	The 45 students who enroll in the Kindergarten Course Beibu Gulf University in the 1st semester, the academic year 2023 from Section B by cluster random sampling.
Instrument	1. Lesson plan 2. Rubric evaluation form
Data analysis	Categorize students'performance according to rubric scoring criteria into their levels descriptor.
Output	Students' problem-solving ability are at good level at least 80%

Summary project-based learning instructional model by figure 3.2.

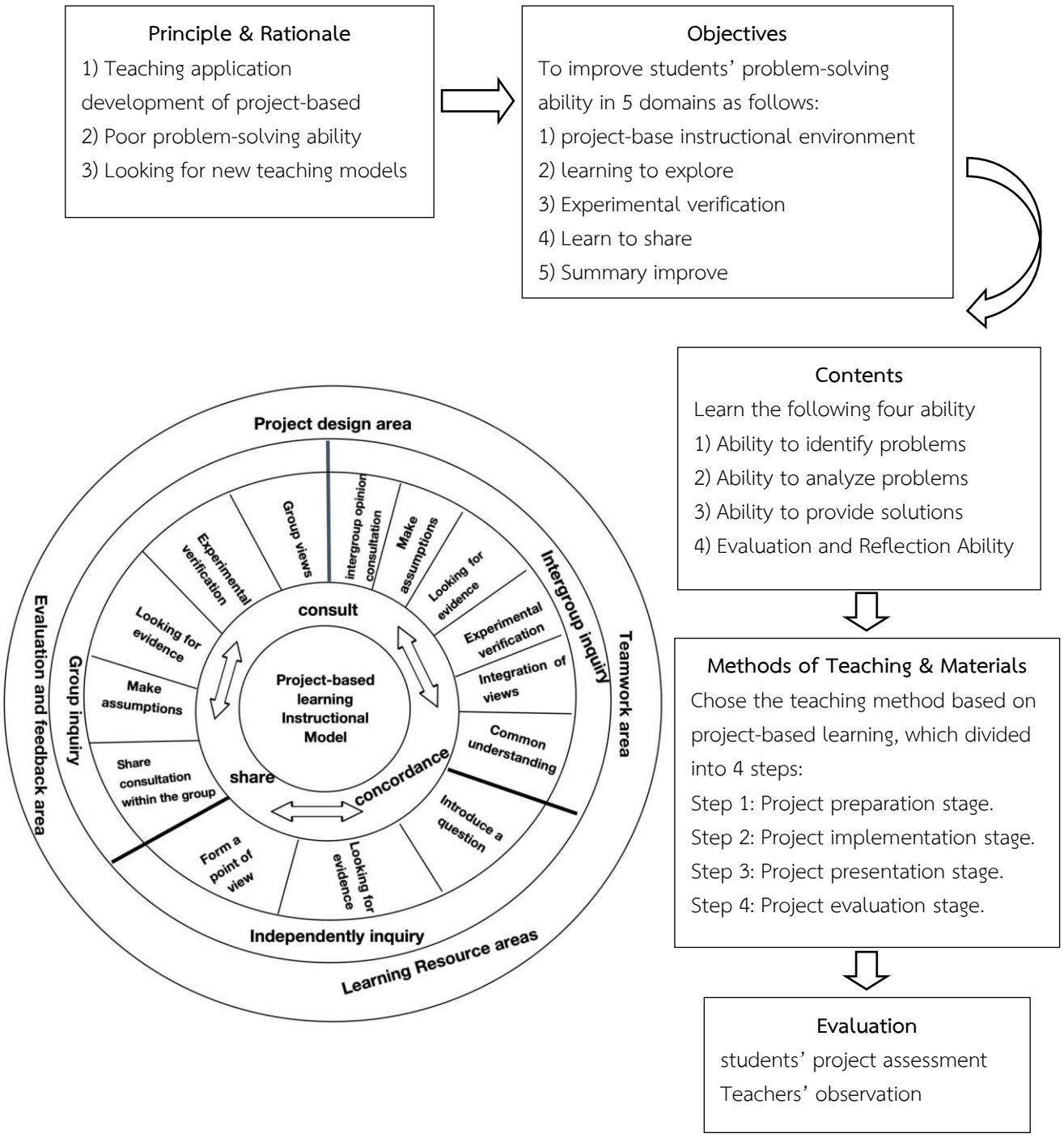

Figure 3.2 Development of project-based Learning
Instructional Model to Improve problem-solving ability for undergraduate students

Chapter 4
Results of Analysis

This chapter presents findings derived from the fieldwork procedures outlined previously, focusing on data collection crucial to this study. The objectives, outlined in Chapter I, serve three primary purposes:

Objective 1. Analyzing factors affecting problem-solving ability for undergraduate students at 3 colleges in Guangxi province.

Objective 2. Creating project-based learning instructional model to improve problem-solving ability for undergraduate students at Beibu Gulf University.

Objective 3. Assessing the impact of Implementing the project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

Data Analysis Results

Phase 1: Analysis results serving objective 1–To examine the factors affecting problem-solving ability for undergraduate students in Guangxi Province.

Table 4.1 Common data of the respondent in overall (N=150)

Data	Frequency	Percentage
Gender		
A. Male	8	5.30
B. Female	142	94.70
Total	**150**	**100.00**
Age		
A. below 18 yrs.	0	0.00
B. 19-20 yrs.	50	33.40
C. 21-22 yrs.	100	66.60
D. over 23 yrs.	0	0.00
Total	**150**	**100.00**

From table 4.1, the common data for the overall respondents shows that women accounted for 94.70% of the total participants and male respondents accounted for 5.30% of the total. The most age is 21-22yrs. ,66.60%.

Table 4.2 The result of questionnaire from students in overview (N=150)

Factors	**μ**	**σ**	Interpretation	Ranking within All Factors
1. Students are very interested in Kindergarten Course.	4.20	0.769	High	3
2. Students actively learn the basic knowledge of Kindergarten Course.	3.96	0.654	High	8
3. Students believe that good teaching skills can improve students' curriculum development and application ability in the Kindergarten Course.	4.18	0.733	High	4
4. Would do you like to improve problem-solving ability in the Kindergarten Course.	4.34	0.693	High	1

Table 4.2 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
5.Students are industrious in their learning (assignments, projects, participation, etc.) with the highest potential themselves.	3.79	0.922	High	11
6. Students feel satisfied with the teacher's teaching style.	3.60	0.724	High	15
7. Students feel that Kindergarten course is the great significance to personal growth and development in future.	4.17	0.621	High	5
8. Students think that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	3.66	0.784	High	13
9. Students can learn and practice problem-solving ability in Kindergarten Course.	3.93	0.761	High	9
10. Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in Kindergarten Course.	3.61	0.817	High	14
11.Students feel that homework or project work assigned by lecturers and students can help students better apply the knowledge they have learned.	3.89	0.687	High	10
12. Students feel that the evaluation exercise or testing assigned by lecturers and students can help students better apply the knowledge they have learned.	3.77	0.66	High	12
13. Students learn through various instruction model to enhance their problem-solving ability based on kindergarten curriculum practice in Kindergarten Course.	3.97	0.802	High	7

Table 4.2 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
14. Students believe that with the help of project-based learning platforms and resources they can achieve success in Kindergarten Course.	4.21	0.756	High	2
15. Students respect and trust the professional knowledge of teachers in organizing and managing project-based learning models.	4.05	0.693	High	6
Total Average	**3.96**	**0.738**	**High**	
External factors				
1. The lecturers use modern teaching methods in Kindergarten course. (such as cooperative learning, computers, App platforms effectively, demonstrations, exploration, etc.)to let students participate in problem-solving activities.	4.23	0.823	High	1
2. The lecturer combines traditional classroom evaluation methods with various modern teaching models.	3.73	0.864	High	11
3. The lecturer can guide students to realize that developing problem-solving skills in the kindergarten curriculum has a positive impact on their future development.	3.91	0.698	High	6
4. The lecturer pay more attention to the cultivation of students' problem-solving ability in Kindergarten Course and its influence on Kindergarten Course.	3.88	0.665	High	7

Table 4.2 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
5. The lecturers choose appropriate teaching methods according to the characteristics of Kindergarten Course and the tasks and goals of the ability to problem-solving ability.	3.81	0.783	High	9
6. The lecturers combine the teaching method he teaches with objectives and the knowledge in Kindergarten Course to enhance undergradu -ate students' problem-solving ability .	3.77	0.823	High	10
7. The lecturers can stimulate students' interest and meet the contemporary needs of students.	3.63	0.847	High	15
8. The lecturers choose suitable materials and emerging network resources.	3.87	0.658	High	8
9. The textbook fully considers the content and objectives of Kindergarten Course and the training to undergraduate students' problem-solving ability.	3.65	0.891	High	13
10. The materials can fully support students' learning in Kindergarten Course and the raining to guide students in kindergarten education.	3.64	0.884	High	14
11. The textbook provides practical, interactive and inspiring cases and materials to useful for students.	3.71	0.915	High	12
12. The materials and environment can enhance undergraduate students'problem-solving ability to guide students in kindergarten education.	4.13	0.745	High	2

Table 4.2 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
13. The availability of learning spaces and anchored instruction model can affect students interest in Kindergarten Course.	4.01	0.851	High	4
14. Provides a teaching mode with a stable high-speed network anytime, anywhere on campus as a teaching guarantee, and supports anchored instruction model to enhance undergraduate students' problem-solving ability in kindergarten education practice.	4.12	0.694	High	3
15. The environments is clean and bright, with desks and chairs, blackboards, podiums, projectors, large screens, and other multimedia facilities to facilitate the teaching process.	3.96	0.767	High	5
Total Average	**3.87**	**0.79**	**High**	

Table 4.2 indicates that internal factors affecting the learning achievement of the Kindergarten Course are found to be at a high level overall (μ=3.96). Considering each item individually, it was found that have the highest mean (μ=4.34), followed by iternal factor 4: Would do you like to improve problem-solving ability in the Kindergarten Course, Followed by iternal factor 14:Students believe that with the help of project-based learning platforms and resources, they can achieve success in Kindergarten Course (μ=4.21), and the lowest mean is iternal factor 6: Students feel satisfied with the teacher's teaching style (μ=3.60).

For external factors affecting the learning achievement of the Kindergarten course, the overall level is found to be high (μ=3.87). Considering each item individually, it was found that has the highest mean (μ=4.23), external factor 1: The lecturers use modern teaching methods in Kindergarten Course (such as cooperative

learning, computers, APP platforms effectively, demonstrations, exploration, etc.) to to let students participate in problem-solving activities. followed by external factor 12 :The materials and environment can enhance undergraduate students' problem-solving ability to guide students in kindergarten education (μ=4.13), and the lowest mean is external factor 7:The lecturers can stimulate students' interest and meet the contemporary needs of students (μ=3.63).

Table 4.3 Common data of the respondent in Hechi College. (N=50)

Data	Frequency	Percentage
Gender		
A. Male	3	6.0
B. Female	47	94.0
Total	**50**	**100**
Age		
A. below 18 yrs.	0	0
B. 19-20 yrs.	19	38.0
C. 21-22 yrs.	31	62.0
D. over 23 yrs.	0	0
Total	**50**	**100**

From table 4.3 the common data of the respondent majoring in Preschool education the most gender is female 94%. the male is 6%. The most age is 21-22 yrs. ,62%.

Table 4.4 The result of questionnaire from students in Hechi College. (N=50)

Factors	μ	σ	Interpretation	Ranking within All Factors
1. Students are very interested in Kindergarten Course.	4.30	0.789	High	2
2. Students actively learn the basic knowledge of Kindergarten Course.	4.04	0.669	High	8
3. Students believe that good teaching skills can improve students' curriculum development and application ability in the Kindergarten Course.	4.16	0.792	High	5
4. Would do you like to improve problem-solving ability in the Kindergarten Course.	4.34	0.717	High	1
5. Students are industrious in their learning (assignments, projects, participation, etc.) with the highest potential themselves.	3.88	0.872	High	10
6. Students feel satisfied with the teacher's teaching style.	3.62	0.753	High	13
7. Students feel that Kindergarten Course is the great significance to personal growth and development in future.	4.22	0.679	High	4
8. Students think that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	3.66	0.658	High	12
9. Students can learn and practice problem-solving ability in Kindergarten Course.	3.96	0.781	High	9
10. Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in Kindergarten Course.	3.56	0.787	High	15

Table 4.4 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
11. Students feel that homework or project work assigned by lecturers and students can help students better apply the knowledge they have learned.	3.80	0.756	High	11
12. Students feel that the evaluation exercise or testing assigned by lecturers and students can help students better apply the knowledge they have learned.	3.58	0.758	High	14
13. Students learn through various instruction model to enhance their problem-solving ability based on kindergarten curriculum practice in Kindergarten Course.	4.10	0.647	High	6
14. Students believe that with the help of project-based learning platforms and resources, they can achieve success in Kindergarten Course.	4.24	0.822	High	3
15. Students respect and trust the professional knowledge of teachers in organizing and managing project-based learning models.	4.06	0.712	High	7
Total Average	**3.97**	**0.746**	**High**	
External factors				
1. The lecturers use modern teaching methods in Kindergarten Course. (such as cooperative learning, computers, APP platforms effectively, demonstrations, exploration, etc.) to let students participate in problem-solving activities.	4.26	0.777	High	1

Table 4.4 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
2. The lecturer combines traditional classroom evaluation methods with various modern teaching models.	3.62	1.028	High	15
3. The lecturer can guide students to realize that developing problem-solving skills in the kindergarten curriculum has a positive impact on their future development.	3.90	0.647	High	7
4. The lecturer pay more attention to the cultivation of students 'problem-solving ability in Kindergarten course and its influence on Kindergarten Course.	3.86	0.756	High	8
5. The lecturers choose appropriate teaching methods according to the characteristics of Kindergarten Course and the tasks and goals of the ability to problem-solving ability.	3.76	0.771	High	12
6. The lecturers combine the teaching method he teaches with objectives and the knowledge in Kindergarten Course to enhance undergradu-ate students' problem-solving ability.	3.78	0.679	High	11
7. The lecturers can stimulate students' interest and meet the contemporary needs of students.	3.72	0.809	High	14
8. The lecturers choose suitable materials and emerging network resources.	3.90	0.678	High	6
9. The textbook fully considers the content and objectives of Kindergarten Course and the training to undergraduate students' problem-solving ability.	3.86	0.756	High	9

Table 4.4 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
10. The materials can fully support students 'learning in Kindergarten Course and the raining to guide students in kindergarten education.	3.80	0.969	High	10
11. The text book provides practical, interactive and inspiring cases and materials to useful for students.	3.74	0.922	High	13
12. The materials and environment can enhance undergraduate students' problem-solving ability to guide students in kindergarten education.	4.20	0.606	High	3
13. The availability of learning spaces and anchored instruction model can affect students interest in kindergarten course.	4.26	0.751	High	2
14. Provides a teaching mode with a stable high-speed network anytime, anywhere on campus as a teaching guarantee, and supports anchored instruction model to enhance undergraduate students' problem-solving ability in kindergarten education practice.	4.02	0.654	High	4
15. The environments is clean and bright, with desks and chairs, blackboards, podiums, computers, projectors, large screens, and other multimedia facilities to facilitate the teaching process.	4.00	0.808	High	5
Total Average	**3.90**	**0.782**	**High**	

Table 4.4 indicates that internal factors affecting the problem-solving ability of Kindergarten Course, overall found at a high level (μ=3.97). Considering only each item, it was found internal factor that 4: Would do you like to improve problem-solving ability in the Kindergarten Course (μ=4.34) has the highest mean, followed by 1: Students are very interested in Kindergarten Course (μ=4.30), and the lowest mean is 10: Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in Kindergarten Course (μ=3.56).

For external factors affecting the problem-solving ability of Kindergarten Course, overall found at a high level (μ=3.90). Considering only each item, it was found external factor that 1: he lecturers use modern teaching methods in Kindergarten Course. (such as cooperative learning, computers, APP platforms effectively, demonstration, exploration, etc.) to let students participate in problem-solving activities and 13: The availability of learning spaces and anchored instruction model can affect students interest in Kindergarten Course (μ=4.26) has the highest mean. followed by 12: The materials and environment can enhance undergraduate students' problem-solving ability to guide students in kindergarten education (μ=4.20), and the lowest mean is 3 :The lecturer combines traditional classroom evaluation methods with various modern teaching models (μ=3.62).

Table 4.5 Common data of the respondent in Yulin Normal College. (N=50)

Data	Frequency	Percentage
Gender		
A. Male	1	2.00
B. Female	49	98.00
Total	**50**	**100.00**
Age		
A. below 18 yrs.	0	0
B. 19-20 yrs.	20	40.00
C. 21-22 yrs.	30	60.00
D. over 23 yrs.	0	0.00
Total	**50**	**100.00**

From table 4.5 the common data of the respondent majoring in Preschool education the most gender is female, 98. 00%, the male is 2.00%. The most age is 21-22 yrs. , 60.00%.

Table 4.6 The result of questionnaire from students in Yulin Normal College. (N=50)

Factors	μ	σ	Interpretation	Ranking within All Factors
1. Students are very interested in Kindergarten Course.	4.18	0.691	High	3
2. Students actively learn the basic knowledge of Kindergarten Course.	3.96	0.570	High	8
3. Students believe that good teaching skills can improve students' curriculum development and application ability in the Kindergarten Course.	4.22	0.679	High	2
4.Would do you like to improve problem-solving ability in the Kindergarten Course.	4.32	0.653	High	1
5. Students are industrious in their learning (assignments, projects, participation, etc.) with the highest potential themselves.	3.82	0.873	High	10
6. Students feel satisfied with the teacher's teaching style.	3.58	0.731	High	14
7. Students feel that Kindergarten Course is the great significance to personal growth and development in future.	4.10	0.58	High	5
8. Students think that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	3.56	0.993	High	15
9. Students can learn and practice problem-solving ability in Kindergarten Course.	3.88	0.746	High	9

Table 4.6 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
10. Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in Kindergarten Course.	3.64	0.875	High	13
11. Students feel that homework or project work assigned by lecturers and students can help students better apply the knowledge they have learned.	4.04	0.727	High	6
12. Students feel that the evaluation exercise or testing assigned by lecturers and students can help students better apply the knowledge they have learned.	3.80	0.639	High	11
13. Students learn through various instruction model to enhance their problem-solving ability based on kindergarten curriculum practice in Kindergarten Course.	3.76	0.894	High	12
14. Students believe that with the help of project-based learning platforms and resources, they can achieve success in Kindergarten Course	4.16	0.792	High	4
15. Students respect and trust the professional knowledge of teachers in organizing and managing project-based learning models.	4.02	0.742	High	7
Total Average	**3.94**	**0.746**	**High**	
External factors				
1. The lecturers use modern teaching methods in Kindergarten Course. (such as cooperative learning, computers, APP platforms effectively, demonstrations,	4.22	0.815	High	1

Table 4.6 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
exploration, etc.) to let students participate in problem-solving activities.				
2. The lecturer combines traditional classroom evaluation methods with various modern teaching models.	3.78	0.815	High	10
3. The lecturer can guide students to realize that developing problem-solving skills in the kindergarten curriculum has a positive impact on their future development.	3.96	0.727	High	4
4. The lecturer pay more attention to the cultivation of students' problem-solving ability in Kindergarten Course and its influence on Kindergarten Course.	3.90	0.647	High	5
5. The lecturers choose appropriate teaching methods according to the characteristics of Kindergarten Course and the tasks and goals of the ability to problem-solving ability.	3.84	0.866	High	8
6. The lecturers combine the teaching method he teaches with objectives and the knowledge in kindergarten Course to enhance undergraduate students' problem-solving ability.	3.70	1.015	High	11
7. The lecturers can stimulate students' interest and meet the contemporary needs of students.	3.62	0.805	High	14
8. The lecturers choose suitable materials and emerging network resources.	3.86	0.67	High	7
9. The textbook fully considers the content and objectives of Kindergarten Course and the training to undergraduate students'	3.66	1.022	High	13

Table 4.6 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
problem-solving ability.				
10. The materials can fully support students' learning in Kindergarten Course and the raining to guide students in kindergarten education.	3.58	0.758	High	15
11. The textbook provides practical, interactive, and inspiring cases and materials to useful for students.	3.68	0.957	High	12
12. The materials and environment can enhance undergraduate students' problem-solving ability to guide students in kindergarten education.	4.08	0.853	High	3
13. The availability of learning spaces and anchored instruction model can affect students interest in Kindergarten Course.	3.82	0.941	High	9
14. Provides a teaching mode with a stable high-speed net work anytime, anywhere on campus as a teaching guarantee, and supports anchored	4.14	0.67	High	2
15. The environments is clean and bright, with desks and chairs, black boards, podiums, computers projectors, large screens, and other multimedia facilities to facilitate the teaching process.	3.86	0.833	High	6
Total Average	**3.85**	**0.826**	**High**	

Table 4.6 indicates that internal factors affecting the problem-solving ability of Kindergarten Course, overall found at a high level (μ=3.94). Considering each item individually, it was found that internal factor by 4:Would do you like to improve problem-solving ability in the Kindergarten Course has the highest mean (μ=4.32),

followed internal factor by 3: Students believe that good teaching skills can improve students' curriculum development and application ability in the Kindergarten Course (μ=4.22), and the lowest mean is internal factor by 8:Students think that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned (μ=3.56).

For external factors affecting the problem-solving ability of Kindergarten Course, overall is found at a high level (μ=3.85). Considering each item individually, it was found that external factor by 1: The lecturers use modern teaching methods in Kindergarten course (such as cooperative learning, computers, APP platforms effectively, demonstrations, exploration, etc.) to let students participate in problem-solving activities. has the highest mean (μ=4.22), followed external factor by 14:Provides a teaching mode with a stable high-speed net work anytime, anywhere on campus as a teaching guarantee, and supports anchored instruction model to enhance undergraduate students' problem-solving ability in kindergarten education practice (μ=4.14), and the lowest mean is external factor by 10:The materials can fully support students' learning in Kindergarten Course and the raining to guide students in kindergarten education (μ=3.58).

Table 4.7 Common data of the respondent in Beibu Gulf University (N=50)

Data	Frequency	Percentage
Gender		
A. Male	4	8.00
B. Female	46	92.00
Total	**50**	**100.00**
Age		
A. below 18 yrs.	0	0.00
B. 19-20 yrs.	11	22.00
C. 21-22 yrs.	39	78.00
D. over 23 yrs.	0	0.00
Total	**50**	**100.00**

From table 4.7 the common data of the respondent majoring in Preschool education. the most gender is female, 92.00%. the male is 8.00%, the most age is 21-22 yrs, 78.00%.

Table 4.8 The result of questionnaire from students in Beibu Gulf University. (N=50)

Factors	μ	σ	Interpretation	Ranking within All Factors
1. Students are very interested in kindergarten Course.	4.12	0.824	High	5
2. Students actively learn the basic knowledge of Kindergarten Course.	3.88	0.718	High	10
3. Students believe that good teaching skills can improve students' curriculum development and application ability in the Kindergarten Course.	4.16	0.738	High	4
4.Would do you like to improve problem-solving ability in the Kindergarten Course.	4.36	0.722	High	1
5. Students are industrious in their learning (assignments, projects, participation, etc.)with the highest potential themselves.	3.68	1.019	High	13
6. Students feel satisfied with the teacher's teaching style.	3.60	0.7	High	15
7. Students feel that Kindergarten Course is the great significance to personal growth and development in future.	4.20	0.606	High	3
8. Students think that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	3.76	0.657	High	12
9. Students can learn and practice problem-solving ability in Kindergarten Course.	3.94	0.767	High	8

Table 4.8 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
10. Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in Kindergarten Course.	3.64	0.802	High	14
11. Students feel that homework or project work assigned by lecturers and students can help students better apply the knowledge they have learned.	3.84	0.548	High	11
12.Students feel that the evaluation exercise or testing assigned by lecturers and students can help students better apply the knowledge they have learned.	3.92	0.528	High	9
13.Students feel that the evaluation exercise or testing assigned by lecturers and students can help students better apply the knowledge they have learned.	3.92	0.528	High	9
14. Students believe that with the help of project-based learning platforms and resources, they can achieve success in Kindergarten Course.	4.24	0.657	High	2
15. Students respect and trust the professional knowledge of teachers in organizing and managing project-based learning models.	4.08	0.634	High	6
Total Average	**3.97**	**0.716**	**High**	
External factors				
1. The lecturers use modern teaching methods in Kindergarten Course. (such as cooperative learning, computers, APP platforms effectively, demonstrations,	4.22	0.887	High	1

Table 4.8 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
exploration, etc.) to let students participate in problem-solving activities.				
2. The lecturer combines traditional classroom evaluation methods with various modern teaching models. curriculum has a positive impact on their future development.	3.80	0.728	High	11
3. The lecturer can guide students to realize that developing problem-solving skills in the kindergarten curriculum has a positive impact on their future development.	3.86	0.729	High	7
4. The lecturer pay more attention to the cultivation of students' problem-solving ability in Kindergarten Course and its influence on Kindergarten Course.	3.88	0.594	High	6
5. The lecturers choose appropriate teaching methods according to the characteristics of Kindergarten Course and the tasks and goals of the ability to problem-solving ability.	3.82	0.72	High	10
6. The lecturers combine the teaching method he teaches with objectives and the knowledge in Kindergarten Course to enhance undergradua -te students' problem-solving ability.	3.82	0.748	High	9
7. The lecturers can stimulate students'interest and meet the contemporary needs of students.	3.56	0.929	High	14
8. The lecturers choose suitable materials and emerging network resources.	3.86	0.639	High	8
9. The textbook fully considers the content and objectives of Kindergarten Course and	3.60	0.782	High	13

Table 4.8 (Continued)

Factors	μ	σ	Interpretation	Ranking within All Factors
the training to undergraduate students' problem-solving ability.				
10. The materials can fully support students' learning in Kindergarten Course and the raining to guide students in kindergarten education.	3.54	0.908	High	15
11. The textbook provides practical, interactive, and inspiring cases and materials to useful for students.	3.72	0.882	High	12
12. The materials and environment can enhance undergraduate students' problem-solving ability to guide students in kindergarten education.	4.10	0.763	High	3
13. The availability of learning spaces and anchored instruction model can affect students interest in Kindergarten course.	3.96	0.807	High	5
14. Provides a teaching mode with a stable high-speed network anytime, anywhere on campus as a teaching guarantee, and supports anchored instruction model to enhance undergraduate students' problem-solving ability in kindergarten education practice.	4.20	0.756	High	2
15. The environments is clean and bright with desks and chairs, blackboards, podiums, computers, projectors, large screens, and othe multimedia facilities to facilitate the teaching process.	4.02	0.654	High	4
Total Average	**3.86**	**0.768**	**High**	

Table 4.8 indicates that internal factors affecting the problem-solving ability of Kindergarten Course, overall found at a high level (μ=3.97). Considering each item individually, it was found that internal factor by 4: Would do you like to improve problem-solving ability in the Kindergarten Course (μ=4.36) has the highest mean; followed by 11: Students feel that homework or project work assigned by lecturers and students can help students better apply the knowledge they have learned (μ=3.94), and the lowest mean is by. 6: Students feel satisfied with the teacher's teaching style (μ=3.60).

For external factors affecting the problem-solving ability of Kindergarten Course, overall found at a high level (μ=3.86). Considering each item individually, it was found that external factor by 1: The lecturers use modern teaching methods in Kindergarten Course (such as cooperative learning, computers, APP platforms effectively, demonstrations, exploration, etc.) to to let students participate in problem-solving activities (μ=4.22) has the highest mean;followed by 14: Provides a teaching mode with a stable high-speed network anytime, anywhere on campus as a teaching guarantee, and supports anchored instruction model to enhance undergraduate students' problem-solving ability in kindergarten education practice (μ=4.20), and the fewest mean is by 10:The materials can fully support students 'learning in Kindergarten Course and the raining to guide students in kindergarten education. (μ=3.54).

Summary about the internal and external factors from students as follows:

Internal factors: students' cognitive ability, learning attitude, learning motivation.

External factors : teaching method, teaching content and teaching materials, learning environment, professional competence, teaching style of teachers.

The Lecturers Interview analysis results

The amount of lecturers University in Guangxi Province.

1 lecturer, work on Hechi college

1 lecturer, work on Yulin Normal College

1 lecturer, work on Beibu Gulf University

Table 4.9 Common data of the respondent in Guangxi Province.

Data	Frequency	Percentage
Gender		
A. male	1	33.30
B. Female	2	66.70
Total	**3**	**100.00**
Experience teaching		
A. Below 3 yrs.	0	0
B. 4-6 yrs.	1	33.30
C. 7-9 yrs.	1	33.30
D. Over 9 yrs.	1	33.30
Total	**3**	**100.00**
Age		
A. Below 25 yrs.		
B. 26-30 yrs.	1	33.30
C. 31-35 yrs.	1	33.30
D. Over 35 yrs.	1	33.30
Total	**3**	**100.00**

From table 4.9, the common data of the lecturers shows that the most common gender is Female, representing 66.7% of the respondents, while male lecturers make up 33.3% of the sample.

Interview Results

According to the interview results of the three lecturers, it can be concluded that the factors affecting students' problem-solving ability are as follows:

Internal factors:

Physics: All three lecturers agreed that the adoption of active teaching methods, a good teaching environment, and the provision of learning resources and opportunities require a certain degree of practical involvement of students, including project work, interactive lectures, and other learning tasks in the course practice. This involvement can help students better focus and retain information. In addition, physical requirements in course practice and discussion emphasize the importance of physical fitness and endurance.

Psychology: Each teacher uses a teaching strategy to increase student motivation and interest in the course. For example, lecturer A integrates the application of kindergarten curriculum education practice and the problems of kindergarten curriculum teaching reform in education into the homework, and lecturer B adopts the way of peer cooperation and teaches in the way that front-line kindergarten teachers and college teachers jointly teach. Lecturer C engages students through the use of active teaching methods (collaboration, communication, exploration, etc.) and the introduction of MOOC. These strategies can promote a positive learning mindset and improve students' confidence and problem-solving ability.

External Factors:

Teaching methods : Lecturers use a range of teaching methods depending on their specific curriculum. These approaches include a blended learning approach that includes interactive lectures, online resources, and hands-on activities.

Teaching environment: All three lecturers promote a learning environment of collaboration and inquiry. They encourage group discussions, collaborative projects with preschools, and discussions with peer teachers in preschools, which can enhance students' social interaction, teamwork skills, and mutual learning, providing more competency support for real-life educational practices later in life.

learning resources and opportunities: Good learning resources include textbooks, reference books, online courses, instructor guides, etc. Instructors provide students with a wide range of knowledge and skills. These resources can help them build a solid academic foundation, master professional knowledge, and develop analytical, thinking, and problem-solving skills. A variety of learning resources and opportunities help students develop problem-solving skills. Learning resources and opportunities in different fields can help college students broaden their horizons, understand diverse issues, and think and solve problems from different perspectives.

Together, these internal and external factors highlight the complex interplay between students' physical and mental state, teaching methods, learning environment, learning resources and opportunities, teaching methods,, affecting their learning outcomes and experiences, and thus students' problem-solving ability.

Table 4.10 Problem-solving ability

factor	Internal factors	External factors
Student s'opinion	1) Students recognize the role of kindergarten Course preparation for future development and develop learning plans. 2) Students value a project-style interactive environment, believing that it will improve their skills. 3) The students showed a clear interest in the project-based teaching method. 4) Students respect and trust teachers in organizing and managing project-based learning models.	1) Teaching methods: Students will have the opportunity to appreciate modern collaborative, inquiry-based, autonomous teaching methods, as well as the practical application of information technology in project-based teaching. 2) Self-assessment and feedback: Students will attach importance to self-assessment, peer assessment and teacher assessment, and obtain relevant feedback information from them. 3) Equal treatment:In the activities, students will pay attention to the principle of fairness, but also to the guidance and attention of the lecturer. 4) Course materials: high-quality textbooks and online resources are the basis for effective learning, and students will make full use of these resources to learn.

Table 4.10 (Continued)

factor	Internal factors	External factors
Lecturers'opinion	1) The lecturer adopts active teaching methods such as interactive lectures, inquiry-based teaching and projects to stimulate students' interest in learning. 2) This teaching method requires the active participation of students, emphasizes the importance of health and endurance for students, and promotes the all-round development of students. 3) Lecturers implement strategies that emphasize real-world application in order to improve students' learning motivation and practical application ability. 4) They use a project-based approach to develop deeper understanding and practical application skills, enabling students to apply what they have learned to real life situations.	1) Environment: Teachers advocate an interactive and cooperative learning atmosphere to enhance students' teamwork ability and awareness of independent learning. 2) Materials: Teachers use a variety of teaching tools to elaborate concepts and practical application knowledge to improve students' learning results. 3) Teaching methods: Teachers adopt various interactive, inquiry-based, cooperative and other teaching methods to stimulate students' learning interest and improve their learning results. 4) Class size: The number of students participating in the class affects the teaching method adopted by the teacher.

Table 4.10 (Continued)

factor	Internal factors	External factors
Synthesized data	1) Both teachers and students understand the value in the curriculum for student development, students are interested, and lecturers should be adequately prepared for teaching 2) Teachers should adopt effective teaching methods to guide students to overcome difficulties, and be willing to study hard in class and explore knowledge actively after class. 3) Students are willing to adopt new teaching methods to help students improve their learning outcomes and problem-solving abilities	1) Physics :Lecturers emphasize better participation in courses and learning for students, and carry out effective teaching to meet the learning needs of each student. For students, they are physically and mentally prepared to maximize their concentration during the learning process. 1) Psychology: Lecturers use projects as the core and connect with real life, which can enhance students' learning motivation. 2) Students actively participate in problem solving, develop a positive learning mindset, and improve skills.

As can be seen from table 4.10, the internal factors that affect students' learning include students' learning interest, learning attitude, self-efficacy and metacognitive ability. The lecturers adopt an effective teaching model and students actively participate in problem-solving activities. This can foster a positive learning mindset and improve problem solving skills.

External factors such as teaching methods, teaching environment, learning resources and opportunities, cooperation and communication, challenging tasks, etc., students prefer equal treatment and cooperative communication in the learning environment, well-designed learning resources are conducive to effective learning, and good teaching environment provides a positive learning atmosphere, encouraging students to take the initiative to think and solve problems. In order to benefit the students, the project teaching model is carried out, and effective teaching methods and evaluation methods are adopted.

Phase 2 Analysis results serving objective 2: To develop project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

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 and description below table 4.11.

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Table 4.11 Frequency and percentage of confirmability of utility, feasibility, propriety, and accuracy of the instructional model components in 6 areas by specialists.

No.	Components of Instructional Model of virtual reality plus augmented reality	Opinion of the Specialists															
		Utility				Feasibility				Propriety				Accuracy			
		Agree		Disagree		Agree		Disagree		Agree		Disagree		Agree		Disagree	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
1	Principle and Rationale	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
2	Objectives	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
3	Contents	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
4	Methods of Teaching & Materials	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0
5	Evaluation	5	100	5	0	5	100	5	0	5	100	5	0	5	100	5	0

From table 4.11 the confirmability of each component of the instructional model by 5 specialists can be elaborated as follows.

Principle and Rationale

The utility of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100% of all specialists; feasibility 5 specialists 100%; propriety 5 specialists 100%; and accuracy 5 specialists 100%.

Objectives

The objectives of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100%of all specialists; feasibility 5 specialists 100%; propriety 5 specialists 100%;and accuracy 5 specialists 100%.

Contents

The contents of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100%of all specialists; feasibility 5 specialists 100%;propriety 5 specialists 100%;and accuracy 5 specialists 100%.

Methods of Teaching & Materials

The methods of teaching & materials of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100%of all specialists; feasibility 5 specialists 100%; propriety 5 specialists 100%;and accuracy 5 specialists 100%.

Evaluation

The evaluation of teaching & materials of principle and rationale of the instructional model is confirmed to be appropriate by 5 specialists 100%of all specialists; feasibility 5 specialists 100%; propriety 5 specialists 100%; and accuracy 5 specialists 100%.

Summary: Development of Project-based learning Instructional Model Implementation Step Framework mainly refers to five aspects of standards by the researcher.

Phase 3 Analysis results serving objective 3: To study the results of project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

Objective 3 analysis results are presented by reporting students' performance according to rubric score-based assessment criteria and satisfaction of problem-solving ability through project-based learning Instructional model as specified in chapter 3 with tables and descriptive analysis.

Table 4.12 Students' Performance Results on Basis of Analytic and Holistic Rubri Score Assessment

Aspects of assessment	$\overline{X}$	SD	Interpretation of quality level	Rank
Ability to identify problems	7.33	1.044	Good	4
Ability to analyze problems	7.42	1.076	Good	3
Ability to provide solutions	8.02	1.118	Good	2
Evaluation and Reflection Ability	8.04	1.205	Good	1
Total Average	**7.70**	**1.110**		

Table 4.12 indicates that after implementing Project-based learning instructional model, students' performance assessed overall level is found to be good ($\overline{X}$ =7.70), Considering each item individually, it was found that Evaluation and Reflection Ability have the highest mean ($\overline{X}$ =8.04), and the follow is Ability to provide solutions ($\overline{X}$ =8.02), the lowest mean is ability to identify problems ($\overline{X}$ =7.33).

Table 4.13 Relative developmental score of students' problem-solving ability (Summary the level: problem-solving ability over all 8 Standards) enhancement through project-based learning instructional model :

Score	Grade
33-40	Excellent
25-32	Good
17-24	Medium
9-16	Pass
Less than 9	Poor

Summary the level: problem-solving ability over all 8 Standards

Development level	Frequency	Percentage
Excellent	15	33.33
Good	23	51.11
Medium	7	15.56
Pass	0	0.00
Poor	0	0.00
Total	**45**	100.00

From table 4.13, it can be seen that most of the students (84.44%) showed good problem-solving ability. Among them, 15 were excellent (33.33%), 23 were good (51.11%), 7 were Medium (15.56%). No student had a poor level of problem-solving ability.

Overall, as can be seen from Table 4.13, after implementing the Project-Based Learning teaching model, the problem-solving ability of most students (84.44%) has been improved. This result is consistent with the research hypothesis that after implementing the Project-Based Learning Teaching model, students'critical thinking skills will increase by 80% overall (Good Level or higher). Therefore, we can conclude that the Project-Based Learning instructional model is effective for improving students' problem-solving ability.

Ability to identify problems

Table 4.14 Relative developmental score of students' problem-solving ability (Criteria to evaluate 1. ability to identify problems) enhancement through project-based learning Instructional model :

Criteria to evaluate 1: ability to identify problems

Item 1: Ability to identify problems

Standard 1: Obtain effective information on project activities

Standard 2: Attitude towards problems

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

Summary the level item 1: ability to identify problems

Development level	Frequency	Percentage
Excellent	10	22.22
Good	29	64.44
Medium	6	13.33
Pass	**0**	**0**
Poor	**0**	**0**
Total	**45**	**100.00**

From table 4.14, it can be seen that the majority of students (86. 66%) have reached a good or excellent problem-solving ability level, exceeding the 80% in the research hypothesis. This indicates that project-based learning instructional mode has a significant positive impact on students' problem-solving ability.

Ability to analyze problems

Table 4.15 Relative developmental score of students' problem-solving ability (Criteria to evaluate 2. ability to analyze problems) enhancement through project-based learning instructional model :

Criteria to evaluate 2: ability to analyze problems

Item 1: Ability to analyze problems

Standard 1: Able to accurately grasp driving issues

Standard 2: Able to propose problem-solving ideas

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

Summary the level item 2 : ability to analyze problems

Development level	Frequency	Percentage
Excellent	3	6.67
Good	34	75.56
Medium	8	17.78
Pass	**0**	**0**
Poor	**0**	**0**
Total	**45**	**100.00**

According to table 4.15, the majority of students (82.23%) have achieved at least a good level of problem-solving ability, 6.67 % have achieved an excellent level, and 75. 56 % have achieved a good level. This supports the research hypothesis that implementing the project-based learning instructional mode can improve students' problem-solving ability.

Table 4.16 Relative Developmental Score of Students' problem-solving ability (Criteria to evaluate 3. Ability to provide solutions) Enhancement Through project-based learning Instructional model :

Criteria to evaluate 3: ability to provide solutions

Item 3: Ability to provide solutions

Standard 1: able to collaborate to solve problems

Standard 2: able to correctly apply methods to solve problems

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

Summary the level item 3: ability to provide solutions

Development level	Frequency	Percentage
Excellent	21	46.67
Good	19	42.22
Medium	5	11.11
Pass	**0**	**0**.00
Poor	**0**	**0**.00
Total	**45**	**100.00**

From table 4.16, it can be seen that the majority of students (88.89%) have achieved good (42.22%) or excellent (46.67%) problem-solving ability after implementing the project-based learning instructional mode. This supports our research hypothesis that project-based learning instructional models have a positive impact on students' problem-solving abilities.

Table 4.17 Relative developmental score of students' problem-solving ability (Criteria to evaluate 4. evaluation and reflection ability) enhancement through project-based learning instructional model :

Criteria to evaluate 4: evaluation and reflection ability

Item 4: Evaluation and Reflection Ability

Standard 1: Evaluate the effectiveness of the solution

Standard 2: Reflection and learning

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

Summary the level Item4: Evaluation and Reflection Ability

Development level	Frequency	Percentage
Excellent	24	53.33
Good	14	31.11
Medium	7	15.56
Pass	**0**	**0**.00
Poor	**0**	**0**.00
Total	**45**	**100.00**

From table 4.17, it can be seen that the majority of students (84.44%) have achieved good (31.11%) or excellent (53.33%) problem-solving ability after implementing the project-based learning instructional mode. This supports our research hypothesis that project-based learning instructional models have a positive impact on students' problem-solving abilities.

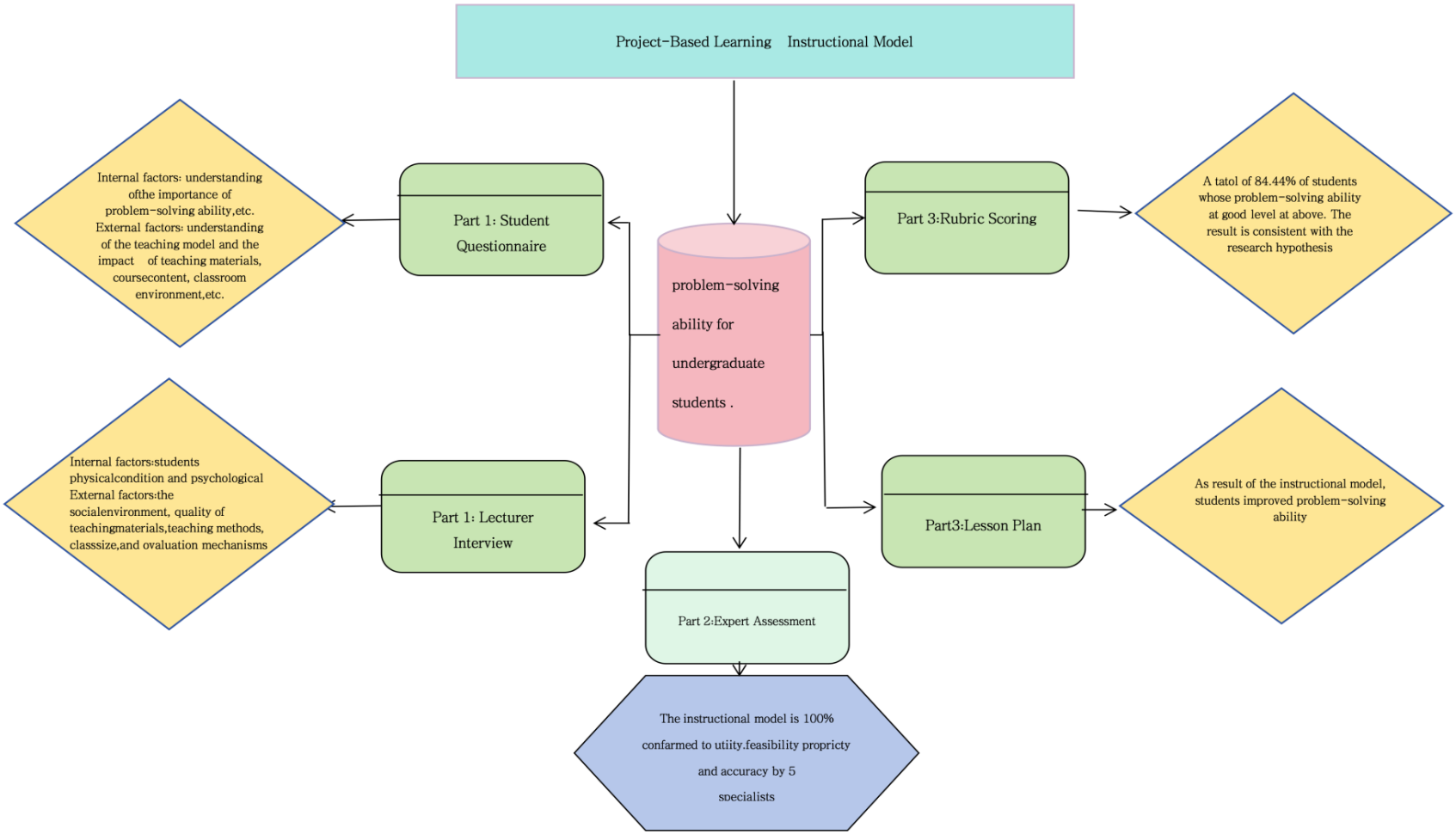

Figure 4.1 Development the Project-Based Learning Instructional Model after implementation

Chapter 5
Conclusion, Discussion and Recommendations

After analyzing and presenting data analysis results in chapter 4 as serving all research objectives of the present study "Development of project-based learning instructional model to improve problem-solving ability for 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 problem-solving ability for undergraduate students in Guangxi Province.

2. To develop project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

3. To study the results of project-based learning instructional model to improve problem-solving ability for undergraduate students in Beibu Gulf University.

Conclusion

1. The factors to improve undergraduate students' problem-solving ability of undergraduate students in Guangxi Province were internal and external factors. The former included earning interest, learning attitude, self-efficacy and metacognitive ability. while the latter involved teaching methods, teaching environment, learning resources and opportunities, collaboration and exchange, and challenging tasks provided with course.

2. The project-based learning Instructional model to improve students' problem-solving ability in Beibu Gulf University included 5 components 1) Principle and rationale, 2) Objectives, 3) Contents, 4) Method of teaching & materials and 5) Evaluation. The model was 100% conformed to utility, feasibility, propriety, and accuracy standards as assessed by 5 specialists.

3. It was found that 84. 44% of 45 students who enrolled in the Kindgarten Course in Beibu Gulf University whose problem-solving ability was at good level while another 15. 55% of them were assessed to be at Medium and Pass level. The

result was consistent with the research hypothesis that 80. 00% upwards of the participants would have problem-solving performance ability at Good level after learning through project-based learning instructional model.

Discussion

1. **There were 2 factors: 1) Internal Factors and 2) External factors from the students and the lecturers were affecting problem-solving ability of undergraduate students according to:**

1) **Internal Factors** consisted of learning interest, learning attitude, self-efficacy and metacognitive ability. A positive learning attitude and a strong desire to learn help to develop students' problem-solving awareness and ability. Self-efficacy enables students to believe that they can solve problems successfully and take positive actions to solve them. Students with good metacognitive ability can analyze problems more effectively, choose appropriate solutions, and constantly adjust and improve strategies in the process of solving problems. Retno et al. (2019) pointed out that cultivating students' ability to solve problems in practice, creating a positive learning atmosphere, and improving students' learning interest, learning attitude and metacognitive ability as well as self-efficacy can significantly influence students' academic performance through the interaction between project-based learning methods and problem-solving ability. In the experimental class, students participate in project-based learning, and the learning effect is significantly higher than that in the regular class. It is emphasized that project-based learning can be used as an alternative way for teachers to carry out learning, create a positive learning atmosphere, and enhance students' ability to understand problems.

2) **External factors** include teaching methods, teaching environment, learning resources and opportunities, collaboration and exchange, and challenging tasks provided. Project-based learning model provides students challenging tasks with" problems", encourages students to work together provided collaboration and exchange, so as to cultivate students' problem awareness and problem-solving ability (Susanti, 2021). It is an important way for students to develop their problem-solving ability to deal with knowledge trans formatively in teaching (Wu & Xie, 2013), so teaching methods, teaching environment, learning resources and opportunities will have an impact on the cultivation of students' problem-solving ability. The learning

resources and opportunities that students have access to, such as libraries, laboratories, research projects, etc., can provide the practical and hands-on opportunities students need to solve problems.

In summary, well-structured project-based learning instructional model, project-centered, innovative learning methods that teach multiple strategies, and active participation of students play an important role in improving problem-solving ability, which has been confirmed by student feedback and academic research.

2. The project-based learning Instructional model to improve students' problem-solving ability in Beibu Gulf University was 100% conformed to utility, feasibility, propriety, and accuracy standards as assessed by 5 specialists according to:

The principle and rational, the researcher took the result from students and the lecturers to prepare and be careful when teaching in the class,

The objectives of the instructional model were agreed upon by all the experts. This consistency shows that the goal set by this model is based on the actual situation of students, the characteristics of disciplines and educational requirements, comprehensive consideration of all aspects of the factors, so the goal is reasonable, feasible and effective, aimed at improving the ability of college students to solve problems.

The contents component gets one from all the experts, indicating that the emphasis on learning materials and topics is appropriate and well designed for the goals of the model. Project-based teaching emphasizes learning materials and topics that help students build a solid understanding of knowledge. The focus is on practical problem solving, so the choice of study materials and topics is closely linked to practical applications, students engage in project work, make a project, apply acquired concepts, solve problems, and interact between students and peers to create and use new knowledge (Retno et al., 2019). This is an important problem-solving ability.

The teaching methods and materials are certified by experts to be useful, feasible, appropriate and accurate. It is proved that the teaching methods and materials adopted in the teaching mode of project-based learning are diverse, operable and effective, which is in line with the purpose of improving students'

problem-solving ability. Project-based learning use teaching methods and materials provides can give students with a way to actively engage in learning, enabling them to apply what they have learned to real-world situations, and developing their overall literacy and ability to innovate (Balemen & Keskin, 2018).

The evaluation was unanimously affirmed by all experts, emphasizing that the evaluation and improvement of students' problem-solving ability should fully consider the characteristics of project-based teaching mode, so as to achieve a comprehensive and more prepared evaluation of teaching effects. Project-based learning emphasizes feedback and evaluation. Improve your problem-solving skills through feedback and evaluation. Core elements of project design include reflection, critical feedback and revision, and public presentation of results (Lai & Xing, 2023). Therefore, helping students to understand themselves and adjust their learning methods and strategies is conducive to students' better learning of problem-solving ability.

To sum up, experts unanimously recognize the practicability, feasibility, appropriateness and accuracy of the project-based teaching model, which is the basic structure of stable teaching activities established under the guidance of certain teaching concepts or theories .If implemented correctly, it can effectively improve the problem solving ability of college students.

3. **It was found that the result is consistent with the research hypothesis that 80% upwards of the participants will have problem-solving performance ability at Good level after learning through project-based learning instructional model. are discussed as follows**:

First, through the implementation of the project-based teaching model, 84.44% of the students reached a good level, indicating that this model focuses on cultivating students' application ability in practical problems. The project-based learning model strengthen students to ability to identify problems 86.66% have reached a good or excellent problem-solving ability level); ability to analyze problems (82.23% have achieved at least a good level of problem-solving ability; ability to provide solutions 88.89% have achieved good 42.22% or excellent 46.67% problem-solving ability) and enhance students evaluation and reflection Ability(students 84.44% have achieved good 31.11% or excellent 53.33% problem-solving ability. Project-based teaching mode can provide an effective teaching

method to help college students cultivate their problem-solving ability and prepare for their future career development (Thomas, 2000). By engaging in practical and collaborative problem-solving, students are able to flexibly apply their knowledge to solve real-world problems in a real learning environment (Ernest, 2005). This style of learning emphasizes students' active participation, effective responses to problems and finding solutions. In project-based teaching, students are expected to think independently, ask questions, conduct research, gather information, analyze data, and present and evaluate results. This not only enables them to deepen their understanding of knowledge, but also develops important skills such as critical thinking, teamwork and communication skills, so the ability to find problems, analyze problems, solve problems, evaluate problems and reflect on problems makes an important contribution to the improvement of students' problem-solving ability.

Second, 15.55% of students' problem-solving ability are at an intermediate or pass level, which means that under the project-based teaching model, some students' problem-solving skills need to be improved. When students engage in project-based learning, they are more likely to develop interest and motivation (Zheng et al., 2021), but many factors may cause these students to fail to reach a good level, including but not limited to personal interests, learning attitudes, and learning methods. We should propose corresponding intervention measures to improve students' problem-solving ability. This may include encouraging the development of personal interests, promoting the formation of positive learning attitudes, and teaching effective learning methods and strategies. Students' problem-solving ability can only be developed in the process of problem solving. Both classroom teaching and extra-curricular practice are students problem-solving ability is an important way, and guiding students to reflect on the process of problem solving is also a channel that cannot be ignored to improve their ability (Wu & Xie, 2013). Through these interventions, we can improve students' problem-solving skills and better adapt to project-based teaching models.

Third, by verifying the hypothesis, the research results support project-based teaching as an effective teaching method, which can improve the problem-solving ability of college students. This has important implications for educators and educational policy makers, encouraging them to adopt project-based teaching models in instructional design and implementation, and project-based learning

models provide students with problem-solving opportunities and experiences (Jalinus, 2017). That is, project-based learning and teaching model has a positive impact on students' problem-solving ability. From it, and deeply reflect on the implementation process and results, learn from the experience, and constantly improve themselves (La i & Xing, 2023). Most students (84.44%) achieved good (31.11%) or excellent (53.33%). Ability to solve problems after implementing project-based teaching mode. This supports our research hypothesis that project-based learning teaching models have a positive impact on students' problem-solving ability.

In summary, the ability to find problems, analyze problems, solve problems, evaluate problems and reflect on problems has made an important contribution to the improvement of students' problem-solving ability. The project-based learning model has been shown to be an effective way to improve these skills, with most students gaining good or excellent problem-solving skills upon implementation.

Recommendations

The findings from the present study bring two fold suggestions: applicabilityof the results and future research.

Applicability of the results

First, to the students, the project-based teaching mode encourages students to participate in active learning and independent inquiry, play a real role in the project, face real problems, and cultivate students' problem-solving ability. Students will learn communication, collaboration and division of labor in teamwork, thereby improving social skills and team awareness. In addition, project-based teaching also stimulates students' interest and motivation, making them more engaged in learning and improving learning results.

Second, to the lecturers, project-based teaching mode improves their teaching quality and professional ability. Teachers play the role of mentors and mentors in the project, no longer the traditional knowledge imparts, but lead the students to in-depth learning and problem-solving facilitators. This requires teachers to have a rich knowledge background and interdisciplinary ability in order to guide students effectively. Teachers also need to pay attention to students' individual differences and provide personalized guidance and support according to students' characteristics and abilities. Through the implementation of project-based teaching,

teachers can better understand the learning needs of students and adjust teaching strategies flexibly, so as to improve their teaching level.

Third, to the university, project-based teaching model helps to improve the quality and reputation of the university. Adopting this innovative teaching method can attract more excellent students and teachers to join the university. Project-based teaching breaks through traditional classroom boundaries, enabling schools to build closer ties with society, industry and enterprises, and promoting cooperation and sharing of resources between university and outside. At the same time, the university can also train graduates with the ability to solve practical problems through project-based teaching mode, meet the social demand for high-quality talents, and improve the social influence of the university.

Therefore, improving undergraduates' problem-solving ability based on project-based teaching model brings many benefits to students, lecturers and university. Students improve their problem-solving ability and teamwork skills through participation in project-based teaching. Lecturers have improved their teaching quality and professional competence by implementing project-based teaching. Through the implementation of project-based teaching, the university has improved the quality of education, attracted talented people, and increased opportunities for cooperation with the outside world. These benefits can be used for reference by other disciplines and fields to further promote the innovation and development of undergraduate education.

Future research

1. Develop project-based teaching mode to improve students' interdisciplinary comprehensive thinking ability. Enabling it to combine multidisciplinary knowledge for cross-disciplinary analysis and innovation.

2. Develop project-based teaching mode to improve college students' innovation and problem-solving ability.

3. Develop project-based teaching mode to improve students' practical skills and application ability.

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Appendices

Appendix A

List of Specialists and Letters of Specialists Invitation for IOC Verification

List of experts to validate Research instruments (IOC)

1. Assistant Professor Dr. Prapai Sridama	Computer and Teachbnolog Program Bansomdejchaopraya Rajabhat University
2. Assistant Professor Dr. Saiphon Songsiengchai	English Program Bansomdejchaopraya Rajabhat University
3. Associate Professor Dr. Wapee Kong-In	English Program Bansomdejchaopraya Rajabhat University
4. Professor Dr. He guangyao	Psychological research Beibu Gulf University
5. Assistant Professor Dr. Wang suhua	Studies in Curriculum Theory Beibu Gulf University

List of experts to evaluate the format instruction model

1. Assistant Professor Dr. Tanaput Chancharoen	Learning Innovation and Teachbnology Program Bansomdejchaopraya Rajabhat University
2. Associate Professor Dr. Wanida Ploysangwal	English Program University of the Thai Chamber of Commerce
3. Dr. Panas Jansritong	Admistration Program Krirk University
4. Assistant Professor Dr. Xian xiuli	Educational Theory Research Beibu Gulf University
5. Assistant Professor Dr. He xueling	Studies in Curriculum Theory Beibu Gulf University

Appendix B

Official Letter

For hardcopy questionnaire
(กรณี สำเนา แบบสอบถาม)

Ref. No. MHESI 0643.14/ 1096

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for data collection

Dear President of Beibu Gulf University.

Attachment Questionnaire and interview

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie , a P h.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117 Thailand under the supervision of

Major Advisor : Associate Professor Jittawisut Wimutipanya
Co-advisor : Associate Professor Dr. Areewan Iamsa-ard
Co-advisor : Associate Professor Dr.Suriya Phankosol

The researcher needs to collect data using questionnaire in terms of factors affecting Problem-solving Ability for Undergraduate Students from the former students who enrolled in Kindergarten course in semester I of academic year 2022 at Beibu Gulf University.Hence, 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 address 471276673@qq.com. Or mailing address, Beibu Gulf University, Qinzhoui, Guangxi, China,535000. The researcher plans to use this data for her 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,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.

Fax. 66 0204737000

For hardcopy questionnaire

Ref. No. MHESI 0643.14/ 1097

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for data collection

Dear President of Hechi College

Attachment Questionnaire and interview

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie , a P h.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117 Thailand under the supervision of

Major Advisor : Associate Professor Jittawisut Wimutipanya
Co-advisor : Associate Professor Dr. Areewan Iamsa-ard
Co-advisor : Associate Professor Dr.Suriya Phankosol

The researcher needs to collect data using questionnaire in terms of factors affecting Problem-solving Ability for Undergraduate Students from the former students who enrolled in Kindergarten course in semester I of academic year 2022 at Hechi College.Hence, 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 address 471276673@qq.com. Or mailing address, Hechi College, Hechi, Guangxi, China,547000. The researcher plans to use this data for her 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,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.

Fax. 66 0204737000

For hardcopy questionnaire
(กรณี ส่ง แบบ สอบถาม)

Ref. No. MHESI 0643.14/ 1098

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for data collection

Dear President of Hechi College

Attachment Questionnaire and interview

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie , a P h.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117 Thailand under the supervision of

Major Advisor : Associate Professor Jittawisut Wimutipanya
Co-advisor : Associate Professor Dr. Areewan Iamsa-ard
Co-advisor : Associate Professor Dr.Suriya Phankosol

The researcher needs to collect data using questionnaire in terms of factors affecting Problem-solving Ability for Undergraduate Students from the former students who enrolled in Kindergarten course in semester I of academic year 2022 at Hechi College.Hence, 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 address 471276673@qq.com. Or mailing address, Hechi College, Hechi, Guangxi, China,547000. The researcher plans to use this data for her thesis completion and further necessary publication as required by the Ph.D. course.

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(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.

Fax. 66 0204737000

For hardcopy questionnaire
(กรณี ส่ง แบบ สอบถาม)

Ref. No. MHESI 0643.14/ 1100

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for data collection

Dear President of Yulin Normal College

Attachment Questionnaire and interview

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie , a P h.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117 Thailand under the supervision of

Major Advisor : Associate Professor Jittawisut Wimutipanya
Co-advisor : Associate Professor Dr. Areewan Iamsa-ard
Co-advisor : Associate Professor Dr.Suriya Phankosol

The researcher needs to collect data using questionnaire in terms of factors affecting Problem-solving Ability for Undergraduate Students from the former students who enrolled in Kindergarten course in semester I of academic year 2022 at Yulin Normal College.Hence, 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 address 471276673@qq.com. Or mailing address, Yulin Normal College, Yulin, Guangxi, China,537000. The researcher plans to use this data for her 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,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.

Fax. 66 0204737000

Ref. No. MHESI 0643.14/ 1101

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for research tool validation

Dear Professor Dr.Wang suhua

Attachment Validation sheets

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117, Thailand under the supervision of Associate Professor JittawisutWimutipanya and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol, the written questionnaire,Interview and rubric scoring from as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the questionnaire,Interview and rubric scoring from as instruments to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

The research objective, definitions of terms, Interview, rubric scoring from ,questionnaire and the validation sheets are hereby attached. I will be glad to hear your suggestions and comments for the improvement of the instrument. Your positive response is highly appreciated.

Sincerely,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
Fax. +66 0204737000

Ref. No. MHESI 0643.14/ 1102

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for research tool validation

Dear Professor Dr.He guangyao

Attachment Validation sheets

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117, Thailand under the supervision of Associate Professor JittawisutWimutipanya and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol, the written questionnaire,Interview and rubric scoring from as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the questionnaire,Interview and rubric scoring from as instruments to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

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Sincerely,

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Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
Fax. +66 0204737000

Ref. No. MHESI 0643.14/ 1103

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for research tool validation

Dear Professor Dr.Saiphon Songsiengchai

Attachment Validation sheets

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117, Thailand under the supervision of Associate Professor JittawisutWimutipanya and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol, the written questionnaire,Interview and rubric scoring from as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the questionnaire,Interview and rubric scoring from as instruments to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

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Sincerely,

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Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
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Ref. No. MHESI 0643.14/ 1104

Graduate School
Bansomdejchaopraya Rajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for research tool validation

Dear Professor Dr.Prapai Sridama

Attachment Validation sheets

Regarding the thesis entitled "Development of Project-Based Learning Instructional Model to Improve Problem- solving ability for Undergraduate Students" of Mrs. Tang shangjie, a Ph.D. student majoring in Curriculum and Instruction Programme at Bansomejchaopraya Rajabhat University code number 6473103117, Thailand under the supervision of Associate Professor JittawisutWimutipanya and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol, the written questionnaire,Interview and rubric scoring from as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the questionnaire,Interview and rubric scoring from as instruments to qualify for conduction. Knowing your experience in the field of Education, I would like to ask for your help in validating the said instrument before administering it to the participants of the study.

The research objective, definitions of terms, Interview, rubric scoring from ,questionnaire and the validation sheets are hereby attached. I will be glad to hear your suggestions and comments for the improvement of the instrument. Your positive response is highly appreciated.

Sincerely,

(Asst.Prof.Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
Bansomejchaopraya Rajabhat University

Tel. +66 0204737000 Ext.
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Ref. No. MHESI 0643.14/ 1105

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr.Wapee Kong-In

Attachment Validation sheets

Regarding the thesis entitled"Development of Project-Based Learning Instructional Model to Improve Problem-solving ability for Undergraduate Students"of Tang shangjie A Ph. D.student majoring in Curriculum and Instruction Programmeat BansomejchaoprayaRajabhat University code number 6473103117, Thailand under the supervision of Associate Professor Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/1106

Graduate School
BansomdejchaoprayaRajabhat University
1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr.Wanida Ploysangwal

Attachment Validation sheets

Regarding the thesis entitled"Development of Project-Based Learning Instructional Model to Improve Problem-solving ability for Undergraduate Students"of Tang shangjie A Ph. D.student majoring in Curriculum and Instruction Programmeat BansomejchaoprayaRajabhat University code number 6473103117, Thailand under the supervision of Associate Professor Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

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Dean of Graduate School
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Tel. (662) 4737000
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Ref. No. MHESI 0643.14/1107

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1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr.Panas Jansritong

Attachment Validation sheets

Regarding the thesis entitled"Development of Project-Based Learning Instructional Model to Improve Problem-solving ability for Undergraduate Students"of Tang shangjie A Ph. D.student majoring in Curriculum and Instruction Programmeat BansomejchaoprayaRajabhat University code number 6473103117, Thailand under the supervision of Associate Professor Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/ 1108

Graduate School
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1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr.Xian xiuli

Attachment Validation sheets

Regarding the thesis entitled"Development of Project-Based Learning Instructional Model to Improve Problem-solving ability for Undergraduate Students"of Tang shangjie A Ph. D.student majoring in Curriculum and Instruction Programmeat BansomejchaoprayaRajabhat University code number 6473103117, Thailand under the supervision of Associate Professor Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/ 1109

Graduate School
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1061 Itsarapap 15 Itsarapap Rd.
Thonburi Bangkok 10600

31 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr.He xueling

Attachment Validation sheets

Regarding the thesis entitled"Development of Project-Based Learning Instructional Model to Improve Problem-solving ability for Undergraduate Students"of Tang shangjie A Ph. D.student majoring in Curriculum and Instruction Programmeat BansomejchaoprayaRajabhat University code number 6473103117, Thailand under the supervision of Associate Professor Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Ref. No. MHESI 0643.14/ 1110

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Thonburi Bangkok 10600

31 August 2023

Subject Request for evaluation of instructional model

Dear Assistant Professor Dr.Tanaput Chancharoen

Attachment Validation sheets

Regarding the thesis entitled"Development of Project-Based Learning Instructional Model to Improve Problem-solving ability for Undergraduate Students"of Tang shangjie A Ph. D.student majoring in Curriculum and Instruction Programmeat BansomejchaoprayaRajabhat University code number 6473103117, Thailand under the supervision of Associate Professor Jittawisut Wimutipanya as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Suriya Phankosol as co-advisors, the instructional model will be developed in the said research. In view with this, the researcher would like your expertise to evaluate the appropriateness of such a developed instructional model. Knowing your experience in the field of Education, I would like to ask for your help in evaluating the said instructional model before its implementation.

I will be glad to hear your suggestions and comments for the improvement of the instructional model. Your positive response is highly appreciated.

Sincerely,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
BansomejchaoprayaRajabhat University

Tel. (662) 4737000
Fax. (662) 4737000

Appendix C

Research Instrument

- Questionnaire for students (Objective 1)
- Interview for lecturers (Objective 1)
- Questionnaire for experts (Objective 2)
- Lesson Plan (Objective 3)
- Scoring rubric form (Objective 3)

Questionnaire For students (Objective 1)

Instructions：

These questionnaires are the instruments for collecting data in 1st phase of the research entitled“Development Of Project-Based Learning Instructional Model To Improve Problem-Solving Ability For Undergraduate Students”conducted by Tang Shangjie, a Ph. D. student in Curriculum and Instruction Programme at Bansomdejchaopraya Rajabhat University under the supervision of Assistant Professor Dr. Jittawisut Wimutipanya, majoring advisor, Associate Professor Dr. Areewan Iamsa-ard and Assistant Professor Dr. Suriya Phankosol co-advisor.

This questionnaire is divided into 3 sections i. e.

Section I Common data of the respondent

Section II Information on factors influencing problem-solving ability for Undergraduate Students in 3 Colleges： Hechi College; Yulin Normal College;Beibu Gulf University.

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 III 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 I Common data of the respondent

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

No. 1	Gender ❑ A. Male ❑ B. Female
No. 2	Students from ❑ A. Hechi College, Major in Preschool education ❑ B. Yulin Normal College, Major in Preschool education ❑ C. Beibu Gulf University, Major in Preschool education
No. 3	Age ❑ A. below 18 yrs. ❑ B. 19-20 yrs. ❑ C. 21-22 yrs. ❑ D. over 23 yrs

S ection II Questionnaire on factors affecting the of problem-solving ability of Undergraduate students in 3 Colleges:Hechi College;Yulin Normal College;Beibu Gulf University.

Instructions::Please rate the following factors affecting the Integration of Blended Learning Model by putting✓into the attitude level column based on the criteria given below. Each question can select only one answer.

5 means you STRONGLY agree with the item.

4 means you QUITE agree with the item.

3 means you remain NEUTRAL.

2 means you DO NOT QUITE agree with the item

1 means you DO NOT STRONGLY agree with the item

Section 2	Factors	Answers				
		5	4	3	2	1
Internal factors (respondents)						
No. 1	Students are very interested in Kindergarten Course.					
No. 2	Students actively learn the basic knowledge of Kindergarten Course.					
No. 3	Students believe that good teaching skills can improve students'curriculum development and application ability in the Kindergarten Course.					
No. 4	Would do you like to improve problem-solving ability in the Kindergarten Course.					
No. 5	Students are industrious in their learning (assignments, projects, participation, etc.)with the highest potential themselves.					
No. 6	Students feel satisfied with the teacher's teaching style.					
No. 7	Students feel that Kindergarten course is the great significance to personal growth and development in future.					
No. 8	Students think that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.					
No. 9	Students can learn and practice problem-solving ability in Kindergarten Course.					
No. 10	Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in Kindergarten Course.					
No. 11	. Students feel that homework or project work assigned by lecturers and students can help students better apply the knowledge they have learned.					

Table (Continued)

Section 2	Factors	Answers				
		5	4	3	2	1
Internal factors (respondents)						
No. 12	Students feel that the evaluation exercise or testing assigned by lecturers and students can help students better apply the knowledge they have learned.					
No. 13	Students learn through various instruction model to enhance their problem-solving ability based on kindergarten curriculum practice in Kindergarten Course.					
No. 14	Students believe that with the help of project-based learning platforms and resources they can achieve success in Kindergarten Course.					
No. 15	Students respect and trust the professional knowledge of teachers in organizing and managing project-based learning models.					
External factors (teachers, circumstances)						
No. 16	The lecturers use modern teaching methods in Kindergarten course. (such as cooperative learning, computers, App platforms effectively, demonstrations, exploration, etc.)to let students participate in problem-solving activities.					
No. 17	The lecturer combines traditional classroom evaluation methods with various modern teaching models.					
No. 18	The lecturer can guide students to realize that developing problem-solving skills in the kindergarten curriculum has a positive impact on their future development.					

Table (Continued)

Section 2	Factors	Answers				
		5	4	3	2	1
External factors (teachers, circumstances)						
No. 19	The lecturer pay more attention to the cultivation of students'problem-solving ability in Kindergarten Course and its influence on Kindergarten Course.					
No. 20	The lecturers choose appropriate teaching methods according to the characteristics of Kindergarten Course and the tasks and goals of the ability to problem-solving ability.					
No. 21	The lecturers combine the teaching method he teaches with objectives and the knowledge in Kindergarten Course to enhance undergradu -ate students'problem-solving ability .					
No. 22	The lecturers can stimulate students' interest and meet the contemporary needs of students.					
No. 23	The lecturers choose suitable materials and emerging network resources.					
No. 24	The textbook fully considers the content and objectives of Kindergarten Course and the training to undergraduate students'problem-solving ability.					
No. 25	The materials can fully support students' learning in Kindergarten Course and the raining to guide students in kindergarten education.					
No. 26	The textbook providespractical, interactive and inspiring cases and materials to useful for students.					
No. 27	The materials and environment can enhance undergraduate students'problem-solving ability to guide students in kindergarten education.					

Table (Continued)

Section 2	Factors	Answers				
		5	4	3	2	1
External factors (teachers, circumstances)						
No. 28	The availability of learning spaces and anchored instruction model can affect students interest in Kindergarten Course.					
No. 29	Provides a teaching mode with a stable high-speed network anytime, anywhere on campus as a teaching guarantee, and supports anchored instruction model to enhance undergraduate students'problem-solving ability in kindergarten education practice.					
No. 30	1The environments is clean and bright, with desks and chairs, blackboards, podiums, projectors, large screens, and othe rmultimedia facilities to facilitate the teaching process.					

SECTION III Suggestions for improving the better instruction

. . . . . .
. . . . . .
. . . . . .
. . . . . .
. . . . . .

Thank you for your kind cooperation for completing the questionnaire!

Researcher sign

Tang shangjie

Interview for Lecturers(Objective 1)

Directions: This interview is a part of research entitled"Development Of Project-based Learning Instructional Model To Improve Problem-Solving Ability For Undergraduate Students"

Research Objectives:1. To examine the factors affecting problem-solving ability for undergraduate students in Guangxi Province.

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

1. Assistant Professor Dr. JittawisutWimutipanya
2. Associate Professor Dr. Areewan Iamsa-ard
3. Assistant Professor Dr. Suriya Phankosol

The following open questions are the instrument for collecting data in 1st phase of the research, concerning about factors to effect improve problem-solving ability. Please write down your own opinion for each questions. 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.

Part 1: The information about the Bio-social characteristic of the respondents.

Section 1	**Common data of the respondent**
No. 1	Gender ❑ A. Male ❑ B. Female
No. 2	Lecturer from ❑ A. From Preschool Education of Hechi College ❑ B. From Preschool Education of Yulin Normal College ❑ C. From Preschool Education of Beibu Gulf University
No. 3	Teaching experience ❑ A. Below 3 yrs. ❑ B. 4-6 yrs. ❑ C. 7- 9 yrs. ❑ D. Over 10 yrs.
No. 4	Age ❑ A. below 30 yrs. ❑ B. 30-40 yrs. ❑ C. 41-50 yrs. ❑ D. over 50 yrs.
No. 5	Professional title ❑ A. Professor ❑ B. Associate Professor ❑ C. Assistant Professor ❑ D. Lecturer

Part 2 The information about factors influencing Problem-Solving Ability.
Instructions: 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.

Section 2	Questions
No. 1	Why do you accept or select to teach this subject?(Example, prefer to teach, be expert in the content, be requested, or other reasons.)
No. 2	How do you prepare to teach this subject?(Preparing, contents, materials, teaching location)
No. 3	For the first time in your teaching, how do you prepare subject orientation to educate students about the teaching system, measuring, and assessment?
No. 4	Do you always implement teaching according to your teaching plan?Do you think your teaching plan can effectively Improve Problem-solving Ability For Undergraduate Students”?Do you often think about how to improve teaching?
No. 5	How do you give the opportunity for students to participate in the teaching?(Please clarify the methodology.)
No. 6	How many methodologies for students’measurement and assessment, and do you think your measurement and assessment course can reflect students’learning effect and knowledge level?
No. 7	What Learning Tasks do you carry out to improve students'learning enthusiasm?
No. 8	Do you provide the time for students after their regular class?If yes, how do you help students solve their difficulties?
No. 9	Which aspects of your teaching need to be improved, or which aspects do you want the school to support you?
No. 10	Previously, what problems do you meet in your teaching, and how do you find the solution?

Comment and recommendation for improving the better instruction

Thank you for your kind cooperation for completing the questions.

Researcher Tang shangjie

Questionnaire for experts(Objective 2)
Development of Project-Based Learning Instructional Model to Improve Problem-solving Ability for Undergraduate Students

Dear assessors,

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

1. Associate Professor Dr. JittawisutWimutipanya
2. Assistant Professor Dr. Areewan Iamsa-ard
3. Assistant Professor Dr. Dr. Suriya Phankosol

The attached open questions are the instrument for collecting data in phase 2 of the research, the objective of which is to confirm instructional. 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 Standard 2) Feasibility Standard 3**)** Propriety Standard and 4)Accuracy Standard.

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.

Ph. D. student Name Tang Shangjie
Curriculum and Instruction Program
Bansomdejchaopraya Rajabhat University

Assessment of confirm the quality of Instructional Model Based on Project-Based Learning

Assessor: Assistant Professor Xian xiuli

Position: Educational Theory Research Beibu Gulf University

Workplace: Beibu Gulf University

Assessment Items	Rating Results		
	Agree	Disagree	Remarks
Internal factors (respondents)			
Principle and Rationale:			
Utility Standard			
1. The result of questionaire from students have the benefit for Principle and Rationale			
2. The result of interview from lecturers have the benefit for Principle and Rationale			
Feasibility Standard			
3. The result of questionaire from students have the possibility for Principle and Rationale			
4. The result of interview from lecturers have the possibility for Principle and Rationale			
Propriety Standard			
5. The result of questionaire from students have the suitability for Principle and Rationale			
6. The result of interview from lecturers have the suitability for Principle and Rationale			
Accuracy Standard			
7. The result of questionaire from students have the accuracy for Principle and Rationale			
Objectives:			

Table (Continued)

Assessment Items	Rating Results		
	Agree	Disagree	Remarks
Utility Standard			
9. The objectives have benefit for students			
Feasibility Standard			
10. The objectives have possibility for students			
Propriety Standard			
11. The objectives have suitability for students			
Accuracy Standard			
12. The objectives have accuracy for students.			
Contents:			
Utility Standard			
13. The contents have benefit for students.			
Feasibility Standard			
14. The contents have possibility for students.			
Propriety Standard			
15. The contents have suitability for students.			
Accuracy Standard			
16. The contents have accuracy for students.			
Methods of teaching & materials:			
Project-Based Learning and the ADDIE Teaching Instructional Model			
Utility Standard			
17. The methods of teaching & materials have benefit for students.			
Feasibility Standard			

Table (Continued)

Assessment Items	Rating Results		
	Agree	Disagree	Remarks
18. The methods of teaching & materials have possibility for students.			
Propriety Standard			
19. The methods of teaching & materials have suitability for students.			
Accuracy Standard			
20. The methods of teaching & materials have accuracy for students.			
Evaluation:			
Utility Standard			
21. The evaluation has benefit for students.			
Feasibility Standard			
22. The evaluation has possibility for students.			
Propriety Standard			
23. The evaluation has suitability for students.			
Accuracy Standard			
24. The evaluation has accuracy for students.			

Direction: Assessment of confirm the quality of instructional model

Directions: Please answer all questions by marking in the answer box that corresponds to your opinion or the truth using the following criteria.

Suggestions. . . . . .

. . . . . .

Sign..... . Assessor

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

Appendix D

The Results of the Quality Analysis of Research Instruments

Table Appendix 1: Evaluation Results of IOC for Factor Analysis (For Students)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	Common data of the respondent								
	NO 1: Gender ❑ A. Male ❑ B. Female	+1	+1	+1	+1	+1	5	1. 00	Valid
	NO 2: Studens from ❑ A. Hechi College, Major in Preschool education ❑ B. Yulin Normal College, Major in Preschool education ❑ C. Beibu Gulf University, Major in Preschool education	+1	+1	+1	+1	+1	5	1. 00	Valid
	No 3: Age ❑ A. below18 yrs. ❑ B. 19-20yrs. ❑ C. 21-22 yrs. ❑D. over 23 yrs.	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 1: (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	Internal Factors								
1	Students are very interested in Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid
2	Students actively learn the basic knowledge of Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid
3	Students believe that good teaching skills can improve students'curriculum development and application ability in the Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid
4	Would do you like to improve problem-solving ability in the Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	valid
5	Students are industrious in their learning (assignments, projects, participation, etc.)with the highest potential themselves.	+1	+1	+1	+1	+1	5	1. 00	Valid
6	Students feel satisfied with the teacher's teaching style.	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 1: (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
7	Students feel that Kindergarten course is the great significance to personal growth and development in future.	+1	+1	+1	+1	+1	5	1. 00	Valid
8	Students think that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	+1	+1	+1	+1	+1	5	1. 00	Invalid
9	Students can learn and practice problem-solving ability in Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid
10	Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid
11	Students feel that homework or project work assigned by lecturers and students can help students better apply the knowledge they have learned.	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 1: (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
12	Students feel that the evaluation exercise or testing assigned by lecturers and students can help students better apply the knowledge they have learned.	+1	+1	+1	+1	+1	5	1. 00	Valid
13	Students learn through various instruction model to enhance their problem-solving ability based on kindergarten curriculum practice in Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid
14	Students believe that with the help of project-based learning platforms and resources they can achieve success in Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid
15	Students respect and trust the professional knowledge of teachers in organizing and managing project-based learning models.	+1	+1	+1	+1	+1	5	1. 00	Valid
	External factors								

Table Appendix 1: (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
16	The lecturers use modern teaching methods in Kindergarten Course. (such as Cooperative learning, computers, APP platforms effectively, demonstrations, exploration, etc.)to to let students participate in problem-solving activities.	+1	+1	+1	+1	+1	5	1. 00	Valid
17	The lecturer combines traditional classroom evaluation methods with various modern teaching models.	+1	+1	+1	+1	+1	5	1. 00	Valid
18	The lecturer can guide students to realize that developing problem -solving skills in the kindergarten curriculum has a positive impact on their future development.	+1	+1	+1	+1	+1	5	1. 00	Valid
19	The lecturer pay more attention to the cultivation of students' problem-solving ability in Kindergarten Course and its influence on Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 1: (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
20	The lecturers choose appropriate teaching methods according to the characteristics of Kindergarten Course and the tasks and goals of the ability to problem -solving ability.	+1	+1	+1	+1	+1	5	1. 00	Valid
21	The lecturers combine the teaching method he teaches with objectives and the knowledge in Kindergarten Course to enhance undergraduate students'problem -solving ability.	+1	+1	+1	+1	+1	5	1. 00	Valid
22	The lecturers can stimulate students' interest and meet the contemporary needs of students.	+1	+1	+1	+1	+1	5	1. 00	Valid
23	The lecturers choose suitable materials and emerging network resources.	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 1: (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
24	The textbook fully considers the content and objectives of Kindergarten Course and the training to undergraduate students' problem-solving ability.	+1	+1	+1	+1	+1	5	1. 00	Valid
25	The materials can fully support students'learning in Kindergarten course and the raining to guide students in kindergarten education.	+1	+1	+1	+1	+1	5	1. 00	Valid
26	The textbook provides practical, interactive, and inspiring cases and materials to useful for students.	+1	+1	+1	+1	+1	5	1. 00	Valid
27	The materials and environment can enhance undergraduate students'problem-solving ability to guide students in kindergarten education.	+1	+1	+1	+1	+1	5	1. 00	Valid
28	The availability of learning spaces and anchored instruction model can affect students interest in Kindergarten Course.	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 1: (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
29	Provides a teaching mode with a stable high-speed network anytime, anywhere on campus as a teaching guarantee, and supports anchored instruction model to enhance undergraduate students'problem-solving ability in kindergarten education prasetice.	+1	+1	+1	+1	+1	5	1.00	Valid
30	The environments is clean and bright, with desks and chairs, blackboards, podiums, computers, projectors, large screens, and other multimedia facilities to facilitate the teaching process.	+1	+1	+1	+1	+1	5	1.00	Valid
	Total(In Overview)						150	1.00	**Valid**

Note: Valid when≥0 .50

Table Appendix 2 : Evaluation Results of IOC for Factor Analysis(For Lecturers)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	Part 1								
	No. 1 Gender A. Male B. Female	+1	+1	+1	+1	+1	5	1. 00	Valid
	No. 2 University A. From Preschool Education of Hechi College B. From Preschool Education of Yulin Normal College C. From Preschool Education of Beibu Gulf University	+1	+1	+1	+1	+1	5	1. 00	Valid
	No. 3 Teaching experience A. Below 3 yrs. B. 3-6 yrs. C. 7-9 yrs. D. Over 9 yrs.	+1	+1	+1	+1	+1	5	1. 00	Valid
	No. 4 Age A. below 25 yrs. B. 25-35yrs. C. 36-49 yrs. D. over 49 yrs.	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 2 (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	No. 5 Professional title A. Assistant B. Lecturer C. Associate professor D. Professor	+1	+1	+1	+1	+1	5	1. 00	Valid
	Questions								
1	Why do you accept or select to teach this subject?(Example, prefer to teach, be expert in the content, be requested, or other reasons.)	+1	+1	+1	+1	+1	5	1. 00	Valid
2	How do you prepare to teach this subject?(Preparing contents, materials, teaching location)	+1	+1	+1	+1	+1	5	1. 00	Valid
3	For the first time in your teaching, how do you prepare subject orientation to educate students about the teaching system, measuring, andassessment?	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 2 (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
4	Do you always implement teaching according to your teaching plan?Do you think your teaching plan can effectively Improve Problem-solving Ability For Undergraduate Students"? Do you often think about how to improve teaching?	+1	+1	+1	+1	+1	5	1. 00	Valid
5	How do you give the opportunity for students to participate in the teaching?(Please clarify the methodology.)	+1	+1	+1	+1	+1	5	1. 00	Valid
6	How many methodologies for students'measurement and assessment, and do you think your measurement and assessment course can reflect students'learning effect and knowledge level ?	+1	+1	+1	+1	+1	5	1. 00	Valid
7	What Learning Tasks do you carry out to improve students' learning enthusiasm?	+1	+1	+1	+1	+1	5	1. 00	Valid

Table Appendix 2 (Continued)

No	Item	Experts'rating					Total	Mean	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
8	Do you provide the time for students after their regular class?If yes, how do you help students solve their difficulties?	+1	+1	+1	+1	+1	5	1. 00	Valid
9	Which aspects of your teaching need to be improved, or which aspects do you want the school to support you?	+1	+1	+1	+1	+1	5	1. 00	Valid
10	Previously, what problems do you meet in your teaching, and how do you find the solution?	+1	+1	+1	+1	+1	5	1. 00	Valid
	Total(In Overview)						**50**	**1. 00**	**Valid**

Note: Valid when≥0 .50

Table Appendix 3: Evaluation Results of IOC for instructional model

Item	Experts'rating					Total	MEAN	Results
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Utility Standard								
1. The result of questionaire from students have the benefit for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
2. The result of interview from lecturers have the benefit for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
Feasibility Standard								
3. The result of questionaire from students have the possibility for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
4. The result of interview from lecturers have the possibility for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
Propriety Standard								
5. The result of questionaire from students have the suitability for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
Feasibility Standard								

Table Appendix 3 (Continued)

Item	Experts'rating					Total	MEAN	Results
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
6. The result of interview from lecturers have the suitability for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
Accuracy Standard								
7. The result of questionaire from students have the accuracy for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
8. The result of interview from lecturers have the accuracy for Principle and Rationale	+1	+1	+1	+1	+1	5	1.00	Valid
Objectives:								
Utility Standard								
9. The objectives have benefit for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Feasibility Standard								
10. The objectives have possibility for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Propriety Standard								
11. The objectives have suitability for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Accuracy Standard								
12. The objectives have accuracy for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Contents:								

Table Appendix 3 (Continued)

Item	Experts'rating					Total	MEAN	Results
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Utility Standard								
13. The contents have benefit for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Feasibility Standard								
14. The contents have possibility for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Propriety Standard								
15. The contents have suitability for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Accuracy Standard								
16. The contents have accuracy for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Methods of teaching & materials:								
Project-Based Learning and the ADDIE Teaching Instructional Model								
Utility Standard								
17. The methods of teaching & materials have benefit for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Feasibility Standard								

Table Appendix 3 (Continued)

Item	Experts'rating					Total	MEAN	Results
	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
possibility for students.								
Propriety Standard								
19. The methods of teaching & materials have suitability for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Accuracy Standard								
20. The methods of teaching & materials have accuracy for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Evaluation:								
Utility Standard								
21. The evaluation has benefit for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Feasibility Standard								
22. The evaluation has possibility for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Propriety Standard								
23. The evaluation has suitability for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Accuracy Standard								
24. The evaluation has accuracy for students.	+1	+1	+1	+1	+1	5	1.00	Valid
Total(In Overview)						120	1.00	Valid

Note:Valid when≥ 0. 50

Table Appendix 4: Evaluation Results of IOC for rubric Observation

NO.	Item	Experts'rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	Ability to identify problems								
1	Standard 1: Obtain effective information on project activities	+1	+1	+1	+1	+1	5	1.00	Valid
2	Standard2: Attitude towards problems	+1	+1	+1	+1	+1	5	1.00	Valid
	Ability to analyze problems								
3	Standard 3: Able to accurately grasp driving issues	+1	+1	+1	+1	+1	5	1.00	Valid
4	Standard 4： Able to Propose problem-solving ideas	+1	+1	+1	+1	+1	5	1.00	Valid
	Ability to provide solutions								
5	Standard 5： Able to collaborate to solve problems	+1	+1	+1	+1	+1	5	1.00	Valid
6	Standard 6： Able to correctly apply methods to	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix 3: (Continued)

NO.	Item	Experts'rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
	solve problems								
	Evaluation and Reflection Ability								
7	Standard 7: Evaluate the effectivenes of the solution	+1	+1	+1	+1	+1	5	1.00	Valid
8	Standard 8: Reflection and learning	+1	+1	+1	+1	+1	5	1.00	Valid
	Total(In Overview)						40	1.00	Valid

Note:Valid when≥ 0. 50

Table Appendix 5: Evaluation Results of IOC for Lesson Plan

NO	Items	Experts'rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert4	Expert5			
	Learning Objective	+1	+1	+1	+1	+1	5	1.00	Valid
1	Complying with content of the course	+1	+1	+1	+1	+1	5	1.00	Valid
2	Covering knowledge, process, and attitude	+1	+1	+1	+1	+1	5	1.00	Valid
3	Being measurable in knowledge, process, and attitude	+1	+1	+1	+1	+1	5	1.00	Valid
	Contents	+1	+1	+1	+1	+1	5	1.00	Valid
4	Complying with learning objective	+1	+1	+1	+1	+1	5	1.00	Valid
5	Being appropriate in terms of time management	+1	+1	+1	+1	+1	5	1.00	Valid
	Project-Based Learning instructional models								

Table Appendix 5 (coutied)

NO	Items	Experts'rating					Total	MEAN	Results
		Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
6	Complying with the designed instructional model	+1	+1	+1	+1	+1	5	1. 00	Valid
7	Supporting students'learning	+1	+1	+1	+1	+1	5	1. 00	Valid
8	Including various activities	+1	+1	+1	+1	+1	5	1. 00	Valid
	Learning materials	+1	+1	+1	+1	+1	5	1. 00	Valid
9	Complying with the learning objectives	+1	+1	+1	+1	+1	5	1. 00	Valid
10	Complying with the contents	+1	+1	+1	+1	+1	5	1. 00	Valid
	Evaluation and Assessment								
11	Complying with the learning objectives	+1	+1	+1	+1	+1	5	1. 00	Valid
12	Including various methods and instruments	+1	+1	+1	+1	+1	5	1. 00	Valid

Note: Valid when ≥ 0.50

Table Appendix6: Evaluation Results of IOC for Leaning Report Scoring Criteria

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
1. Ability to identify problems						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard 1: Obtain effective information on project activities	Effectively obtaining, analyzing, and using information on project activities, able to identify key information and optimize project effectiveness.	Usually project activity information can be obtained and used, but improvement is needed in analysis and optimization.	Can obtain project information, but requires support to analyze and apply this information.	Limited access and use of project information, often requiring assistance from others.	Lack of ability and skills to obtain and use project activity information.	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix6 (Continued)

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard2: Attitude towards problems	Showing extremely high initiative, not only identify -ing problems, but also anticipating potential problems and developing preventive measures.	Proactively identifying and facing problems, but the identification and prevention of potential problems still need improvement.	Able to identify problems in obvious situations, but requires guidance and support to face and handle them.	Rarely proactively identifying problems, usually only with the guidance of others can they be identified and addressed.	Lack of initiative in identifying and handling problems, always requiring help and guidance from others	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix6 (Continued)

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
2. Ability to analyze problems						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard 1: Able to accurately grasp driving issues	Able to accurately identify and analyze the core factors and driving forces of a problem, demonstrating profound insights and analytical abilities.	Usually able to identify the core factors of the problem, but in-depth analysis and insight require further improvement.	Sometimes the core factors of a problem can be identified, but more support is needed to analyze and understand.	It is rare to identify the core factors of a problem and often requires analysis and guidance from others.	Lack of ability to identify and analyze the core factors of the problem.	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix6 (Continued)

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard 2: Able to propose problem-solving ideas	Always able to propose specific and innovative solutions, and be able to flexibly adjust solutions to different situations.	Usually specific solutions can be proposed, but there is room for improvement in innovation and flexibility.	Can propose basic solutions, but usually requires guidance and assistance from others.	Rarely able to independently propose solutions, often relying on others' ideas and solutions.	Unable to propose effective solutions.	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix6 (Continued)

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
3. Ability to provide solutions						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard 1: Able to collaborate to solve problems	Effectively collaborate with the team to develop and execute efficient and innovative solutions.	Collaborating with a team can provide valuable contributions, but there is still room for improvement in collaboration and execution.	Able to participate in team collaboration, but requires more support in terms of contribution and execution.	It is rare to provide valuable contributions within a team and often requires guidance and support from others.	Unable to effectively collaborate with the team or lacking collaborative skills.	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix6 (Continued)

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard 2: Able to correctly apply methods to solve problems	Mastering and applying multiple methods to solve problems, demonstrating a high level of skills and flexibility	Can apply basic methods to solve problems, but needs improvement in selecting and applying multiple methods.	Able to apply basic methods under clear guidance, but lacking flexibility and self adjustment ability.	Rarely can methods be used correctly to solve problems, often requiring detailed guidance from others.	Lack of ability and skills to use methods to solve problems	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix6 (Continued)

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
4. Evaluation and Reflection Ability						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard 1: Evaluate the effectiveness of The solution	Able to deeply and accurately evaluate the effectiveness of solutions and derive valuable insights from them.	Can evaluate the effectiveness of the solution, but may need to be enhanced in terms of depth and breadth.	Able to conduct basic plan evaluations, but requires more guidance and support to gain insights.	It is rare to independently and comprehensively evaluate the effectiveness of the plan, and often relies on the evaluation of others.	Lack of ability to evaluate the effectiven-ess of solutions, unable to learn and improve from execution.	+1	+1	+1	+1	+1	5	1.00	Valid

Table Appendix6 (Continued)

Items	5 points	4 points	3 points	2 points	1 points	Experts' rating					Total	MEAN	Results
						Expert 1	Expert 2	Expert 3	Expert 4	Expert 5			
Standard 2: Reflection and learning	Deeply reflect on the execution process and results, learn from experience and continuously improve oneself	Able to reflect and learn from it, but there is room for improvement in depth and practical application.	Conduct basic reflection and learn from it in a limited manner, usually requiring guidance from others to identify improvement points.	Very little reflection, limited ability to learn from experience.	Lack of basic reflective ability, unable to learn or improve from experience.	+1	+1	+1	+1	+1	5	1.00	Valid

Note:Valid when≥ 0. 50

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mrs. Tang Shangjie

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C2

Given on 22nd August 2021

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Acceptance Research

MHESI 8038.1/11

Mcu Ubonratchathani journal of Buddhist Studies (TCI.2)
Mahachulalongkornrajavidyalaya University, Ubon Ratchathani Campus

RESPONSE FOR PUBLICATION OF THE ARTICLE

23rd August 2023

The Editorial Department of Mcu Ubonratchathani journal of Buddhist Studies (TCI.2) MCU, Ubon Ratchathani Campus has considered the article

Title	DEVELOPMENT OF PROJECT-BASED LEARNING INSTRUCTIONAL MODEL TO IMPROVE PROBLEM-SOLVING ABILITY FOR UNDERGRADUATE STUDENTS
Writer	Tang Shangjie, Jittawisut Wimutipanya, Areewan Iamsa-ard and Suriya Phankosol
Publication Approval	Mcu Ubonratchathani journal of Buddhist studies (ISSN : 2774-0463 (Online)) Mahachulalongkornrajavidyalaya University, Ubon Ratchathani Campus
Period of Publication	5th Year, Volume III (September-December, 2023)

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 Mcu Ubonratchathani journal of Buddhist studies (TCI)
Mahachulalongkornrajavidyalaya University,
Ubon Ratchathani Campus

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