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

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Thesis Title Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students

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ABSTRACT

The objectives of this research were 1) to examine the factors to enhance problem solving ability for undergraduate students in Guangxi Province 2) to develop Problem-based learning instructional model to enhance problem solving ability for undergraduate students in Guangxi Minzu University and 3) to study the results of implementing problem-based learning instructional model to enhance problem solving ability for undergraduate students in Guangxi Minzu University. The population in Phase 1 were 200 former students of Legal Logic Course first semester of 2022 from 3 universities in Guangxi Province. There were 3 experts in phase 2 to confirm problem-based learning instructional model in Guangxi Minzu University, and there were 50 students who enrolled in Legal Logic Course from Class A were obtained by cluster random sampling in Guangxi Minzu University in Phase 3. The research instruments were 1) a set of questionnaires for students and interview for lecturers 2) a set of questionnaires for confirming instructional model 3) Lesson plan and 4) Scoring rubric. Data were statistically analyzed by percentage, mean, standard deviation, data analytics statistics for confirmation of instructional model and data analytics for scoring rubric.

The results were found that:

1. The impact of external and internal factors on students' problem-solving ability comes from both students and lectures. Internal factors were physical, physical, psychological, motivation, knowledge, attitude and external factors were social environment, materials, teaching methods, class size, and evaluation.

2. Problem-based learning instructional model to enhance problem solving ability for undergraduate students was 100% confirmed to utility standards, feasibility standards, propriety standards and accuracy standards as assessed by 3 specialists. It includes 5 components: 1) Principle and Rationale, 2) Objectives, 3) Contents, 4) Method of teaching & materials and 5) Evaluation.

3. The results of implementing problem problem-based learning instructional model enhance problem solving ability for undergraduate students. It was found that 96% of 50 students whose problem solving ability is at good level while another 4% of them are assessed to be at medium level. The result is consistent with the research hypothesis that 80% upwards of the participants will have problem solving ability at good level after learning through problem-based learning instructional model.

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

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Introduction

Rationale

The Legal Logic course plays a crucial role in the education and training of law students. It is of immense importance in the legal education curriculum as it equips law students with fundamental skills and knowledge essential for their future legal careers. The Logic of Law course is a tool discipline, mainly for enhancing people's legal theory and problem-solving ability. It should teach the logic and effectiveness of reasoning. Embedding problem-solving activities into tutorials enables law students to apply their new knowledge and skills to realistic scenarios. Researchers generally agree that across all disciplines, good teachers are concerned with developing students' problem-solving skills. Trudeau (2013) focuses on enhancing law students' ability to recognize and address client-specific problems through legal writing courses. It argues that a lawyer's ability to problem solve is a crucial tool and discusses how legal education can connect students' legal knowledge and skills with the needs of diverse client populations.

Functionally, legal logic is a tool discipline, mainly for people's legal theory and problem solving ability, should teach the logic and effectiveness of reasoning; in order to improve students' problem solving and critical thinking. The Legal Logic course provides law students with the necessary skills to problem solving, critical thinking, analyze legal issues, interpret legal norms, conduct investigations, and construct persuasive arguments.

Law discipline is a practical discipline, if it does not have the ability to solve practical legal problems, it is not a qualified law school graduate. Due to the influence of traditional educational concepts, Chinese's students lack the ability to think and do with independent thinking. The main learning goals of students are through various examinations and assessments. At the stage of learning the basic knowledge in schools, colleges and universities are only limited to the explanation of legal concepts and students' dead memories of legal norms. In the face of actual legal issues, many students do not use the basic knowledge they have learned to solve the legal problems encountered in life. At the same time, the school rarely

takes into account students' personal development direction and work needs, which leads to too much knowledge of students. It makes law students have a wealth of theoretical basic knowledge, But the ability to solve legal problems is not enough.

Problem-Based Learning (PBL), initially pioneered in medical education as a method of small-group instruction, has expanded its reach to encompass large undergraduate classes across various disciplines. Research indicates that PBL notably enhances undergraduate students' communication and problem-solving skills, suggesting that conventional educational frameworks may fall short in nurturing these essential competencies for effective collaboration and professional problem-solving. A key benefit of PBL, as supported by multiple studies, is its efficacy in fostering problem-solving abilities in students, particularly in small, tutor-led group settings (Berkson, 1993; Gallagher et al., 1992); Strobel and Van Barneveld (2009). While (Norman & Schmidt, 1992) concur that PBL aids in the development of problem-solving skills, they contend that this enhancement is confined to the specific subject area and argue against the transfer-ability of these skills to other contexts (Klegeris et al., 2017).

The Problem-based learning instructional model has been widely recognized as an effective approach to enhance problem-solving abilities among undergraduate students. This model focuses on active learning, student engagement, and the application of knowledge to real-world situations (Capon & Kuhn, 2004). Problem-Based Learning is an instructional model that can be highly effective in enhancing problem-solving abilities for undergraduate students. PBL shifts the focus from traditional lecture-style teaching to a student-centered approach that promotes active learning, critical thinking, and problem-solving skills (Hasanah et al., 2023). Problem-solving skills to law students is directly relevant to the practice of law Institutes of higher education are encouraging active learning and development of skills relevant to the 21st century, including problem solving (Rahman, 2019).

PBL shifts the learning process from passive absorption of information to active engagement. Instead of solely relying on lectures and textbook learning, students are actively involved in solving authentic, complex problems. This active learning approach stimulates critical thinking, creativity, and analytical skills necessary for effective problem-solving (Choo et al., 2011). In PBL, students take ownership of the learning process by identifying and exploring problems independently or in

groups. Problem-Based Learning encourages collaboration and teamwork among students. Through PBL, undergraduate students not only acquire problem-solving skills but also develop lifelong learning skills (By researcher).

The majority of research on the effectiveness of PBL is focused on its traditional use in small, tutor-led group settings of medical and dental schools, where PBL has been shown to improve student satisfaction. Johnson (1999) pointed out that the development of a problem-based learning instructional model for the "Legal Logic" course aims to provide undergraduate students with a solid foundation in legal reasoning and problem-solving abilities. By actively engaging in practical problem solving activities, students will develop the necessary skills to excel in legal analysis and make informed judgments within the legal field.

Investigations into the effects of cognitive diversity on problem-solving ability suggest that PBL, particularly in team-based formats, can significantly enhance the problem-solving outcomes of students. By exposing students to diverse viewpoints and problem-solving approaches, PBL prepares them to tackle a wide array of challenges more effectively. Problem-solving ability is highly important for undergraduate students, particularly those majoring in law. The Legal Logic course plays a crucial role in the education and training of law students. It is of immense importance in the legal education curriculum as it equips law students with fundamental skills and knowledge essential for their future legal careers. The Logic of Law course is a tool discipline, mainly for enhancing people's legal theory and problem-solving ability.

The shift towards active learning environments like PBL is a response to the need for developing critical thinking and self-directed learning among students. These environments provide the necessary context and challenges for students to actively engage in learning, thereby enhancing their problem-solving skills (Manuaba et al., 2022).

Problem-solving ability is crucial for law students who will eventually become practicing lawyers. It equips them with the critical thinking, analytical, and reasoning skills necessary to excel in legal studies, conduct comprehensive legal research, construct persuasive legal arguments, provide effective legal advice, and navigate ethical considerations. By developing problem-solving skills, law students can lay a

strong foundation for a successful career in the legal field. (Guangxi Minzu University, 2022)

In conclusion, the application of PBL is a strategic response to the identified gaps in problem-solving abilities among undergraduate students. By focusing on active, collaborative, and student-centered learning, PBL addresses the need for critical thinking, effective communication, and adaptive learning strategies, thereby enhancing the overall problem-solving capabilities of undergraduate students. This approach aligns with the goal of developing robust, adaptable, and skilled graduates capable of navigating the complex problems of the modern world.

Students' problem-solving ability can be improved by learning and using the instruction model. Functionally, legal logic is a tool discipline, mainly for people's legal theory and problem solving ability, should teach the logic and effectiveness of reasoning; in order to improve students' problem solving and critical thinking. The Legal Logic course provides law students with the necessary skills to problem solving, critical thinking, analyze legal issues, interpret legal norms, conduct investigations, and construct persuasive arguments. Problem-solving ability is crucial for law students who will eventually become practicing lawyers. Logic and probability theory are fundamental in decision-making, thinking, communicating, problem-solving, and reasoning. He suggests that these tools are increasingly being used across various disciplines and industries, including law.

These research findings collectively indicate that implementing a Problem-Based Learning instructional model holds promise for improving problem solving abilities across various disciplines and educational contexts. The PBL approach promotes critical thinking, collaborative problem-solving, integration of knowledge, and practical application, all of which contribute to enhancing students' problem-solving competence.

As the rational above found that, the important of studying “Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students”, To equip law students with better professional skills and better adapt to future development. Develop a new instructional model to enhance undergraduate students’ problem solving ability with the expectation that the research findings can be used in actual teaching and as a teaching guide for legal logic teachers.

Research questions

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

2. Is problem-based learning instructional model for enhancing problem solving ability of undergraduate students in Guangxi Minzu University appropriate for further implementation and how?

3. What are the results of implementing problem-based learning instructional model for enhancing problem solving ability of undergraduate students in Guangxi Minzu University?

Research objectives

1. To examine the factors to enhance Problem solving ability for undergraduate students in Guangxi Province.

2. To develop Problem-based learning instructional model to enhance problem solving ability for undergraduate students in Guangxi Minzu University.

3. To study the results of implementing problem-based learning instructional model to enhance problem solving ability for undergraduate students in Guangxi Minzu University.

Research hypotheses

After implementing problem-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 145 students from 3 classes of students with different learning achievements who enrolled in The Legal Logic Course at Guangxi Minzu University in semester 1 academic year 2023. Those sections involve the following.

Class A 50 students

Class B 50 students

Class C 45 students

The sample group

The 50 students who enrolled in The Legal Logic Course from class A are obtained by simple cluster random sampling.

Independent variable

Problem-based learning instructional model

Dependent variable

Students' problem solving ability

Contents

There are 10 Units, 32 hours in Legal Logic Course. The content is shown below:

Unit 1: Introduction (2 hours)

Unit 2: Logical Basis of Legal Thinking (Part 1) (6 hours)

Unit 3: Logical Basis of Legal Thinking (Part 2) (7 hours)

Unit 4: Investigation logic (3 hours)

Unit 5: Interpretation Logic of Legal Norms (Part 1) (2 hours)

Unit 6: Interpretation Logic of Legal Norms (Part 2) (2 hours)

Unit 7: Application logic of legal norms (2 hours)

Unit 8: Legal Argument Logic (Part 1) (3 hours)

Unit 9: Legal Argument Logic (Part 2) (3 hours)

Unit 10: Legal Arguments Logic (Part 3) (2 hours)

According to experiment in this study, the researcher chose Unit 2, Unit 3, Unit 4.

Time frame

Semester 1 of academic year 2023 (September – December 2023)

Advantages

To the students: Let the students understand the reasoning method and practical application of legal logic and help the students to use the reasoning of legal logic to solve the practical legal problems, Improving their problem-solving ability.

To the lectures: For the traditional teaching mode, the new teaching mode is conducive to teachers' timely understanding of students' dynamics and mastery of knowledge points and is more targeted in the process of lesson teaching.

To the institute: The new teaching method can provide help to other teachers ' teaching, which is of great help to improve teachers' teaching level and improve students' professional knowledge and problem-solving ability.

Definition of Terms

The factors affecting the problem solving ability 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 problem-based learning instructional model refers to a new instructional framework which consists of the stable teaching activities and procedures. Such a developed instructional model with 6 components: 1) Rationale & Principle, 2) Objectives, 3) Contents, 4) Methods of teaching & Materials, and 5) Evaluation is confirmed by the experts in 4 aspects: 1) Utility Standards, 2) Feasibility Standards, 3) Propriety Standards and 4) Accuracy Standards (Stufflebeam, 2012) as the follows:

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

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

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

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

Problem-Based Learning model refer to a teaching method that constitutes a novel instructional model based on constructivism methods. It is designed to align with curriculum requirements, placing the development of students' problem-solving abilities at its core (Hmelo-Silver, 2004). The approach involves teacher guidance and fosters teacher-student interaction and cooperation as fundamental elements (Savery & Duffy, 1995). Problem-based learning is an instructional method that

initiates students' learning by creating a need to solve an authentic problem. During the problem solving process, students construct content knowledge and develop problem-solving skills as well as self-directed learning skills while working toward a solution to the problem. PBL aims to guide students in solving problems using their existing knowledge (Hung et al., 2008).

The mode mostly adopts the dialogue and discussion teaching, and the information is cross carried out between teachers and students, and between students and students. The concrete implementation steps are as follows(IQAC Training Literature 20 /21):

Step 1: The formulating the expected learning outcome. Teachers set teaching objectives that are expected to be achieved so that students can identify what they are learning.

Step 2: Understanding the concept of the teaching materials. Teachers first understand the concept of teaching materials and content, so that students can understand the need to grasp the knowledge and faster into the state of learning.

Step 3: Problem-solving Skill training. Teachers will perform a series of exercises to improve problem-solving skills so that students can solve problems more quickly in the curriculum.

Step 4: Designing solutions to the problem. Teachers Guide students to apply relevant knowledge and problem-solving skills, so that students can put forward a variety of feasible problem-solving solutions in various situations.

Step 5: Executing problem solutions. The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. The teacher evaluates the solutions and results of the students' problems solutions, so that the students can make clear their problems and make positive adjustments.

Problem solving ability refers to the capacity of individuals to identify, analyze, and generate effective solutions to complex problems or challenges. The problem-solving ability of this paper refers to the students have ability in 3 aspects : 1) The attitude of problem solving, 2) The methods of problem solving, 3) The quality of problem solving (Huang & Chen, 2004).

1) The attitude of problem solving

The studied can measure by 3 Standard:1) Confidence to solve the problem, 2) The motivation to solve problems,3) Self-control of problem solving.

2) The methods of problem solving

The solution to the problem can be determined using these standards 1) The diversity of problem solutions, 2) The rationality of using the relevant knowledge, 3) Operability of the problem solutions.

3) The quality of problem solving

The studied can measure it based on the following criteria Standard 1) Effectiveness and rationality of problem-solving strategies, 2) Efficiency of the problem-solving process, 3) Quality of the problem-solving results.

Undergraduate students refer to students majoring in law who enrolled legal logic course semester 1 in academic year 2023 at Guangxi Minzu University.

Guangxi Minzu University refers to government university in the Nanning city, and it is a local application-oriented undergraduate institution. It is a public full-time general undergraduate college.

Research Framework

Based on the research objectives, relevant theories are compiled and studied Problem-based Learning and problem-solving ability (Liu, 2015). Confirmed in 4 aspects: 1) Utility Standards, 2) Feasibility Standards, 3) Propriety Standards and 4) Accuracy Standards (Stufflebeam, 2012), The Legal Logic Course (Guangxi Minzu University, 2022). These thoughts and principles are employed as the foundation of the following research framework as shown in figure 1.1.

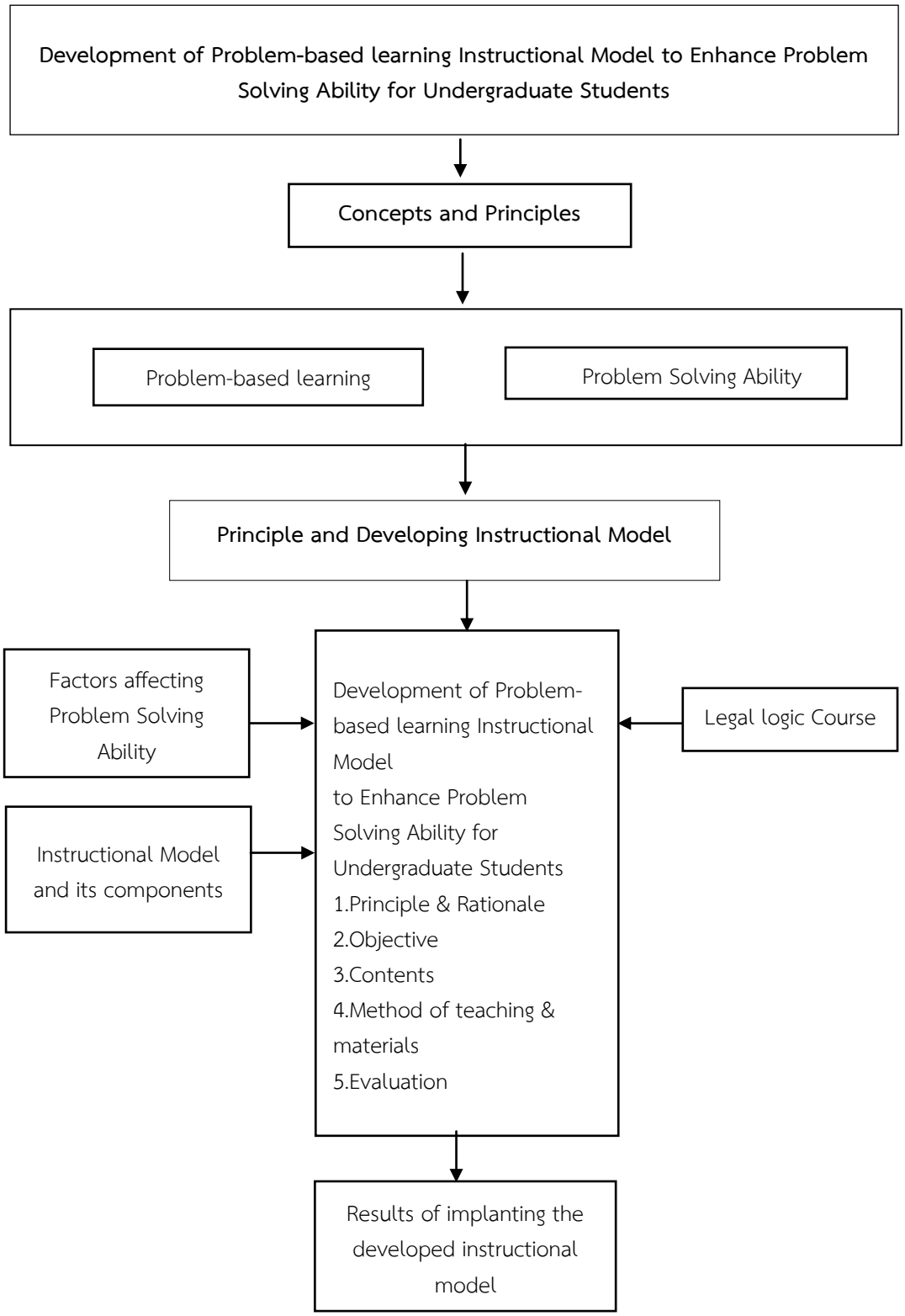

Figure 1.1 Research Framework

Chapter 2
Literature Review

In the study of “Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students”, the researcher studied the documents concerning the following.

1. Legal Logic Course
2. Development of Problem-based learning Model
3. Problem solving ability
4. Related Research

The details are as follows.

Legal Logic Course

Principle

The Principle of Legal Logic course is designed to provide students with a comprehensive understanding of the fundamental principles and concepts that govern legal reasoning and argumentation. The course explores the application of logic within the legal context, focusing on how legal professionals analyze, interpret, and construct arguments in legal proceedings. By the conclusion of the course, students will have honed their problem-solving skills to facilitate effective legal analysis and sharpened their ability to construct logical arguments in the field of law.

Problem solving ability refers to the capacity of individuals to identify, analyze, and generate effective solutions to complex problems or challenges. The students can pass problem solving ability by testing paper consists of three test items under standard, each of standards are rubric score (Liu, 2015):

Objectives

1. The students can master the main knowledge of the Logic reasoning method.

2. The students can use knowledge to complete relevant.

3. The students can train and improve their logical thinking ability and legal problem-solving ability of law major students (Guangxi Minzu University, 2022).

Curriculum structure

There are 10 Units, 32 hours in Legal Logic Course. They are respectively Introduction, Logical Basis of Legal Thinking (Part 1), Logical Basis of Legal Thinking (Part 2), Investigation logic, Interpretation Logic of Legal Norms (Part 1), Interpretation Logic of Legal Norms (Part 2), Application logic of legal norms, Legal Argument Logic (Part 1), Legal Argument Logic (Part 1), Legal Arguments Logic (Part 3).

The curriculum structure provided here is a general framework and can be adapted or customized by educational institutions according to their specific requirements, time constraints, and additional learning objectives. (Guangxi Minzu University, 2022)

Table 2.1 Chapters and contents used in the present study

Unit	Chapter	Contents	Times (32 hrs.)
1.Introduction	1.1 Logic and Thinking 1.2 The Research Content and Significance of Legal Logic	Research content, commonly used models, and methods of legal logic	2 hrs.
2.Logical Basis of Legal Thinking (Part 1)	2.1Overview of deductive logic 2.2 Simple proposition 2.3 Simple Proposition Reasoning 2.4 Compound propositional 2.5 Compound propositional reasoning	Simple and compound propositions and their reasoning methods	6 hrs.
3.Logical Basis of Legal Thinking (Part 2)	3.1Overview of inductive logic 3.2 induction 3.3 analog inference 3.4 abduction	Types of Inductive reasoning and logical requirements of	7 hrs.
4.Investigation logic	4.1Overview of Investigation Logic	The Characteristics and Methods of Investigation Logic	3 hrs.

Table 2.1 (Continued)

Unit	Chapter	Contents	Times (32 hrs.)
	4.2 Investigation Interpretation 4.3Investigative hypothesis		
5.Interpretation Logic of Legal Norms (Part 1)	5.1The Logical Method of Searching for Legal Norms 5.2Reasoning on the Choice of Legal Norms	The logical mode of legal norms and the basic content of legal norm selection reasoning	2 hrs.
6.Interpretation Logic of Legal Norms (Part 2)	6.1The Logical Method of Proposition Analysis 6.2The Logical Method of Conceptual Analysis 10.2Evaluation of Legal Debate	Key points such as the types, definitions, and divisions of various standardized propositional methods and concepts	2 hrs.
7.Application logic of legal norms	7.1Aristotelian logic of the application of law 7.2legal analogy 7.3Normal Propositional calculus natural reasoning 7.4Canonical Predicate logic natural reasoning	Various types of Aristotelian logic applicable to law, and rules and methods of analogy and reasoning	2 hrs.
8.Legal Argument Logic (Part 1)	8.1Overview of Legal Debate 8.2The Logical Law of Legal Debate 8.3Rules of Legal Debate	Various logical laws and rules of legal debate	3 hrs.
9.Legal Argument Logic (Part 2)	9.1The Basic Methods of Legal Debate 9.2Legal defense 9.3Legal Debate	Various basic methods of legal debate, characteristics and commonly used methods of legal defense and legal debate	3 hrs.
10.Legal Arguments Logic (Part 3)	10.1The Construction of Legal Debate 10.2Evaluation of Legal Debate	Method, Requirements, Steps, and Element Evaluation of Legal Debate	2 hrs.

Unit 2, 3, 4 is chosen by the research for implementing the developed model in the present study.

The factors affecting the problem solving ability

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.

Lin and Yang (2021) explored both internal and external factors affecting students' learning experiences. Explored both internal and external factors affecting students' learning experiences. They defined internal factors as personal attributes such as personality, self-esteem, and attribution style. These factors significantly influence students' enthusiasm and attitude towards learning. On the other hand, external factors are identified as environmental elements including school factors (like learning pressure and teaching environment), and family factors (such as parenting style and family economic status). These external elements also play a crucial role in shaping students' academic experiences and their susceptibility to burnout.

Li and Han (2022) studied about the research on boredom in language learning among Chinese university students highlights both learner-internal and learner-external factors. Learner-internal factors include personal attributes and attitudes towards learning, while learner-external factors encompass elements like teaching methods, course content, and classroom environment. Their study emphasizes the complex interplay between these internal and external factors in shaping students' learning experiences and emotional responses.

Wulandari et al. (2020) In their case study on the difficulties in learning English, Wulandari, Surtikanti, and Agung analyze both internal and external factors. Internal factors include students' health conditions, interests, motivation, and study habits, while external factors involve teaching methods, media used by teachers, and the classroom environment. Their findings suggest that both sets of factors

significantly impact students' learning difficulties, with a notable influence of teaching methods and student motivation.

Liu et al. (2017) studied on technology use in language teaching, examine the perceptions of pre-service Chinese-language teachers regarding internal and external barriers to instructional technology use. Internal barriers identified include teachers' negative attitudes and lack of technology-related knowledge. External barriers encompass issues like lack of technology, difficulty accessing available technology, lack of technical support, improper assessment methods, and negative parental attitudes. This study highlights the significant impact of both internal and external factors on the effective integration of technology in teaching.

Development of Problem-based learning Model

The full name of PBL teaching mode is "problem-based learning", which is directly translated as "problem-based learning". PBL theory originates from Dewey's educational philosophy: learn by doing and stimulate students' potential in teaching. Attract students to learn and stimulate their learning motivation by life experience and construct their knowledge and skills when solving practical problems. In 1969, barrows, a professor of Neurology in the United States, first introduced PBL into the field of medical education at McMaster University in Canada. In 1980, he carried out problem-oriented learning and student-centered learning (Dolmans & Schmidt, 2010).

Schoenfeld (1992) adapted the research work of Polya (1975) and distinguished between five episodes of cylindrical stages in solving problems are: 1) problem survey, 2) stimulation and initiation of knowledge, 3) make a plan, 4) carry out the plan, and 5) check the answer.

Polya (1945) cited by Selcuk et al. (2008), (Barrows, 1996) assigns that the process of Problem-based learning can be divided into five stages: the problem analysis stage, the information gathering stage, Synthesis stage, Abstract stage, Reflection stage.

Barrows and Tamblyn (1980) assigns that the processes of PBL as follows: Problem introduction, Problem situation plausibility, Encouraging learners to develop reasoning ability through systematic problem solving, Identifying learning needs, guiding independent research, Applying the knowledge and skills acquired from

research to original problems, evaluating learning efficiency and strengthening learning, Summarizing and integrating original knowledge.

Kale and Akcaoglu (2020) indict that problem-solving stages and relevant questions: Problem Identification, Generating Solutions, Reflection on Process.

Summarize above opinions, the Problem-Based Learning (PBL) approach in a legal logic course involves stimulating students' potential and motivation to learn by engaging in practical problem-solving experiences, guiding independent research, and applying acquired knowledge to original legal problems, with an emphasis on reflection for continual improvement.

The important of problem based learning model

There are many academic educators defined about the Components of problem based learning model as follows:

Birch (1986) consider that Problem-based learning is argued to be the most effective means of developing the general qualities of mind of the student, to securing an integration of academic and operational approaches to higher education and to instilling a high level of motivation and a capacity for active learning.

Thomas (2000) defined a directive model as a structured framework that guides the design and implementation of problem-based learning (PBL) tasks. The effectiveness of PBL as an instructional method probably depends to a great extent on the incorporation of a range of supports to help students learn how to learn. This model encompasses several key elements that are crucial for enhancing problem-solving ability in undergraduate students.

Gregson et al. (2010) defined a directive model as an instructional framework that encompasses problem-based learning (PBL). In this model, PBL serves as a critical approach rooted in social constructivism, facilitating student engagement, discussion, collaboration, and consensus-building through the sharing of individual assignments within a group setting.

In summary, the experts' opinions highlight the directive model as a structured framework that incorporates PBL to enhance undergraduate students' problem solving abilities. PBL, within this model, facilitates active knowledge construction, collaboration, and critical thinking, leading to a deeper understanding of the subject matter and the exploration of diverse perspectives. (By researcher)

Components of development curriculum

There are many academic educators defined about the Components of problem based learning model as follows:

Sand et al. (1960) attempts to identify four components of the curriculum: (a) objectives, including both behavioral and content components; (b) types and quality of opportunities for learning, including organizing centers for learning; (c) organizing threads and patterns of organization; and (d) evaluation procedures.

Nathanson (1994) suggests that what teachers should do in the design of instruction is to synthesize general problem-solving skills and context-specific knowledge.

Kranthi (2017) consider that the Components of an Effective Curriculum Development Process that include eleven components, each of these components is addressed in the sections: A. Planning, B. Articulating and Developing, C.Implementing, D.Evaluating.

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

The development of problem-based learning instructional model

To ensure the appropriateness of developed instructional model before implementation, Such a developed instructional model with 5 components: 1) Principle & Rationale, 2) Objectives, 3) Contents, 4) Methods of teaching & Materials and 5) Evaluation, the developed instructional model is confirmed depending on program evaluation standards in 4 aspects: 1) Utility Standards, 2) Feasibility Standards, 3) Propriety Standards and 4) Accuracy Standards (Stufflebeam, 2012)

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

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

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

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

Method of teaching of problem based learning model

Problem-based learning started from Case Western University in the United States in the 1950s and McMaster University in Canada in the 1960s. Based on discovery learning and case study, it created more appropriate learning goals for learners and gradually spread to other countries from 1970 to 1980.

There are many academic educators defined about the method of teaching of problem-based learning model as follows:

Barrows (1996) assigns that the process of Problem-based learning can be divided into five stages, as follows. 1) the problem analysis stage: learners are divided into groups and assigned a catalyst to present problems, generate preliminary solutions, and then identify learning topics; 2) the information gathering stage: start self-directed learning, and learners must collect relevant information; 3) Synthesis stage: Learners gather again and evaluate the information they have obtained; 4) Abstract stage: After completing the task, summarize and summarize what they have learned; 5) Reflection stage: Learners conduct self-evaluation and peer review after reviewing the learning process. Therefore, in the process of Problem-based learning, learners must evaluate the source of knowledge obtained, and then analyze how to solve problems.

Barrows and Tamblyn (1980) assigns that the processes of PBL as follows. 1) Problem introduction, 2) Problem situation plausibility, 3) Encouraging learners to develop reasoning ability through systematic problem solving, 4) Identifying learning needs, guiding independent research, 5) Applying the knowledge and skills acquired from research to original problems, evaluating learning efficiency and strengthening learning, 6) Summarizing and integrating original knowledge.

IQAC Training Literature 20 /21 consider that Problem-based learning (PBL) is an instructional method and it have seven steps, consisting of: 1) the formulating the expected learning outcome, (2) understanding the concept of the teaching materials, (3) skills training, (4) designing the project theme, (5) making the project proposal, (6) executing the tasks of projects and (7) presentation of the project report.

Nite (2017) found that in order to solve problems that are not routine that require the ability to solve problems students must be able to go through the stages

of problem solving as formulated by Polya (1954) states in solving problem solving there are four steps that must be done, namely: (1) understanding the problem, (2) plan the solution, (3) carry out the problem according to plan and (4) re-check all the steps undertaken.

Summary method of teaching of problem-based learning model in Table 2.2 Summary method of teaching of problem-based learning model.

Table 2.2 Summary method of teaching of problem-based learning model.

Barrow (1996)	Barrows and Tamblyn (1980)	IQAC Training Literature 20 /21	Nite (2017)
1) The problem analysis stage 2) The information gathering stage 3) Synthesis stage 4) Abstract stage 5) Reflection stage	1) Problem introduction 2) Problem situation plausibility, 3) Encouraging learners to develop reasoning ability through systematic problem solving 4) Identifying learning needs, guiding independent research 5) Applying the knowledge and skills 6) Summarizing and integrating original knowledge.	1) The formulating the expected learning outcome, 2) understanding the concept of the teaching materials, 3) skills training, 4) designing the project theme, 5) making the project proposal, 6) executing the tasks of projects and 7) presentation of the project report.	1) Understanding the problem, 2) plan the solution, 3) carry out the problem according to plan and 4) re-check all the steps undertaken.

From above the researcher choose of IQAC Training Literature 20 /21 step to teach in this course.

The concrete implementation steps are as follows: 1) the formulating the expected learning outcome, 2) understanding the concept of the teaching materials, 3) Problem-solving skill training, 4) Designing solutions to the problem, 5) executing problem solutions, 6)Summary and evaluation. (By researcher)

These stages highlight the iterative nature of PBL, where learners actively engage in problem-solving, independent research, and critical thinking to develop their reasoning abilities and integrate new knowledge. (By researcher)

Roles of teachers and students

Roles of teachers

In the Problem-Based Learning (PBL) teaching process outlined, the teacher assumes a multifaceted role. Initially, the teacher serves as a guide in understanding the teaching materials and formulating expected learning outcomes. They play a crucial role in defining what students need to learn and guiding them to identify the problems that require attention. The teacher's responsibilities extend to facilitating group work by dividing students into teams during the problem analysis phase. They also act as a model problem solver, encouraging learners to develop reasoning abilities by asking questions and exploring underlying issues. Moreover, teachers guide independent research and problem-solving, fostering students' autonomy and exploration. In the final phase, the teacher evaluates the learning outcomes, providing feedback and summarizing the proposed solutions from each group.

Roles of students

Throughout the Problem-Based Learning process, students actively engage in various roles. In the initial phase, they define the problem and identify issues that need addressing. During problem analysis, students collaborate within their groups, communicate ideas, and analyze potential solutions collectively. As the teacher encourages reasoning ability development, students actively participate in discussions, sharing their insights and building on each other's knowledge. In the independent research and problem-solving stage, students take the lead in writing reports on their group's work, proposing solutions, and evaluating possible problem resolutions. They independently explore, find relationships between cases, and engage in self-directed learning. During the evaluation phase, students assess the effectiveness of their problem-solving approaches, contributing to group collaborative learning. Overall, students play a central role in constructing meaning from learned knowledge, solving problems, and actively participating in the PBL process.

Strengths and weaknesses of problem-based learning

In the problem-based learning instructional model, teachers guide and support students' learning, while students take an active role in problem-solving, collaboration, and reflection. This collaborative and student-centered approach fosters critical thinking, problem-solving abilities, and enhances students' overall learning experience.

Strengths of problem-based learning

Problem-based learning promotes active engagement and participation of students in the learning process. Students actively explore and solve real-world problems, which enhances their critical thinking, problem-solving skills, and deep understanding of the subject matter.

Problem-based learning connects learning to real-life situations, allowing students to apply their knowledge and skills in authentic contexts. This relevance fosters a deeper understanding of the subject matter and helps students see the practical applications of what they are learning.

Problem-Based Learning encourages collaborative learning as students work together in small groups to solve problems. This collaboration enhances communication, interpersonal skills, and the ability to work effectively as a team, mirroring real-world professional environments.

Problem-Based Learning stimulates higher-order thinking skills such as analysis, synthesis, evaluation, and problem-solving. Students are challenged to think critically, make connections, and generate innovative solutions, which prepares them for complex problem-solving in their future careers.

Student motivation and engagement: Problem-Based Learning typically presents students with intriguing and challenging problems, which can increase their motivation and engagement in the learning process. The active and student-centered nature of PBL can foster a sense of ownership and autonomy in students' learning journey.

Weaknesses of problem-based learning

Problem-based learning can be time-consuming for both teachers and students. The process of identifying and analyzing problems, conducting research, and developing solutions may require more time compared to traditional

instructional methods. This can be a challenge within the constraints of a fixed curriculum.

Problem-based learning often involves open-ended problems that do not have clear-cut solutions. This ambiguity can be uncomfortable for some students who are used to more structured learning environments. It may also create uncertainty for teachers who need to navigate the learning process without predetermined outcomes.

In group based PBL, there is a risk of unequal participation among group members. Some students may contribute more actively, while others may rely on their peers. Managing group dynamics and ensuring equitable participation can be a challenge for teachers.

Problem-Based Learning requires skilled facilitation from teachers to ensure that students stay on track, maintain focus, and acquire the necessary knowledge and skills. Inexperienced facilitators may struggle to provide effective guidance and support throughout the PBL process.

Assessment challenges: Assessing student learning in Problem-Based Learning can be complex. Traditional forms of assessment, such as exams, may not adequately capture the skills and competencies developed through PBL. Designing and implementing appropriate assessment methods that align with the objectives of PBL can be a challenge.

Summary the connection from method of teaching problem-based learning model and problem solving ability in table 2.3

Table 2.3 Summary the connection from method of teaching problem-based learning model and problem solving ability

Unit /hrs.	Problem based learning model						Problem solving ability			Instruments / Activities
	S1	S2	S3	S4	S5	S6	Item 1 St.1	Item2 St.2	Item3 St.3	
Unit 2: Logical Basis of Legal Thinking (Part 1) (6 hours)	The formulating the expected learning outcome	Understanding the concept of the teaching materials	Problem-solving skill training	Designing solutions to the problem	Executing problem solutions	Summary and evaluation	The attitude of problem solving	The methods of problem solving	The quality of problem solving	Scoring Rubric
Unit 3: Logical Basis of Legal Thinking (Part 2) (7 hours)	The formulating the expected learning outcome	Understanding the concept of the teaching materials	Problem-solving skill training	Designing solutions to the problem	Executing problem solutions	Summary and evaluation	The attitude of problem solving	The methods of problem solving	The quality of problem solving	Scoring Rubric
Unit4: Investigation logic (3 hours)	The formulating the expected learning outcome	Understanding the concept of the teaching materials	Problem-solving skill training	Designing solutions to the problem	Executing problem solutions	Summary and evaluation	The attitude of problem solving	The methods of problem solving	The quality of problem solving	Scoring Rubric

S – Step, L – Learner – St. – Standard

Step to teach problem-Based Learning mode are as follows:

Step 1: The formulating the expected learning outcome.

Step 2: Understanding the concept of the teaching materials.

Step 3: Problem-solving skill training.

Step 4: Designing solutions to the problem.

Step 5: Executing problem solutions.

Step 6: Summary and evaluation.

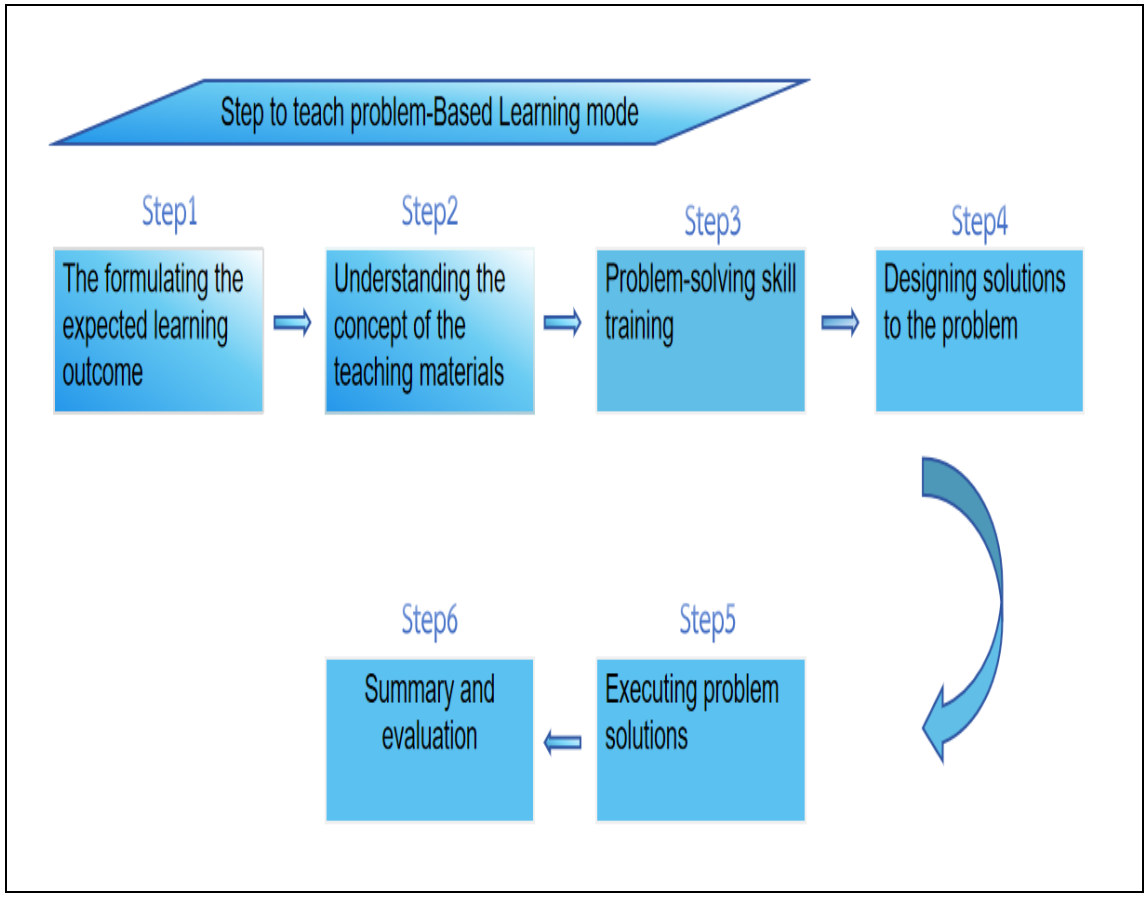

Figure 2.1 The step of development instructional model

Problem solving ability

Background

Problem solving ability is a habit of facing problems and the ability to deal with problems. This ability is reflected in when a person encounters a problem, he can independently and actively seek solutions, deal with the problem in a planned, methodical and step-by-step manner, and properly, reasonably and effectively solve the problem. (Yin & Desierto, 2016) refers to the ability of law students to effectively utilize the legal principles, theories, statutes, and precedents they have learned to analyze and solve legal problems. It involves the practical implementation of acquired legal knowledge to address real-life legal scenarios, develop legal strategies, and propose appropriate solutions or courses of action. Furthermore, this application requires a comprehensive understanding of the legal context, the ability to identify relevant information, and the skill to apply the appropriate legal reasoning and methodologies to reach well-grounded and legally sound conclusions (Mayer, 1992). Ultimately, the successful application of relevant legal knowledge and skills is crucial for developing competent legal professionals capable of handling complex legal challenges in various professional settings.

Hung et al. (2008) consider that a process of understanding the discrepancy between current and goal states of a problem, generating and testing hypotheses for the causes of the problem, devising solutions to the problem, and executing the solution to satisfy the goal state of the problem.

Yin and Desierto (2016) emphasized that problem-solving ability encompasses critical thinking, logical reasoning, creativity, adaptability, and the application of relevant knowledge and skills. Furthermore, they emphasized the importance of teaching problem-solving as a vital component of the learning process. They also identified four factors influencing students' problem-solving ability, namely knowledge, confidence, individual control, and social environment.

Reffiane and Saptono (2021). consider that instrument of problem solving have 4 dimensions: Understanding problems, Planning solutions, Executing problem solving, Crosschecking. Sholihah and Lastariwati (2020) explored the concept of problem solving, highlighting its key components, including the ability to reason through problems, solve novel challenges, approach issues innovatively, and ask pertinent questions to arrive at optimal solutions.

Winarti et al. (2019) described problem-solving as an intellectual and mental process, relying on accurate data and information to draw appropriate and well-considered conclusions.

Çetin (2020) though that Low problem solving ability is caused by the lack of knowledge, motivation and emotional aspect, and the use of learning model in which all of those give impacts on students' problem solving ability.

Chamidy et al. (2020) conducted research on problem-based learning and its impact on problem-solving skills. They found that problem-based learning significantly enhances problem-solving abilities and that students utilize their tacit knowledge effectively during problem-solving tasks.

In conclusion, the reviewed literature highlights the multifaceted nature of problem-solving skills, which encompass legal reasoning ability, the application of relevant knowledge and skills and Planning solutions.

In the paper Problem-based learning refer to the capacity of individuals to identify, analyze, and generate effective solutions to complex problems or challenges.

Problem-based learning as a promising approach to foster effective problem-solving abilities in students, and the development of problem-solving skills should be an integral part of the learning process. The ultimate goal is to equip individuals with the capacity to approach challenges confidently and arrive at sound solutions based on accurate data and information.

Theory

Dewey first put forward the five-paragraph theory, in the process of problem-solving, which believes that the process of problem-solving includes the following five steps: 1. Begin to realize the existence of difficult problems; 2. Identify problem; 3. Collect and sort out materials and put forward hypotheses; 4. Accept and reject tentative Assumptions; 5. Form and evaluate conclusions (Schmidt & Allsup, 2019).

Polya (1945) cited by Selçuk and Çalýskan (2008) described that problem solving has four phases; (1) Understanding problems; students will not be able to solve problems if they do not know the problems well. (2) Planning solutions; (3) Solving problems; (4) Crosschecking. (Winarto et al., 2022).

Problem solving includes integration of concepts and skills to get over the unusual complete situations. Solving a problem means to find or create new

solutions for the problem or to apply the new rules to be learned. According to (Jakhar & Singh, 2017).

The model of problem-solving process proposed by Gick (1986) is representative and helpful to the teaching of general problem-solving strategies. He believes that the general problem-solving strategy includes four stages: understanding and representing the problem; Make plans or seek answers; Execute the plan or try to answer; Evaluation results. There is a dynamic relationship between each stage.

Agustin (2019) defined a directive model as an educational framework specifically designed to enhance problem-solving ability, which is a crucial characteristic of 21st-century education. This model incorporates problem-solving based learning approaches that leverage the collective intelligence of individuals within a group or the surrounding environment to solve meaningful, relevant, and contextual problems.

Above these opinions, Problem-solving theory involves a systematic process of recognizing difficult problems, identifying and collecting relevant information, proposing and testing hypotheses, generating creative solutions, and evaluating outcomes, incorporating stages such as preparation, meditation, inspiration, and verification, while utilizing problem-solving based learning approaches to enhance 21st-century education through collective intelligence and contextual problem-solving. (By researcher)

The researcher choose Problem solving ability refers to the capacity of individuals to identify, analyze, and generate effective solutions to complex problems or challenges. The problem-solving ability of this paper refers to the students have ability in 3 aspects : 1) The attitude of problem solving, 2) The methods of problem solving, 3) as follows (Huang, chen, 2004).

Problem solving ability in 3 aspects: 1) The attitude of problem solving, 2) The methods of problem solving, 3) The quality of problem solving.

1) The attitude of problem solving refers to attitude is a kind of psychological activity, which is dominated by the behavior of the subject. The attitude of problem solving is the positive attitude that should be expected when facing the problem. The opposite problem can be reasonably evaluated first, and have the attitude used

to bear, and develop a habit of considering, understanding and planning to solve problems first when encountering problems.

Standard: 1) Confidence to solve the problem, 2) The motivation to solve problems, 3) Self-control of problem solving.

2) The methods of problem solving refers to the solution of the problem needs the corresponding method, and the correct method can effectively solve the problem. The problem solution means to analyze the problem from many aspects, use relevant subject knowledge, tools and strategies, explore as many solutions as possible, and solve the problem in a planned and step-by-step way. Be able to effectively cooperate with others, propose problem solutions, implement solutions and implement decisions to ultimately solve the problem. The solution of the problem is also the embodiment of the process of problem solving (Liu, 2015).

Standard: 1) The diversity of problem solutions, 2) The rationality of using the relevant knowledge, 3) Operability of the problem solutions.

3) The quality of problem solving refers to quality of problem solving: The quality of problem solving refers to the ability to solve problems appropriately and creatively and obtain reliable and excellent substantive results. It can be specifically described as "the method and strategy used to deal with problems are reasonable and effective; the process of problem solving meets the expected goal; the results of problem handling are enlightening, innovative and positive" (Liu, 2015).

Standard: 1) Effectiveness and rationality of problem-solving strategies, 2) Efficiency of the problem-solving process, 3) Quality of the problem-solving results.

From the definition above: The problem-solving ability of this paper refers to the students' capacity to utilize methods of logical reasoning, apply relevant law knowledge, demonstrate effective problem-solving skills, and employ legal thinking to analyze and solve legal problems, enabling them to become proficient and competent legal professionals.

And from standard the researcher does 5-point Likert scale contains 5 response options that will consist of two extreme sides and a neutral option linked to the middle answer options. Examples of a 5-point rating scale for measuring piano performance are: Excellent, Good, Medium, Pass, and Poor.

Related research

Several have explored the impact of problem-based learning on students' problem-solving skills and have provided valuable insights into the effectiveness of this instructional approach.

Eviyanti et al. (2017) studied “Problem based learning has a positive effect on the improvement of students' mathematical problem solving ability. “Their results of the study concluded that the increase in mathematical problem solving ability of students who received application of problem-based learning model is better than students who received conventional learning the material opportunities.

Sholihah and Lastariwati (2020) studied “The problem based learning model can improve one of the 21st century competencies, namely critical thinking and problem solving in the course subjects”. the aim of this reaches is to determine the improvement of critical thinking and problem solving competencies, and student learning outcomes on subject matter subjects. The results of the study showed an increase in thinking and problem solving critical competencies and the study found that the application of prior knowledge, collaborative learning, modeling and eliciting feedback were the skills promoted by PBL and these are valuable in problem solving.

Patrick (1993) studied “Problem-based learning in mathematics” they found that problem solving as the means by which an individual uses previously acquired knowledge, skills, and understanding to satisfy the demands of an unfamiliar situation. The student must synthesize what he or she has learned and apply it to a new and different situation.

Bao and Koenig (2019) studied “Approaching Problem-Solving Skills of Momentum and Impulse Phenomena Using Context and Problem-Based Learning”, The results showed that the context and problem-based learning (C-PBL) model affected the physics problem-solving skills. The C-PBL model is able to improve the students’ physics problem-solving skills, communication skills, the students’ confidence in learning, as well as improving students’ understanding of physics lessons conceptually.

According to (Malik et al., 2019) studied “Enhancing problem-solving skills of students through problem solving laboratory model related to dynamic fluid” the researcher found that problem-solving skill is a complex and very important skill as a

part of the learning process in all disciplines and it can be acquired and improved by students through learning and laboratory activities.

Karantzas et al. (2013) studied “Enhancing critical analysis and problem-solving skills in undergraduate psychology: An evaluation of a collaborative learning and problem-based learning approach” they found that Critical analysis and problem-solving skills are two graduate attributes that are important in ensuring that graduates are well equipped in working across research and practice settings within the discipline of psychology. The findings suggest that underpinned by collaborative learning and problem-based learning. Underpinned by collaborative learning and problem-based learning, the development of inquiry-based curriculum offers important opportunities for psychology undergraduates to develop critical analysis and problem-solving skills.

Dostál (2015) study about “Problem solving ability”, he found that the ability of solving problem should be one of the materials taught in the learning process. There are four factors influencing the performance of students’ problem solving ability: knowledge, confidence, individual control, and social environment.

Winarti et al. (2019) studied ”The effectiveness of collaborative strategy based on multiple intelligences in chemistry learning to improve students' problem-solving skill and multiple intelligences “The research on problem-solving ability is diverse in terms of its scope, spanning across various disciplines and levels of study. Scholars from different fields have defined problem-solving as a cognitive process that involves applying previously acquired knowledge and skills to address unfamiliar situations and achieve objectives without a predefined solution technique. The importance of problem-solving skills is recognized as a crucial aspect of the learning process, applicable to all disciplines, and can be cultivated through learning activities and laboratory exercises.

Bransford et al. (1986) studied “Teaching thinking and problem solving: Research foundations.” they have identified several factors influencing students' problem-solving performance, including knowledge, confidence, individual control, and social environment. Additionally, a positive correlation has been observed between students' happiness and their problem-solving proficiency, indicating that a positive mindset fosters effective problem-solving. They found that problem-solving ability is seen as a valuable mental and intellectual process that enables individuals

to derive appropriate and careful conclusions based on accurate data and information, essential for succeeding in various contexts and adapting to the era of globalization.

Savery and Duffy (1995) examined “The impact of PBL on problem-solving skills in undergraduate education”. The results showed that students engaged in PBL demonstrated significant improvements in their problem-solving abilities compared to those taught through traditional instruction. The PBL approach fostered critical thinking, problem analysis, and the application of knowledge to real-world situations.

Hung et al. (2008) studied “Problem-based learning”, the researchers investigated the effects of PBL on problem-solving skills in a medical education context. The findings revealed that students who experienced PBL demonstrated higher levels of problem-solving ability compared to those in traditional instructional settings. PBL facilitated the development of problem-solving strategies, information retrieval skills, and collaborative problem-solving abilities.

Hmelo-Silver et al. (2007) studied “Scaffolding and Achievement in Problem-Based and Inquiry Learning: A Response to Kirschner, Sweller, and Citation Clark”, they explored the impact of PBL on problem-solving skills in science education. The findings indicated that students engaged in PBL exhibited significant improvements in their problem-solving abilities. PBL promoted critical thinking, hypothesis generation, experimental design, and data analysis skills, enhancing students' overall problem-solving competence.

Chamidy et al. (2020) studied the “The effect of problem based learning and tacit knowledge on problem-solving skills of students in computer network practice course”, the result had found that problem-based learning has a significant effect on problem solving skills, The results showed that problem-based learning could improve the ability of problem solving while learning outcomes indicate that students use their tacit knowledge for problem-solving. Thus, problem-based learning is more effective in enhancing problem-solving Abilities. The application model of learning can enhance students' problem-solving skills.

Hursen (2019) studied “The effect of technology supported problem-based learning approach on adults' self-efficacy perception for research-inquiry” the researcher found that Problem-based learning can improve problem-solving skills,

including the students, problem-solving skills Majoring in management. Problem-based learning provides better benefits compared to conventional models.

The collective findings from various studies consistently support the positive impact of problem-based learning (PBL) on students' problem-solving skills across diverse disciplines. Eviyanti et al. (2017) and Sholihah and Lastariwati (2020) highlight the efficacy of PBL in enhancing mathematical problem-solving abilities and critical thinking skills. Patrick (1993) emphasize how PBL encourages students to apply previously acquired knowledge to novel situations, fostering synthesis and adaptation. Bao & Koenig, (2019) showcase the effectiveness of context and problem-based learning in improving physics problem-solving skills and conceptual understanding. Malik et al., (2019) and Karantzas et al., (2013) underscore the importance of PBL in honing complex problem-solving skills through laboratory activities and collaborative learning, particularly in dynamic and inquiry-based contexts. The research by Winarti et al., (2019) and Bransford et al., (1986) further reinforces the broad applicability of problem-solving skills across disciplines and the influence of factors such as knowledge, confidence, individual control, and social environment. Additionally, studies by Savery & Duffy (1995), Hung et al., (2008), Hmelo-Silver et al., (2007), Chamidy et al., (2020), Hursen, (2019) consistently demonstrate that PBL leads to significant improvements in problem-solving abilities, critical thinking, and real-world application of knowledge, providing a comprehensive perspective on the effectiveness of PBL in enhancing students' problem-solving skills.

According to the above research, research on problem-based teaching models encompasses multiple fields, with a wide range of research and a long research period. A problem-based teaching model can significantly improve students' problem-solving abilities, but research in this area mainly focuses on fields such as mathematics and medicine, with relatively little research in the humanities, especially in the field of law.

Chapter 3
Research Methodology

In the study of “Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students” the researcher used Mixed Method of Research. This research 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 for enhancing problem solving ability of undergraduate students.

Phase 2 was conducted to answer research objective 2: To develop problem-based learning instructional model for enhancing problem solving ability of undergraduate students.

Phase 3 was conducted to answer research objective 3: To study the results of implementing problem-based learning instructional model for enhancing problem solving ability of undergraduate students.

The details are as follows.

Phase 1 objective 1: To examine the factors for enhancing problem solving ability of undergraduate students.

The population

Group 1: 200 former students of Legal Logic course in the first semester of 2022 from 3 universities in Guangxi Province.

1) 80 students from Guangxi Minzu University
2) 60 students from Guangxi University of Finance and Economic
3) 60 students from Wuzhou University

Research instrument

The questionnaire for students

Designing instrument 1 (The questionnaire for students)

1. Study Legal Logic Course and factors affecting problem solving ability for undergraduate students in Guangxi Province.

2. Design a questionnaire on factors to improve problem solving ability for the students in Guangxi Province, there are 3 parts:

Part 1: Common data of the respondent

Part 2: Internal factors and external factors 30 items Internal factors about physical, Psychological, motivation, knowledge, attitude and external factors about social environment, materials, teaching methods, class size, evaluation.

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 for the students at Guangxi Province by 3 experts (List name from Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria shown below. (Phongsri, 2011).

+1 if you think the question CAN measure the factor given

0 if you are NOT SURE the question can measure the factor given

-1 if you think the question CANNOT measure the factor given

The acceptable items must have the IOC values not less than 0.6. The IOC calculated from the validation measures 1.00.

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

5 means the highest

4 means high

3 means moderate

2 means few

1 means the fewest

Quality validation

Using IOC by 3 experts to test the quality of questionnaire.

Data Collection

1. Ask for permission for data collection.

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

Data Analysis

The result of the factors affecting Problem solving ability related to the student's problem solving ability are interpreted using mean interpretation criteria proposed by Phongsri (2011).

4.51-5.00 refers to the highest

3.51-4.50 refers to high

2.51-3.50 refers to moderate

1.51-2.50 refers to few

1.00-1.50 refers to the fewest

Descriptive statistics, frequency, mean (μ) standard deviation (σ)

Population

Group 2: The 3 lecturers who were teaching Legal Logic Course from 3 universities in Guangxi Province

1) 1 lecturer from Guangxi Minzu University
2) 1 lecturer from Guangxi University for finance economic
3) 1 lecturer from Wuzhou University

Research Process

1. Study literature on problem solving ability, and factors affecting problem solving ability for undergraduate students.

2. Design the draft of open-ended interview on internal factors and externalfactors 10 questions affecting increase problem solving ability. for the lecturers in 3 Universities in Guangxi Province, there are 3 parts:

Part 1: Common data of the respondent

Part 2: Internal factors 5 questions about physical, physical, psychological, motivation, knowledge, attitude and external factors 5 questions about social environment, materials, teaching methods, class size, evaluation.

Part 3: Suggestion.

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

2. Assess the validity of open-end interview on factors affecting problem-solving skills for the students at Guangxi agricultural and technical university 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 are related to the topics

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

5. Do the open-end interview in 3 major in three University in Guangxi province. The open-end interview type can only be answered by the lecturers.

Quality Validation

Using IOC by 3 experts (List name in Appendix A) to test the quality of open-end interview.

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 1

Obtain important information that is used as a basis for examine the internal factors and external factors to improve problem solving ability for undergraduate students from the former students and lecturers. And take the result to do problem-based learning instructional model.

Table 3.1 Summary the process to do in phase 1

Topics	Details
Research Process	Analyzed the internal and external influencing factors from students and lecturers
Research Objectives	To examine the factors affecting problem solving ability for undergraduate students.
Research Method	Studied the internal and external factors that affect undergraduates' problem solving ability
Resources/Target Group	1. Population- 200 students 2. Key Informants- 3 Lecturers
Instruments	1. Questionnaire 30 items 2. Interview by 10 questions
Data Analysis	- Percentage - Frequency - Mean (μ) - Standard Deviation (σ) - Content analysis
Results	Draw conclusions from students and lecturers to provide develop problem-based learning instructional model

Obtain important information that is used as a basis for examine the internal factors and external factors to improve problem solving ability for undergraduate students from the undergraduate students and lecturers. And take the result to do problem-based learning Instructional Model.

Phase 2 was conducted to answer research objective 2: To develop problem-based learning instructional model for enhancing problem solving ability of undergraduate students.

Designing instrument

Designing instrument 1 (The handout problem-based learning instructional model to improve problem solving ability for undergraduate students.)

1. Design the development of problem-based learning instructional model to enhance problem solving ability for undergraduate students to be the handout which consists of the stable teaching activities and procedures. Such a developed problem-based learning model with 5 components: 1) Rational and Principle (Take the results from objective 1, 2) Objectives 3) The Contents 4) Method of Training and Materials and 5) Evaluation by scoring rubric, is in 4 aspects standards : 1) Utility standards, 2) Feasibility standards, 3) Propriety standards and 4) Accuracy standards.

2. Assess the validity of the questionnaire of the appropriateness of the training curriculum by 3 experts (List name in Appendix A) through Item-Objective Congruence (IOC) according to the criteria as shown below: (Phongsri,2011)

+1 if you think the issues can measure the appropriateness of the training curriculum

0 if you are not sure the issues can measure the appropriateness of the training curriculum

-1 if you think the issues cannot measure the appropriateness of the training curriculum

The acceptable items must have the IOC values not less than 0.6. The IOC calculated from the validation measures 1.00.

Designing instrument 2 (The confirming the handout problem-based learning instructional model to improve problem solving ability for undergraduate students)

1. Design the contents after the experts finishing IOC the handout problem-based learning instructional to be agree or disagree.

2. Assess the validity of the questionnaire of the appropriateness of the training curriculum by 5 experts (List name in Appendix A) according to the criteria to be agree or disagree.

Data Collection

1. Ask for permission of data collection.

2. Collect appropriateness of the training curriculum in terms of accuracy standards, propriety standards, feasibility standards, and utility standards from the 3 experts (List name in Appendix A) using the developed conformity assessment based on problem-based learning instructional.

Data Analysis

Descriptive analysis i. e. frequency and percentage.

The acceptable items must not be less than 100%.

Output Phase 2

After implementing learning through problem-based learning instructional model, students score of problem-solving skills will be overall improved at 80. (Good Level).

Table 3.2 Summary the process to do in phase 2

Topics	Details
Research Process	Develop problem-based learning instructional model in terms of accuracy standards, propriety standards, feasibility standards, and utility standards.
Research Objectives	To develop problem-based learning instructional. model to enhance problem solving ability for undergraduate students.
Research Method	Research the component for development of problem-based learning instructional model.
Resources/Target Group	3 experts to confirm model from handout that rating results have agree/disagree
Instruments	Conformity Assessment Form of problem-based learning instructional model in terms of accuracy standards, propriety standards, feasibility standards, and utility standards.
Data Analysis	- Frequency - percentage
Results	Confirming problem-based learning instructional model to teach in the classroom.

Phase 3 was conducted to answer research objective 3: To examine the results of implementing the developed instructional model based on problem-based learning of undergraduate students at Guangxi Minzu University.

Population

The total of 145 students from 3 classes of students with different learning achievements who enrolled in The Legal Logic Course at Guangxi Minzu University in semester 1 academic year 2023. Those sections involve the following.

Class A 50 students

Class B 50 students

Class C 45 students

The Sample Group

The 50 students who enrolled in The Legal Logic course from class A are obtained by simple cluster random sampling.

Research Design

Table 3.3 Post test Only Experimental Design

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

X-Problem-based learning instructional model

T1-Problem solving ability

Research instruments

1. Lesson plans using PBL instructional model
2. Rubric scoring

Designing instrument 1 (Lesson plans)

1. Study contents, objectives, methods of teaching, materials, evaluation.
2. Design lesson plans by format given.
3. Present the lesson plan to the advisors for checking correctness, completion and improvement.

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

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

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

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

The acceptable items must have the IOC values not less than 0.6. The IOC calculated from the validation measures 1.00.

5. Conduct 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. Study the rubric scoring criteria aligned with Problem-based learning instructional model.

2. Design rubric scoring criteria (From Appendix D).

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

4. Assess the validity of the designed rubric scoring criteria by 3 experts List name from Appendix A) through Index of Item-Objective Congruence (IOC) according to the criteria 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 0.6. The IOC calculated from the validation measures 1.00.

Data Collection

1. Ask for permission of data collection

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

Data Analysis

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

Table 3.4 Criteria of interpreting learning outcomes 3 Item of problem solving ability

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

Table 3.5 Criteria of interpreting learning outcomes Item 1, Item 2 and Item 3.

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

Output Phase 3 (Rubric Scoring Criteria)

Results of implementing learning through the instructional model based on Problem-based learning instructional, students' score of problem solving ability will be overall improved at 80% (Good Level)

Table 3.6 Summary the process to be carried out in phase 3

Topics	Details
Research Process	1. Deign lesson plan 2. Design scoring rubric criteria
Research Objectives	To study the results of problem-based learning instructional model to improve problem solving ability
Research Method	1. Study how to design lesson plan 2. Study how to design scoring rubric criteria
Resources/Target Group	50 students who enrolled in Legal logic course from class A are obtained by cluster random sampling.
Instruments	1. Lesson plan 2. Scoring Rubric Criteria

Table 3.6 (Continued)

Topics	Details
Data Analysis	- Percentage - Frequency -Mean ($\overline{X}$) - Standard Deviation (S.D.)
Results	Students' score of problem solving ability

Based on important evaluation opinions obtained from 3 experts regarding the development of lesson plans and scoring rubric form for improving undergraduates problem solving ability. This study conducted experiments using lesson plans and scoring rubric form

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:

1. Analyzing Factors Affecting Problem solving ability for undergraduate students at Guangxi Province.

2. Creating problem-based learning instructional model to enhance problem solving ability for undergraduate students in Law School of Guangxi Minzu University.

3. Assessing the Impact of Implementing the problem-based learning instructional model on undergraduate students in Law School of Guangxi Minzu University.

Participants in this research were expected to possess a foundational understanding of problem solving ability and the problem-based learning instructional model. This knowledge was necessary for them to provide informed, analytical, and critical perspectives based on these frameworks.

Data Analysis Results

Phase 1: Analysis results serving objective 1–To study the factors to enhance Problem solving ability for undergraduate students at Guangxi Province.

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

Table 4.1 Common data of the respondent in overall (N=200)

Data	Frequency	Percentage
Gender		
A. Male	75	37.50
B. Female	125	62.50
Total	**200**	**100.00**
Age		
A. below 18 yrs.	5	2.50
B. 19-20 yrs.	68	34.00
C. 21-22 yrs.	127	63.50
D. over 23 yrs.	0	0.00
Total	**200**	**100.00**

From table 4.1 the common data of the respondent in overall the most gender is female, 62.50%, male is 37.50%. The most age is 21-22 yrs 63.50%, the 19-20 yrs is 34.00%, below 18 yrs is 2.50%, over 23 yrs is zero.

Table 4.2 The result of questionnaire from students in overview (N=200)

Factors	**μ**	**σ**	Level	Ranking
Internal factors (respondents)				
1. Students believe that the contents of legal reasoning in Legal Logic course can enhance their ability to solve legal problems.	3.92	0.89	High	10
2. Students are very interested in Legal Logic Course.	4.02	0.82	High	7
3.Students feel that this subject can improve their knowledge of the Law.	4.56	0.56	The highest	2
4.Students believe that teachers should provide more guidance on their problems in class.	3.63	1.03	High	15
5.Students know that the course of legal logic is an important compulsory course for law majors.	3.64	1.03	High	14

Table 4.2 (Continued)

Factors	**μ**	**σ**	Level	Ranking
6.Students believe that the learning resources can improve problem solving ability in legal logic courses.	3.89	0.93	High	11
7.Students like lecturers that can explain many professional practical examples.	4.2	0.89	High	5
8.Students can quickly connect their knowledge and experiences in the process of problem solving problems.	4.36	0.71	High	4
9.Students feel that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	3.98	1.07	High	8
10.Students will compare the advantages of different problem solutions, combine the actual situation, finally choose the most Is the plan.	3.95	0.97	High	9
11.Students will take the initiative to summarize their learning and apply the useful experience to their future study.	4.67	0.62	The highest	1
12.Students can through problem solving by the case analysis method and instrument tools in the legal logic course.	4.42	0.79	High	3
13.Students are satisfied with the cooperation in the classroom in legal logic course.	3.83	0.95	High	12
14.Students' knowledge accumulation is not enough	4.09	0.95	High	6
15.Students are not sure if this course will be helpful for their future careers.	3.79	0.98	High	13
Total Average	**4.06**	**0.88**	**High**	
External factors (teacher, material, and circumstance)				
16.The lecturers' teaching model enables students to understand content clearly.	3.84	0.95	High	10
17.The lecturers can guide students to recognize that learning courses are assistance for future career development.	4.38	0.68	High	2

Table 4.2 (Continued)

Factors	μ	σ	Level	Ranking
18.The lecturer selects appropriate teaching methods based on the legal logic course.	3.8	0.96	High	12
19.The lecturers choose suitable teaching materials resources.	3.98	1.01	High	5
20.The lecturers design learning tasks encourage the students' enthusiasm.	3.88	0.85	High	7
21.The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives.	4.41	0.86	High	1
22.Classroom environment affects students' learning enthusiasm.	3.87	0.93	High	8
23.The lecturers can stimulate students' interest, such as debate in Moot court	3.81	1.00	High	11
24.The multimedia materials teaching can enhance undergraduate students' Problem solving ability	3.76	1.00	High	15
25.The availability of learning spaces can affect students' interest in Legal Logic courses.	3.96	1.08	High	6
26.As a learning place, Moot court can improve students' interest in learning legal logic course.	3.78	0.99	High	13
27.Lecturers do not have enough teaching resources.	4.27	0.86	High	4
28.The textbook provides practical, Professional materials for students.	4.35	0.85	High	3
29.Provides a stable high-speed network anytime, anywhere on campus as a teaching guarantee supports students' study	3.77	1.02	High	14
30.The environments is clean, with desks , chairs, blackboards, podiums, computers, projectors, large screens, loudspeakers with other multimedia facilities to facilitate the teaching process.	3.86	1.03	High	9
Total Average	**3.98**	**0.94**	**High**	

Table 4.2 Indicates that internal factors affecting Problem solving ability of undergraduate students at Guangxi Province overall found at high level (μ=4.06). Considering only each item, it was found that factor No.11 Students will take the initiative to summarize their learning and apply the useful experience to their future study is the highest mean (μ=4.67), follow factor by No.3 Students feel that this subject can improve their knowledge of the Law (μ=4.56) and the fewest mean is factor No.4 Students believe that teachers should provide more guidance on their problems in class. (μ=3.63).

For external factors affecting Legal Logic course enhance Problem solving ability of undergraduate students at Guangxi Province overall found at high level (μ=3.98). Considering only each item, it was found that factor No.21 The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives. is the highest mean (μ=4.41), follow by factor No.17 The lecturers can guide students to recognize that learning courses and problem-solving skills are assistance for future career development (μ=4.38) and the fewest mean is factor No.24 The materials and environment can enhance undergraduate students' Problem solving ability. (μ=3.76).

Table 4.3 Common data of the respondent in A.Guangxi Minzu University. (N=80)

Data	Frequency	Percentage
Gender		
Male	30	37.50
Female	50	62.50
Total	**80**	**100.00**
Age		
A. below 18 yrs.	2	2.50
B. 19-20 yrs.	28	35.00
C. 21-22 yrs.	50	62.50
D. over 23 yrs.	0	0.00
Total	**80**	**100.00**

From table 4.3 the common data of the respondent in Guangxi Minzu University. The most gender is female, 62.50%, male is 37.50%. The most age is 21-22 yrs, 62.50%,19-21 yrs is 35.00%, below 18yrs is 2.50%, over 23 yrs is zero.

Table 4.4 The result of questionnaire from students in A. Law school Guangxi Minzu University. (N=80)

Factors	μ	σ	Level	Ranking
Internal factors (respondents)				
1.Students believe that the contents of legal reasoning in Legal Logic course can enhance their ability to solve legal problems.	3.86	0.89	High	12
2.Students are very interested in Legal Logic Course.	4.00	0.77	High	10
3.Students feel that this subject can improve their knowledge of the Law.	4.55	0.63	The highest	2
4.Students believe that teachers should provide more guidance on their problems in class.	3.68	1.05	High	15
5.Students know that the course of legal logic is an important compulsory course for law majors.	3.78	0.96	High	13
6.Students believe that the learning resources can improve problem solving ability in legal logic courses.	3.99	0.84	High	11
7.Students like lecturers that can explain many professional practical examples.	4.44	0.7	High	5
8.Students can quickly connect their knowledge and experiences in the process of problem solving problems.	4.53	0.61	The highest	3
9.Students feel that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	4.51	0.71	The highest	4
10.Students will compare the advantages of different problem solutions, combine the actual situation, finally choose the most Is the plan.	4.21	0.88	High	7
11.Students will take the initiative to summarize their learning and apply the useful experience to their future study.	4.58	0.72	The highest	1

Table 4.4 (Continued)

Factors	μ	σ	Level	Ranking
12.Students can through problem solving by the Case analysis method and instrument tools in the legal logic course.	4.34	0.88	High	6
13.Students are satisfied with the cooperation in the classroom in legal logic course.	4.15	0.78	High	9
14.Students' knowledge accumulation is not enough	4.19	0.85	High	8
15.Students are not sure if this course will be helpful for their future careers.	3.78	0.96	High	14
Total Average	**4.17**	**0.82**	**High**	
External factors (teacher, material, and circumstance)				
16.The lecturers' teaching model enables students to understand content clearly.	4.05	0.85	High	8
17.The lecturers can guide students to recognize that learning courses are assistance for future career development.	4.31	0.75	High	5
18.The lecturer selects appropriate teaching methods based on the legal logic course.	3.96	0.91	High	11
19.The lecturers choose suitable teaching materials resources.	4.39	0.75	High	2
20.The lecturers design learning tasks encourage the students' enthusiasm.	3.94	0.84	High	13
21.The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives.	4.38	0.84	High	3
22.Classroom environment affects students' learning enthusiasm.	4.09	0.78	High	7
23.The lecturers can stimulate students' interest such as debate in Moot court	3.98	0.95	High	10
24.The materials and environment can enhance undergraduate students’ Problem solving ability	3.88	1.04	High	14

Table 4.4 (Continued)

Factors	μ	σ	Level	Ranking
25.The availability of learning spaces can affect students' interest in Legal Logic courses.	4.14	0.98	High	6
26.As a learning place, Moot court can improve students' interest in learning legal logic course.	3.95	0.79	High	12
27.The lecturers pay more attention to the problem-solving ability of students in legal logic courses.	4.33	0.79	High	4
28.The textbook provides practical, Professional materials for students.	4.43	0.76	High	1
29.Provides a stable high-speed network anytime, anywhere on campus as a teaching guarantee supports students' study	3.71	0.96	High	15
30.The environments is clean, with desks, chairs, blackboards, podiums, computers, projectors, large screens, loudspeakers with other multimedia facilities to facilitate the teaching process.	4.03	0.95	High	9
Total Average	**4.10**	**0.86**	**High**	

Table 4.4 Indicates that internal factors affecting Legal Logic course enhance Problem solving ability of undergraduate students in Guangxi Minzu University overall found at High level (μ=4.17). Considering only each item, it was found that factor NO.11 Students will take the initiative to summarize their learning and apply the useful experience to their future study is the highest mean (μ=4.58), follow by factor NO.3 Students feel that this subject can improve their knowledge of the Law. (μ=4.55) and the fewest mean is factor NO.4 Students believe that teachers should provide more guidance on their problems in class. (μ=3.68).

For external factors affecting Legal Logic course enhance Problem solving ability of undergraduate students in Guangxi Minzu University overall found a high level (μ=4.10). Considering only each item, it was found that factor No.28.The textbook provides practical, Professional materials for students is the highest mean

(μ=4.43), follow by factor No.19 The lecturers choose suitable teaching materials resources. (μ=4.39) and the fewest mean is factor No.29.Provides a stable high-speed network anytime, anywhere on campus as a teaching guarantee supports students' study (μ=3.71).

Table 4.5 Common data of the respondent in B. Guangxi University of Finance and Economics. (N=60)

Data	Frequency	Percentage
Gender		
A. Male	22	37.00
B. Female	38	63.00
Total	**60**	**100.00**
Age		
A. below 18 yrs.	0	0.00
B. 19-20 yrs.	21	35.00
C. 21-22 yrs.	39	65.00
D. over 23 yrs.	0	0.00
Total	**60**	**100.00**

From table 4.5 the common data of the respondent in B. Law school of Guangxi University of Finance and Economics. The most gender is female, 63.00%, Male is 37.00%. The most age is 21-22 yrs, 65.00%,19-21 yrs is 35.00%, over 23 yrs and below 18 yrs are zero.

Table 4.6 The result of questionnaire from students in B. Law school of Guangxi University of Finance and Economics. (N=60)

Factors	μ	σ	Level	Ranking
Internal factors (respondents)				
1.Students believe that the contents of legal reasoning in Legal Logic course can enhance their ability to solve legal problems.	3.95	0.92	High	8
2.Students are very interested in Legal Logic Course.	4.20	0.73	High	5
3.Students feel that this subject can improve their knowledge of the Law.	4.60	0.49	The highest	3
4.Students believe that teachers should provide more guidance on their problems in class.	3.68	1.04	High	12
5.Students know that the course of legal logic is an important compulsory course for law majors.	3.55	1.16	High	14
6.Students believe that the learning resources can improve problem solving ability in legal logic courses.	3.72	1.02	High	11
7.Students like lecturers that can explain many professional practical examples.	4.00	0.89	High	7
8.Students can quickly connect their knowledge and experiences in the process of problem solving problems.	4.32	0.69	High	4
9.Students feel that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	3.52	1.10	High	15
10.Students will compare the advantages of different problem solutions, combine the actual situation, finally choose the most Is the plan.	3.80	0.96	High	10
11.Students will take the initiative to summarize their learning and apply the useful experience to their future study.	4.75	0.54	The highest	1

Table 4.6 (Continued)

Factors	μ	σ	Level	Ranking
12.Students can through problem solving by the Case analysis method and instrument tools in the legal logic course.	4.62	0.66	The highest	2
13.Students are satisfied with the cooperation in the classroom in legal logic course.	3.65	0.99	High	13
14.Students' knowledge accumulation is not enough	4.15	0.89	High	6
15.Students are not sure if this course will be helpful for their future careers.	3.93	0.93	High	9
Total Average	**4.03**	**0.87**	**High**	
External factors (teacher, material, and circumstance)				
16.The lecturers' teaching model enables students to understand content clearly.	3.58	0.86	High	15
17.The lecturers can guide students to recognize that learning courses are assistance for future career development.	4.30	0.69	High	3
18.The lecturer selects appropriate teaching methods based on the legal logic course.	3.62	0.93	High	14
19.The lecturers choose suitable teaching materials resources.	3.82	0.99	High	8
20.The lecturers design learning tasks encourage the students' enthusiasm.	3.87	0.90	High	7
21.The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives.	4.43	0.80	High	1
22.Classroom environment affects students' learning enthusiasm.	3.73	0.99	High	12
23.The lecturers can stimulate students' interest and meet the contemporary needs of students, such as debate in Moot court	3.78	1.02	High	9
24.The materials and environment can enhance undergraduate students’ Problem solving ability	3.77	1.01	High	10

Table 4.6 (Continued)

Factors	μ	σ	Level	Ranking
25.The availability of learning spaces and the problem-based learning can affect students' interest in Legal Logic courses.	4.02	1.12	High	5
26.As a learning place, Moot court can improve students' interest in learning legal logic course.	3.70	1.05	High	13
27.Lecturers do not have enough teaching resources.	4.22	0.93	High	4
28.The textbook provides practical, Professional materials for students.	4.38	0.71	High	2
29.Provides a stable high-speed network anytime, anywhere on campus as a teaching guarantee supports students' study	3.88	1.11	High	6
30.The environments is clean, with desks, chairs, blackboards, podiums, computers, projectors, large screens, loudspeakers with other multimedia facilities to facilitate the teaching process.	3.71	0.96	High	11
Total Average	**3.92**	**0.95**	**High**	

Table 4.6 Indicates that internal factors affecting Legal Logic course enhance learning achievement of undergraduate students in Law school of Guangxi University of Finance and Economics overall found at High level (μ=4.03). Considering only each item, it was found that factor NO.11 Students will take the initiative to summarize their learning and apply the useful experience to their future study is the highest mean (μ=4.75), follow by factor NO.3 Students feel that this subject can improve their knowledge of the Law. (μ=4.6) and the fewest mean is factor NO.4 Students believe that teachers should provide more guidance on their problems in class. (μ=3.68).

For external factors affecting Legal Logic course enhance Problem Solving ability of undergraduate students in Law school Guangxi University of Finance and Economics overall found at high level (μ=3.92). Considering only each item, it was

found that factor NO. 21.The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives. is the highest mean (μ=4.38), follow by factor NO.28.The textbook provides practical, Professional materials for students. (μ=4.38) and the fewest mean is factor NO. 16 The lecturers' teaching model enables students to understand content clearly (μ=3.58).

Table 4.7 Common data of the respondent in Law school of Wuzhou University. (N=60)

Data	Frequency	Percentage
Gender		
A. Male	22	37.00
B. Female	38	63.00
Total	**60**	**100.00**
Age		
A. below 18 yrs.	3	5.00
B. 19-20 yrs.	18	30.00
C. 21-22 yrs.	39	65.00
D. over 23 yrs.	0	0.00
Total	**60**	**100.00**

From table 4.7 the common data of the respondent in Law school of Wuzhou University. The most gender is female, 63.00%, male is 37.00%, the most age is 21-22 yrs., 65.00%, 19-20 yrs is 30.00%, below 18 yrs is 5.00%, over 23 yrs is zero.

Table 4.8 The result of questionnaire from students in Wuzhou University of Law School. (N=60)

Factors	μ	σ	Level	Ranking
Internal factors (respondents)				
1.Students believe that the contents of legal reasoning in Legal Logic course can enhance their ability to solve legal problems.	3.97	0.86	High	6
2.Students are very interested in Legal Logic Course.	3.85	0.91	High	9
3.Students feel that this subject can improve their knowledge of the Law.	4.52	0.53	The highest	2
4.Students believe that teachers should provide more guidance on their problems in class.	3.52	0.99	High	15
5.Students know that the course of legal logic is an important compulsory course for law majors.	3.55	1.06	High	14
6.Students believe that the learning resources can improve problem solving ability in legal logic courses.	3.93	0.93	High	7
7.Students like lecturers that can explain many professional practical examples.	4.08	1.02	High	5
8.Students can quickly connect their knowledge and experiences in the process of problem solving problems.	4.18	0.81	High	4
9.Students feel that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	3.72	1.13	High	11
10.Students will compare the advantages of different problem solutions, combine the actual situation, finally choose the most Is the plan.	3.73	0.99	High	10
11.Students will take the initiative to summarize their learning and apply the useful experience to their future study.	4.72	0.52	The highest	1

Table 4.8 (Continued)

Factors	μ	σ	Level	Ranking
12.Students can through problem solving by the Case analysis method and instrument tools in the legal logic course.	4.33	0.75	High	3
13.Students are satisfied with the cooperation in the classroom in legal logic course.	3.57	0.97	High	13
14.Students' knowledge accumulation is not enough.	3.92	1.1	High	8
15.Students are not sure if this course will be helpful for their future careers.	3.65	1.05	High	12
Total Average	**3.95**	**0.91**	**High**	
External factors (teacher, material, and circumstance)				
16.The lecturers' teaching model enables students to understand content clearly.	3.8	1.08	High	6
17.The lecturers can guide students to recognize that learning courses are assistance for future career development.	4.53	0.63	High	1
18.The lecturer selects appropriate teaching methods based on the legal logic course.	3.77	1.01	High	7
19.The lecturers choose suitable teaching materials resources.	3.58	1.12	High	15
20.The lecturers design learning tasks encourage the students' enthusiasm.	3.82	0.81	High	5
21.The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives.	4.42	0.94	High	2
22.Classroom environment affects students' learning enthusiasm.	3.70	0.97	High	10
23.The lecturers can stimulate students' interest and meet the contemporary needs of students, such as debate in Moot court	3.62	1.03	High	13
24.The materials and environment can enhance undergraduate students’ Problem solving ability	3.60	0.92	High	14

Table 4.8 (Continued)

Factors	μ	σ	Level	Ranking
25.The availability of learning spaces and the problem-based learning can affect students interest in Legal Logic courses.	3.67	1.11	High	11
26.As a learning place, Moot court can improve students' interest in learning legal logic course.	3.63	1.12	High	12
27.Lecturers do not have enough teaching resources.	4.23	0.86	High	3
28.The textbook provides practical, Professional materials for students.	4.22	0.86	High	4
29.Provides a stable high-speed network anytime, anywhere on campus as a teaching guarantee supports students' study	3.72	0.97	High	9
30.The environments is clean, with desks , chairs, blackboards, podiums, computers, projectors, large screens, loudspeakers with other multimedia facilities to facilitate the teaching process.	3.75	0.99	High	8
Total Average	**3.87**	**0.97**	**High**	

Table 4.8 Indicates that internal factors affecting Legal Logic course enhance Problem solving ability of undergraduate students in law school of Wuzhou University overall found at High level (μ=3.95). Considering only each item, it was found that factor NO.11 Students will take the initiative to summarize their learning and apply the useful experience to their future study is the highest mean (μ=4.72) and NO. 3 Students feel that this subject can improve their knowledge of the Law (μ=4.52), the fewest mean is factor NO. 4 Students believe that teachers should provide more guidance on their problems in class. (μ=3.52).

For external factors affecting Legal Logic course enhance Problem solving ability of undergraduate students in law school of Wuzhou University overall found at high level (μ=3.87). Considering only each item, it was found that factor NO. 17 The lecturers can guide students to recognize that learning courses and problem-solving

skills are assistance for future career development is the highest mean (μ=4.53), follow by factor NO. 21 The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives. (μ=4.42) and the fewest mean is factor NO.19 The lecturers choose suitable materials and emerging resources (μ=3.58).

Summary internal and external factors from students:

Internal factors and external factors 30 items Internal factors about physical, psychological, motivation, knowledge, attitude and external factors about social environment, materials, teaching methods, class size, evaluation.

The lecturers interview analysis results

1) Lecturer from Guangxi Minzu University

2) Lecturer from Guangxi University of Finance and Economic

3) Lecturer from Wuzhou University

The amount of lecturers' university by table 4.9

Table 4.9 Common data of the respondents in overall (N=3)

Data	Frequency	Percentage
Gender		
A. Male	1	33.30
B. Female	2	66.70
Total	**3**	**100.00**
Experience teaching		
below 3 yrs.	0	0.00
A.4-6 yrs.	0	0.00
B.7- 9 yrs.	2	66.70
C.over 9 yrs.	1	33.30
Total	**3**	**100.00**
Age		
A. below 25 yrs.	0	0.00
B. 26-30 yrs.	0	0.00
C. 31-35 yrs.	1	33.30
D. over 35 yrs.	2	66.70
Total	**3**	**100.00**

From table 4.9 the common data of the respondents at Guangxi Province. The most gender is female 66.70%, Male is 33.30%, the most Experience teaching is 7- 9 yrs,66.70%, over 9yrs is 33.30%,below 3 years and 4-6yrs is zero. The most age is over 35 yrs, 66.70%,31-35 yrs is 33.30%, below 25 yrs and 25-30 yrs is zero.

Interview Lecturers Results

After the results from interview with the 3 lecturers, the factors affecting the problem solving ability for undergraduate students can be concluded as follows.

Internal factors

Physical: In the teaching of problem-based learning instructional model, the 3 teachers agree on the importance of learning experience and the accumulation of prior knowledge, and the course of legal logic can improve students' knowledge of the legal profession. It is beneficial to develop their problem-solving ability to apply the useful learning experience to their future study. Teachers' good teaching methods, analytical methods and the preparation of teaching equipment in class can help students understand the course more clearly.

Psychological: In the teaching of problem-solving learning mode, all three lecturers emphasized the importance of teacher-student interaction. At the same time, teachers' external environmental factors also play a certain role in the teaching process, and the favorable internal environment is conducive to improving the problem solving ability of undergraduates.

Motivation: Lecturers and students thought that students 'interest and students' motivation to solve problem is the key to the effectiveness of problem solving ability.

Knowledge: The accumulation of students 'knowledge in the early stage is crucial to the mastery of knowledge in the later stage, while the mastery of students' relevant professional knowledge is very important for solving problems.

Attitude: Lecturers agree that it is very important that students have a positive attitude towards solving problems.

External Factors

Social environment: The three lecturers believe that the well-equipped classroom and interactive learning environment can enhance students' knowledge exploration and improve their problem-solving ability. Class size: According to the three teachers in the school of understanding, three teachers teaching classes is the

middle class teaching model, a class of students are about 50. They pay more attention to the learning experience of problem solving and classroom interaction with students.

Materials: The teaching materials used by teachers, including intelligent classrooms, multimedia facilities and other learning materials, are conducive to promoting students' learning and enhancing their interest in learning.

Teaching Methods: The three lecturers mainly use the teacher's teaching methods, combined with group cooperation, case analysis, class and after-school homework.

Evaluation: Two lecturers measure students through classroom group work, after-school assignments, and midterm tests, and one lecturers uses case studies, the students' judgment and reasoning ability in case analysis reflects the students' learning effect but lacks data support.

After analyzing data collected from both groups of informants, the researcher synthesizes those factors dividing them into 2 main types – internal and external factors as shown in table 4.10 below.

Table 4.10 Summary of factors affecting students study Legal Logic course Problem Solving Ability.

Students' opinion		Lecturers' opinion		Synthesized opinion	
Internal Factors	**External Factors**	**Internal Factors**	**External Factors**	**Internal Factors**	**External Factors**
1) Students are interested in the course and know that it is an important required course for professional study.	1) Students do not have a grasp of the various methods of problem solving	1) Physical: Teachers should give more guidance to students in class	1) Materials: All three lecturers advocated updating the teaching model in time	1) Motivation:Students have the learning motivation to learn this subject	1) Materials:teaching materials used by teachers
2)Students have the learning motivation to learn this subject	2) The teaching materials and the content of the classroom case is not adapted to the needs of development.	2) physical: Teachers should have their own teaching methods and strengthen the accumulation of knowledge	2)Materials:The lecturers mainly use teaching methods with group discussions, homework and interim tests	2) Students are interested in the course	2) Teaching methods are not updated enough, and students' methods of problem solving is not various
3) Students have the confidence to solve problems	3) students' learning styles is not enough.	3) physical: Teachers should educate students to use the existing knowledge to solve the new problems, to review and preview.	3) Materials:Each lecturer has access to a variety of teaching materials, including smart classrooms and other multimedia learning resources.	3) students' needs more encouragement.	3) students' learning styles is not enough and teachers do not have enough teaching resources

Table 4.10 (Continued)

Students' opinion		Lecturers' opinion		Synthesized opinion	
Internal Factors	**External Factors**	**Internal Factors**	**External Factors**	**Internal Factors**	**External Factors**
4)Students needs more encouragement from the lecturers	4)Students are not using the knowledge coherently enough	4) Psychological: Teachers should encourage students to explore knowledge actively.	4) Social environment:The middle class teaching mode gives students the learning experience of group learning and discussion and promotes the unity and cooperation of students.	4) Motivation:Students have the confidence to solve problems	4) The teacher-student interaction in the class is not enough.
5) When students encounter difficulties, they will actively find solutions to the problems.	5) Evaluation and teaching methods are more traditional.	5) Psychological: Teachers should encourage students.	5) Evaluation:The methods for evaluating students' learning outcomes is limited.	5) Students like teacher-student interaction in class.	5) The evaluation method is too traditional and not comprehensive enough

From table 4.10 Indicates that all internal factors affecting Legal Logic course enhance Problem solving ability of undergraduate students at Guangxi Province are generally found that the Lecturers should update their teaching methods and teaching materials in time.

Students are interested in the course, Lecturers should maintain an open-minded approach, attentively considering student feedback and making appropriate adjustments based on their needs and suggestions. Exploring innovative teaching models. Lecturers should give students more guidance in class. Lecturers should encourage students to think about problems and solve problems actively. Students are not satisfied with the teaching methods. Collaboration between lecturers and students is important, lecturers through the continuous accumulation of knowledge and the refinement of teaching methods, can ignite students' problem solving ability. Modern technology and multimedia resources should be used to enrich the classroom, or practical cases and problems should be introduced to stimulate students' interest and thinking. Lecturers should strive to cater to students ' learning needs as much as possible, improve the quality of teaching, and improve students' ability.

For external factors affecting Legal Logic course enhance problem solving ability of undergraduate students at Guangxi Province are generally found at traditional teaching models cannot improve students' problem solving ability and more effective teaching models need to be developed. The traditional teaching mode cannot well improve the students' problem-solving ability. Teaching methods are not updated enough, and students' ability to use knowledge is insufficient. Students don’t have too much way to solve problems, and teachers do not have enough teaching resources. The teacher-student interaction in the class is not enough. The evaluation method is too traditional and not comprehensive enough.

Through the above analysis, it is found that among the factors that affect problem solving ability, students' emotion of actively participating about problems is an important factor. Appropriate teaching methods, teaching models and interesting teaching materials can better mobilize students' problem solving ability. At the same time, the environment in which students' problem solving ability includes the external environment of the classroom, the internal environment of the classroom,

and a good learning styles are also important factors that affect students' problem solving ability.

Part 2: To answer research objective 2 – to develop problem-based learning instructional model to enhance problem solving ability for undergraduate students

To serve objective 2, the collected data of confirming the appropriateness of 4 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 Frequency and percentage of conform-ability of utility, feasibility, propriety, and accuracy of the instructional model components in 4 areas by specialists

No.	Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students	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 conform-ability of each component of the instructional model by 3 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 3 specialists or 100% of all specialists; feasibility 3 specialists or 100%; propriety 3 specialists or 100%; and accuracy 3 specialists or 100%.

Objectives

The objectives of principle and rationale of the instructional model is confirmed to be appropriate by 3 specialists or 100% of all specialists; feasibility 3 specialists or 100%; propriety 3 specialists or 100%; and accuracy 3 specialists or 100%.

Contents

The contents of principle and rationale of the instructional model is confirmed to be appropriate by 3 specialists or 100% of all specialists; feasibility 3 specialists or 100%; propriety 3 specialists or 100%; and accuracy 3 specialists or 100%.

Methods of Teaching & Materials

The methods of teaching & materials of principle and rationale of the instructional model is confirmed to be appropriate by 3 specialists or 100% of all specialists; feasibility 3 specialists or 100%; propriety 3 specialists or 100%; and accuracy 3 specialists or 100%.

Evaluation

The evaluation of teaching & materials of principle and rationale of the instructional model is confirmed to be appropriate by 3 specialists or 100% of all specialists; feasibility 3 specialists or 100%; propriety 3 specialists or 100%; and accuracy 3 specialists or 100%.

Part 3 Analysis results serving research objective 3 – to study the results of implementing Problem-based learning instructional model to enhance problem solving ability for undergraduate students

Table 4.12 Students' problem solving ability after implementing Problem-based learning instructional model assessed by rubric scoring criteria in overview (Total scores=45)

Items	$\overline{X}$	S.D.	Interpretation
Item 1: The attitude of problem solving	10.20	1.31	Good
Item 2: The methods of problem solving	10.00	0.98	Good
Item 3: The quality of problem solving	10.08	1.11	Good
Total Scores	**30.28**	**1.99**	**Good**

Table 4.12 indicates that the total average scores after the experiment from students measure 30.28 (Good Level). Considering each item individually, it was found that the learners perform item 1: The attitude of problem solving best ($\overline{X}$=10.2, Good Level), followed by item 3: The quality of problem solving ($\overline{X}$= 10.08, Good Level) and the lowest mean is item 2: The methods of problem solving ($\overline{X}$=10, Good Level).

Table 4.13 Students' problem solving ability after implementing problem-based learning instructional model assessed by rubric scoring criteria in item 1: The attitude of problem solving (Total scores=15)

Standard	$\overline{X}$	S.D.
Standard 1: Confidence to solve the problem	3.90	0.67
Standard 2: The motivation to solve problems	3.54	0.67
Standard 3: Self-control of problem solving	2.76	0.59
Total Scores	**10.20**	**1.31**

From table 4.13: For Item 1, The methods of logical reasoning for undergraduate students, the total average score measures 10.20 (good level). Considering each item individually, it was found that Standard 1: Identify the problem to be solved in legal cases has the highest mean ($\overline{X}$=3.9), followed by Standard 2: Analyzing the logical issues involved in legal cases problems ($\overline{X}$= 3.54),

and the lowest mean is Standard 3: Using logical reasoning methods to solve legal case ($\overline{X}$ = 2.76).

Table 4.14 Students' problem solving ability after implementing problem-based learning instructional model assessed by rubric scoring criteria in item 2: The methods of problem solving (Total scores=15)

Standard	$\overline{X}$	S.D.
Standard 1: The diversity of problem solutions	3.96	0.66
Standard 2: The rationality of using the relevant knowledge	3.40	0.53
Standard 3: Operability of the problem solutions	2.64	0.66
Total Scores	**10.00**	**0.98**

Table 4.14: For Item 2, The methods of problem solving for undergraduate students, the total average score measures 10.00 (good level). Considering each item individually, it was found that Standard 1: The diversity of problem solutions has the highest mean ($\overline{X}$ =3.96), followed by Standard 2: The rationality of using the relevant knowledge ($\overline{X}$ =3.40), and the lowest mean is Standard 3: Operability of the problem solutions ($\overline{X}$ =2.64).

Table 4.15 Students' problem solving ability after implementing problem-based learning instructional model assessed by rubric scoring criteria in item 3: The quality of problem solving (Total scores=15)

Standard	$\overline{X}$	S.D.
Standard 1: Effectiveness and rationality of problem-solving strategies	4.10	0.54
Standard 2: Efficiency of the problem-solving process	3.30	0.54
Standard 3: Quality of the problem-solving results	2.68	0.65
Total Average Scores	**10.08**	**1.11**

Table 4.15: For Item 3,The quality of problem solving for undergraduate students, the total average score measures 10.08 (good level). Considering each item individually, it was found that Standard 1: Effectiveness and rationality of problem-solving strategies has the highest mean ($\overline{X}$=4.10), followed by Standard 2: Efficiency of the problem-solving process ($\overline{X}$=3.30), and the lowest mean is Standard 3: Quality of the problem-solving results ($\overline{X}$=2.68).

Table 4.16 The students' problem solving ability level after implementing problem-based learning technology instructional model in 3 Items (Total scores=45)

Level	Frequency	Percentage
Excellent	0	0.00
Good	48	96.00
Medium	2	4.00
Pass	-	-
Poor	-	-
Total	**50**	**100.00**

From table 4.16, it was found that 96% of 50 students whose problem solving ability is at good level while another 4% of them are assessed to be at medium level. The result is inconsistent with the research hypothesis that 80% upwards of the participants will have problem solving ability at good level after learning through problem-based learning instructional model.

Table 4.17 The Students' Problem Solving ability in Item 1: The attitude of problem solving (Total sores=15)

Level	Frequency	Percentage
Excellent	2	4.00
Good	32	64.00
Medium	16	32.00
Pass	-	-
Poor	-	-
Total	**50**	**100.00**

From table 4.17, it was found that 4% students whose problem solving ability regarding the attitude of problem solving is at excellent level and other 64% at good level, 32% at medium level.

Table 4.18 The Students' problem solving ability in Item 2: The methods of problem solving (Total sores=15)

Level	Frequency	Percentage
Excellent	1	2.00
Good	34	68.00
Medium	15	30.00
Pass	-	-
Poor	-	-
Total	**50**	**100.00**

From table 4.18, it was found that 2% students whose problem solving ability regarding the methods of problem solving is at excellent level and 68% at good level, and other 30% at medium level.

Table 4.19 The Students' problem solving ability in Item 3: The quality of problem solving (Total sores=15)

Level	Frequency	Percentage
Excellent	0	0.00
Good	34	68.00
Medium	16	32.00
Pass	-	-
Poor	-	-
Total	**50**	**100.00**

From table 4.19, it was found that 68% students whose problem solving ability regarding the quality of problem solving is at good level and other 32% at medium level.

Summery development of Problem-based learning instructional Model to enhance Problem Solving Ability for Undergraduate Students by figure 4.1

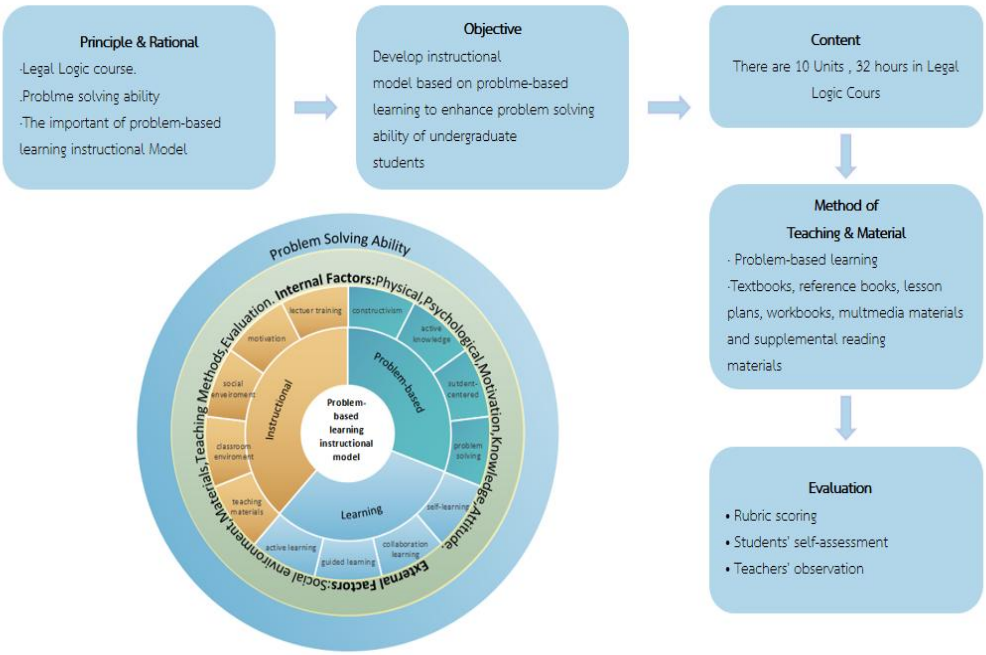

Figure 4.1 Development of Problem-based learning instructional Model to enhance Problem solving Ability for Undergraduate Students

Chapter 5
Conclusion, Discussion and Recommendations

After analyzing and presenting data analysis, The result in the study of "Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students", the researcher presented the documents concerning the following.

Research Objectives

1. To examine the factors to enhance Problem solving ability for undergraduate students in Guangxi Province.

2. To develop Problem-based learning instructional model to enhance problem solving ability for undergraduate students in Guangxi Minzu University.

3. To study the results of implementing problem-based learning instructional model to enhance problem solving ability for undergraduate students in Guangxi Minzu University.

Conclusion

1. The impact of external and internal factors on students' problem-solving ability comes from both students and lectures. Internal factors were physical, physical, psychological, motivation, knowledge, attitude and external factors were social environment, materials, teaching methods, class size, and evaluation.

2. Problem-based learning instructional model to enhance problem solving ability for undergraduate students was 100% confirmed to utility standards, feasibility standards, propriety standards and accuracy standards as assessed by 3 specialists. It includes 5 components: 1) Principle and Rationale, 2) Objectives, 3) Contents, 4) Method of teaching & materials and 5) Evaluation.

3. The results of implementing problem problem-based learning instructional model enhance problem solving ability for undergraduate students. It was found that 96% of 50 students whose problem solving ability is at good level while another 4% of them are assessed to be at medium level. The result is consistent with the research hypothesis that 80% upwards of the participants will have problem solving

ability at good level after learning through problem-based learning instructional model.

Discussion

The impact of external and internal factors on students' problem-solving ability comes from both students and lectures. Internal factors were physical, physical, psychological, motivation, knowledge, attitude and external factors were social environment, materials, teaching methods, class size, and evaluation according to:

Internal factors of the respondents. The overall data indicates that internal factors have a significant impact on the implementation of problem solving ability of undergraduate students. They mainly include motivation, attitude, physical, psychological, knowledge. For internal factors Students ' interest and students' active problem solving is the key to the effectiveness of problem solving ability. In the context of problem-based learning, educators recognize the significance of experiential learning, prior knowledge, and effective teaching methods in enhancing legal education and problem-solving skills. Additionally, the role of teacher-student interaction, a conducive learning environment, student motivation, and a positive attitude towards problem-solving are deemed essential for the successful development of students' problem solving abilities in this instructional model. Lecturers can stimulate students' interest in learning, improve their learning motivation, cultivate their learning attitude, cultivate their learning habits, and thus improve their academic performance. Therefore, internal factors have a significant impact on the implementation of problem solving ability students for undergraduate students.

External factors of the respondents. From the overall data analysis, there are several factors: social environment, materials, teaching methods, classroom size and evaluation, etc. They include Social Environment (well-equipped classroom and interactive learning environment), Materials (The teaching materials used by teachers, including intelligent classrooms, multimedia facilities and other learning materials) ,Teaching Methods (the teacher's teaching methods, combined with group cooperation, case analysis, class and after-school homework) and Evaluation (the evaluation method more scientific and more reliable). There are mainly three

aspects: first, materials affect the cultivation of students' problem-solving ability in the curriculum, and these factors also affect students' interest and participation in the curriculum. Secondly, the teaching level, experience, and expertise of instructors are also important factors that affect problem-solving abilities. The teaching methods and attitudes of instructors can all affect the learning outcomes of students. Thirdly, the size of the classroom can also affect the teaching of the course, such as the size of the classroom, the equipment of multimedia classrooms, etc. The quality of these facilities will directly affect the learning effectiveness of students.

In summary, the problem-solving ability of law students is greatly influenced by intrinsic factors such as motivation, attitude, psychology, and physiology. Lecturers can enhance students' problem-solving ability by stimulating their interest in learning, enhancing their learning motivation, and cultivating their correct learning attitude. External factors mainly include textbooks, teaching tools, lecturer level, classroom size, and evaluation, which also have a significant impact on learning outcomes. Therefore, both internal and external factors have a significant impact on the problem-solving ability of college students.

2. After 3 experts confirm the 5 components of the teaching model to determine the implementation of the teaching model. Through the confirmation results of 3 experts, problem-based learning instructional model have been unanimously agreed and supported, Problem-based learning instructional model to enhance problem solving ability for undergraduate students was 100% by these reasons:

The Principle and rationale. Regarding the utility standard, Problem-based learning model is useful for students to improve problem solving ability and find out the result from 2 factors (internal factors and external factors), and students study with study Problem-based learning those are the advantages of Problem-based learning. students engage actively with real-world problems, fostering critical thinking and honing their problem-solving skills. 2) encourages students' collaboration and effective communication, 3) promotes students self-directed learning, 4) encouraging students to take ownership of their education and delve deeply into subject matter. As undergraduates grapple with complex issues, conduct research, and apply their knowledge to practical scenarios, Conforming to feasibility standards, the intricate framework of undergraduate legal logic courses is influenced by a myriad of internal

and external factors. These factors, as highlighted through comprehensive student surveys and enlightening interactions with seasoned legal educators, play a pivotal role in shaping students' motivation and learning trajectories. As postulated by scholars of repute, such as (Saragih & Habeahan, 2014), the confluence of these factors can either augment or impede learners' academic journeys in the realm of legal logic.

The propriety standards into consideration, the problem-based learning approach in legal logic courses presents students with real-world legal dilemmas and scenarios. Furthermore, the overarching academic environment, equipped with comprehensive case studies and a collaborative learning atmosphere, acts as a catalyst, encouraging students to actively engage in the problem-solving process within the realm of legal logic.

The Accuracy standard were created by the lecturers and students to do the projects, considering students’ academic progress levels and their requests.

2.1 **The objectives.** The teaching goal of this model has been unanimously approved by 3 experts. Clear teaching goal is the premise of realizing teaching effect. The clarity of the teaching objectives of the model can improve students' problem-solving ability.

2.2 **The contents.** The component also received a 100% confirmed competency score for all experts, emphasizing that the learning materials and topics were appropriate for the model's objectives.

2.3 **The method of teaching & materials**. The methods of teaching and materials of the problem-based learning instructional model have been unanimously adopted by experts. Well-designed problem solving ability teaching and practical and interactive learning experience have a good adaptability to the teaching model, can effectively promote the improvement of students' problem solving ability.

2.4 **The evaluation.** The evaluation part was unanimously adopted by the experts, which emphasized the effectiveness and suitability of the evaluation and feedback mechanism to improve the undergraduates' problem-solving ability, and could give effective feedback to the undergraduates' problem-solving ability.

In conclusion, the experts agree that the practicability, feasibility, appropriateness and accuracy of the problem-based learning instructional model

indicate the practicability and adaptability of the model and that if it is successfully implemented, can effectively improve the problem solving ability of undergraduates.

3. The result is consistent with the research hypothesis that 80% upwards of the participants will have problem solving ability at good level after learning through problem-based learning instructional model according to these reasons:

3.1 Self-Directed Learning: It is very important to pay attention to students self-directed. That is one of the reason improve undergraduate's problem solving ability. Self-Directed learning is a good way to enhance undergraduate' problem solving ability. Emphasize the importance of self-directed learning by encouraging students to take initiative, be proactive in seeking resources, and effectively manage their time to maximize the benefits of the Problem-Based Learning (PBL) model (Choi, 2014; Al-Najar et al. (2019)).

3.2 The methods encourage students to learn and enhance their motivation for learning. The methods employed in education not only encourage students to learn but also significantly enhance their motivation for learning. The study 'Innovating Education for Sustainable Urban Development through Problem Based Learning in Latin America: Lessons from the CITYLAB Experience' by T. Coppens et al. (2020), highlights the advantages of Problem-Based Learning (PBL) in education for sustainability. This learner-centered approach, which takes complex problems as the point of departure, has shown to enhance student motivation and interdisciplinary integration of knowledge. In the context of legal logic courses, these findings suggest that a holistic approach that combines internal motivation with external support mechanisms is essential. Such an approach not only fosters problem-solving abilities in undergraduate students but also cultivates a more profound and self-motivated learning experience."

3.3 Application of relevant knowledge and problem-solving ability training, these are the essence of PBL in legal logic courses lies in its ability to bridge the gap between theoretical knowledge and practical application. By presenting students with intricate legal scenarios, PBL encourages them to delve deep into legal principles, fostering a holistic understanding of the subject. This is further corroborated by Armellini, Antunes & Howe (2021), who emphasize the enriched learning experience students garner from PBL, particularly in terms of connecting

theory with practice, engaging in diverse activities, and benefiting from online assistance.

The results of implementing problem problem-based learning instructional model enhance problem solving ability for undergraduate students. It was found that 96% of 50 students whose problem solving ability is at good level while another 4% of them are assessed to be at medium level. The result is inconsistent with the research hypothesis that 80% upwards of the participants will have problem solving ability at good level after learning through problem-based learning instructional model.

Recommendations

To the students. In the context of the Problem-Based Learning (PBL) instructional model, it is imperative for educators to set clear expectations for students to ensure the effectiveness of this pedagogical approach.

First, How to make the students expected to immerse themselves fully in problem-solving exercises. This involves not just understanding the problems presented but actively engaging in the process of finding solutions. Such participation is crucial for enhancing their critical thinking and problem-solving skills, which are at the heart of the PBL model.

Secondly, the PBL approach relies heavily on collaborative learning. Students must be willing to work in groups, leveraging the diverse perspectives and strengths of their peers. This collaboration is not just about working alongside others but involves active communication, idea sharing, and co-constructing solutions with team members.

Third, a key principle of PBL is the emphasis on self-directed learning. Students are expected to take initiative in their learning journey. This includes proactively seeking resources, managing their time effectively, and engaging autonomously in various problem-solving scenarios. Such self-guidance is crucial for developing resilience and independent thinking skills. Finally, students are encouraged to develop a love for learning that extends beyond the classroom. The PBL model aims to instill an appreciation for continuous personal and professional development, motivating students to pursue learning as a lifelong endeavor.

To the lecturers: Mastering and mastering professional knowledge, familiarizing oneself with teaching procedures, mastering students' learning abilities, levels, and attitudes in advance, interacting more with students, and providing timely feedback to make adjustments.

Lecturers play a pivotal role in the successful implementation of the Problem-Based Learning instructional model. It is essential for lecturers to master their professional knowledge and familiarize themselves with the PBL teaching procedures. Understanding students' learning abilities, levels, and attitudes in advance is crucial for tailoring the instructional approach. Lecturers should strive for active interaction with students and provide timely feedback, making necessary adjustments to teaching strategies. This commitment to excellence and adaptability is key to enhancing the problem-solving abilities of undergraduate students as outlined in the 'Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students.' By continuously engaging with students and refining their teaching methods, lecturers can significantly impact the effectiveness of the PBL model and the development of students' problem-solving skills.

For the PBL instructional model to remain dynamic and effective, continuous professional development for lecturers is essential. Educators must stay abreast of the latest methodologies, tools, and techniques in PBL to enhance their teaching skills and effectively guide their students. Participation in workshops, training programs, and collaborative sessions is crucial for lecturers to exchange ideas, learn from peers, and continually refine their teaching strategies. This commitment to professional growth not only ensures that educators are well-equipped to foster an optimal learning environment but also ensures that they can effectively respond to the changing educational landscape, thereby enhancing the overall quality of problem-solving education."

In the realm of Problem-Based Learning (PBL), continuous feedback is an indispensable tool for student development. It is imperative that educators provide timely, constructive feedback that not only acknowledges students' strengths but also clearly identifies areas for improvement. This feedback should be strategically employed to motivate students and guide them towards more effective problem-solving strategies. By focusing on specific instances of success and areas needing

attention, educators can foster a growth mindset, encouraging students to persevere and refine their skills. The feedback loop, therefore, becomes a critical component of the learning process, ensuring that students are continuously evolving and adapting their approach to problem-solving."

To the universities: Universities have a significant responsibility in fostering an environment conducive to the 'Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students.' This involves encouraging continuous professional development for lecturers to ensure they remain updated with the latest PBL methodologies, tools, and techniques. Universities should facilitate participation in workshops, training programs, and collaborative sessions that aim to enhance teaching skills and methodologies. By investing in the professional growth of lecturers, universities contribute to a dynamic and effective learning environment that is essential for the cultivation of problem-solving abilities in students. Such an environment not only supports the academic growth of students but also prepares them to meet the challenges of the future with confidence and competence.

University could implement a system of continuous evaluation and assessment to monitor the effectiveness of the PBL model. This can include gathering feedback from students and lecturers, analyzing learning outcomes, and making necessary adjustments to improve the overall learning experience.

In summary, the PBL model requires active participation and self-directed learning from students, continuous professional development and adaptive teaching strategies from lecturers, and a supportive, evolving educational environment from universities. This collaborative effort is essential to enhance problem-solving abilities in undergraduate students.

Future Research

In the future, the research on the problem-based learning instructional mode in the legal logic course for undergraduates can be carried out from the following four aspects:

1. Creating a problem-based learning instructional model to enhance a distinct skill set among undergraduate students.

2. Designing a problem-based learning instructional model aimed at improving a specific ability for undergraduate students.

3. Crafting an instructional model focused on enhancing problem-solving skills for undergraduate students.

4. Formulating both a problem-based learning and an alternative instructional model to enhance problem-solving abilities in undergraduate students.

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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

1.Assistant Professor Dr.Prapai Sridama	Computer and Technological Program Bansomdejchaopraya Rajabhat University
2.Assistant Professor Dr.Wapee Kong -In	English Program Bansomdejchaopraya Rajabhat University
3.Assistant Professor Dr.Wei Lina	Higher EducationProgram Guangxi Minzu Universtiy

List of experts to evaluate the instructional model

Assistant Professor Dr.Wanida Ploysangwal	English Program University of the Thai Chamber of Commerce
Dr.Panas Jansritong	Administration Program Krirk University
Professor Dr.Tang Dehai	Higher Education Program Guangxi Minzu Universtiy

APPENDIX B

Official Letters

Ref. No. MHESI 0643.14/ 1030

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

29 August 2023

Subject Request for research tool validation

Dear Assistant Professor Dr.Prapai Sridama

Attachment Validation sheets

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs.Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Assistant Professor Dr.Sarayuth Sethakajorn as co-advisors, the written pretest-posttest and questionnaire as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the attached pretest-posttest and questionnaires 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, the pretest-posttest, 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/ 1092

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

29 August 2023

Subject Request for research tool validation

Dear Assistant Professor Dr.Wapee Kong-In

Attachment Validation sheets

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs.Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Assistant Professor Dr.Sarayuth Sethakajorn as co-advisors, the written pretest-posttest and questionnaire as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the attached pretest-posttest and questionnaires 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, the pretest-posttest, 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/ (034

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

29 August 2023

Subject Request for research tool validation

Dear Assistant Professor Dr.Wei Lina

Attachment Validation sheets

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs.Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Assistant Professor Dr.Sarayuth Sethakajorn as co-advisors, the written pretest-posttest and questionnaire as instruments will be used in the said research. In view with this, the researcher would like your expertise to validate the attached pretest-posttest and questionnaires 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, the pretest-posttest, 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
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Ref. No. MHESI 0643.14/1056

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

29 August 2023

Subject Request for evaluation of instructional model

Dear Associate Professor Dr.Wanida Ploysangwal

Attachment Evaluation sheets

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs. Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr. Sarayuth Sethakajorn 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 0643.14/1039

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

29 August 2023

Subject Request for evaluation of instructional model

Dear Dr.Panas Jansritong

Attachment Evaluation sheets

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs. Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr. Sarayuth Sethakajorn 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
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Ref. No. MHESI 0643.14/ 1038

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

29 August 2023

Subject Request for evaluation of instructional model

Dear Professor Dr.Tang Dehai

Attachment Evaluation sheets

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs. Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr. Sarayuth Sethakajorn 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
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Tel. (662) 4737000
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Ref. No. MHESI 0643.14/ 1020

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

29 August 2023

Subject Request for data collection

Dear President of Guangxi Minzu University

Attachment Questionnaire on the influence factors of Problem solving ability for undergraduate students

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs. Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Sarayuth Sethakajorn as co-advisors, the researcher needs to collect data using questionnaire in terms of factors influencing the improvement of Problem solving ability of undergraduate , including the internal and external factors, factors of teaching model and factors of teaching environment. The questionnaire samples are from 80 students who have completed the Legal logic course , sample group e.g. 50 students of section B majoring in law, 1 lecturer from Guangxi Minzu 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 905846715@qq.com or mailing address, School of Architectural Engineering, Guangxi Minzu University, Nanning, Guangxi, China, 530105 .

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,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
Dean of Graduate School
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Ref. No. MHESI 0643.14/ว0941

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

29 August 2023

Subject Request for data collection

Dear President of Guangxi University of Finance and Economics

Attachment Questionnaire on the influence factors of Problem solving ability for undergraduate students

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs. Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Sarayuth Sethakajorn as co-advisors, the researcher needs to collect data using questionnaire in terms of factors influencing the improvement of Problem solving ability of undergraduate,including the internal and external factors, factors of teaching model and factors of teaching environment.The questionnaire samples are from 60 students who have completed the Legal logic course, 1 lecturer from Guangxi University of Finance and Economics. 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 905846715@qq.com or mailing address,School of Architectural Engineering, Guangxi Minzu University, Nanning, Guangxi, China, 530105.

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,

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

Tel. +66 0204737000 Ext.
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Ref. No. MHESI 0643.14/ 1042

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

29 August 2023

Subject Request for data collection

Dear President of Wuzhou University

Attachment Questionnaire on the influence factors of Problem solving ability for undergraduate students

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs.Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Associate Professor Dr.Sarayuth Sethakajorn as co-advisors, the researcher needs to collect data using questionnaire in terms of factors influencing the improvement of Problem solving ability of undergraduate,including the internal and external factors, factors of teaching model and factors of teaching environment.The questionnaire samples are from 60 students who have completed the Legal logic course,1 lecturer from Wuzhou 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 905846715@qq.com or mailing address, School of Architectural Engineering, Guangxi Minzu University, Nanning, Guangxi, China, 530105 .

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,

(Assistant Professor Dr.Kanakorn Sawangcharoen)
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Ref. No. MHESI 0643.14/ 1043

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

29 August 2023

Subject Request for permission to implement experiment

Dear President of Guangxi Minzu University

Regarding the thesis entitled **Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students** of Mrs. Li Siqin, a Ph.D. student majoring in Curriculum and Instruction Programme at BansomejchaoprayaRajabhat University code number 6373103204, Thailand under the supervision of Associate Professor Dr. Narongwat Ming-Mit as major advisor and Associate Professor Dr.Areewan Iamsa-ard and Assistant Professor Dr.Sarayuth Sethakajorn as co-advisors, the researcher needs to implement an experiment in compliance with approved methodology and collect data in terms of the improvement of Problem solving ability of undergraduate students through problem-based learning from sample group e.g.50 first year students of section B majoring in Law of law school , Guangxi Minzu University during the 2nd semester of academic year 2023. Hence, I'm formally requesting permission to implement the experiment and access the aforementioned data.

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

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

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Appendix C

Research Instrument

Table 1 Scale of factors affecting problem solving ability of undergraduate students

Dear students,

This questionnaire aims to understand the factors that influence the problem-solving ability of undergraduate students. We hope to identify these factors from various aspects in order to enhance the quality of teaching. This questionnaire is for educational and research purposes only, and there are no right or wrong answers. Your response will be kept strictly confidential. We appreciate your honest participation.

topic	strongly agree	quite agree	neutral agree	do not quite agree	Strongly disagree
No. 1 Students believe that the contents of legal reasoning in Legal Logic course can enhance their ability to solve legal problems.					
No.2 Students are very interested in Legal Logic Course.					
No3.Students feel that this subject can improve their knowledge of the Law.					
No.4 Students believe that teachers should provide more guidance on their problems in class.					
No.5 Students know that the course of legal logic is an important compulsory course for law majors.					
No.6 Students believe that materials and learning resources to improving problem solving ability in legal logic courses.					
No.7 Students like lecturers that can explain many professional practical examples.					
No.8 Students can quickly connect their knowledge and experiences in the process of problem solving problems.					
No.9 Students feel that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.					

Table (continue)

topic	strongly agree	quite agree	neutral agree	do not quite agree	Strongly disagree
No.10 Students will compare the advantages and cons of different problem solutions, and combine the actual situation, finally choose the most Is the plan.					
No.11 Students will take the initiative to summarize their learning and apply the useful experience to their future study.					
No.12 Students can through problem solving by the Case analysis method and instrument tools in the legal logic course.					
No.13 Students are satisfied with the friendly cooperation and interaction between students and teachers or peers in the classroom in legal logic course.					
No.14 Students enjoy a classroom atmosphere where there is a lot of interaction between teachers and students.					
No.15 Students are not sure if this course will be helpful for their future careers.					
No.16 The lecturers' teaching model enables students to understand content clearly.					
No.17 The lecturers can guide students to recognize that learning courses and problem-solving skills are assistance for future career development.					
No.18 The lecturers choose appropriate teaching methods according to the legal logic courses and the tasks and goals of problem solving training.					
No.19 The lecturers choose suitable materials and emerging resources.					
No.20 The lecturers design learning tasks that challenge and encourage the students' enthusiasm.					

Table (continue)

topic	strongly agree	quite agree	neutral agree	do not quite agree	Strongly disagree
No.21 The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives. .					
No.22 Classroom environment affects students' learning enthusiasm.					
No.23 The lecturers can stimulate students' interest and meet the contemporary needs of students, such as debate in Moot court.					
No 24 The materials and environment can enhance undergraduate students' Problem solving ability					
No.25 The availability of learning spaces and the problem based learning can affect students interest in Legal Logic courses.					
No.26 As a learning place, Moot court can improve students' interest in learning legal logic course.					
No.27 The lecturers pay more attention to students' problem solving ability and its impact in Legal Logic courses.					
No.28.The textbook provides practical, Professional materials for students. .					
No.29 Provides a teaching mode with a stable high-speed network anytime, anywhere on campus as a teaching guarantee, and supports Problem based learning mode to enhance students' problem solving ability.					
No.30 The environments is clean and bright, with desks and chairs, blackboards, podiums, computers, projectors, large screens, loudspeakers and other multimedia facilities to facilitate the teaching process.					

Interview for Lecturers

Dear Colleagues,

This interview's objective is to delve into these factors that shape the problem-solving capabilities of our undergraduate students from multiple dimensions, aiming to refine our teaching methodologies and elevate the overall educational experience.This interview serves purely for educational and research purposes, and there are no definitive right or wrong answers. All responses provided will be treated with the utmost confidentiality. Your active engagement and candid insights are sincerely appreciated.

Serial Number	Contents
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, etc.)
No.3	What are the most students 'problem when you teach inLegal Logic ?And how you solve the problem ?course
No.4	Do you always manage teaching according to your lesson plan? If you cannot teach according to your lesson plan, how do you solve the problem to enhance students achieving the goal?
No.5	What methods do you use to help students solve problems in class when they are unable to solve them.
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?

Table (continued)

Serial Number	Contents
No.7	Can you tell me what kind ofProblem Based Learning to enhance their problem solving?ability
No.8	Previously, what problems do you meet in your teaching, and how do you find the solution?
No.9	Which aspects of your teaching need to be improved, or which aspects do you want the school to support you?
No.10	Can you tell me What is the best way to teach students' problem-solving abilities in a logical approach classroom?

Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students

By

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Preface

My handout is divided into 5 parts, the first part is principle & rational, mainly introduced development problem-based learning instructional model, the factors to promote problem solving ability for undergraduate students. The second introduced my objectives of handout, namely, to develop instructional model based on problem-based learning to enhance problem solving ability of undergraduate students. The third part is Contents, mainly include 3 units and 6 chapters, select representative chapters in the textbook, Adapting methodologies that align with the present learning environment and the proficiency level of the students is crucial to ensure the experiment's scientific and rational validity.

The fourth part is Methods of teaching & Materials, mainly introduced how to proceed the class, after the assessment of students' learning situation, the teaching plan is formulated, the process of teaching implementation is determined, and experts are invited to evaluate and confirm. The fifth part is evaluation, mainly introduced how to evaluate problem solving ability, from which aspects to evaluate it, through literature review and daily teaching experience to determine how to evaluate students and invite experts to conform the effectiveness of the evaluation, standards, hoping that the evaluation of teaching can be more scientific and reasonable.

Research Framework

My research framework as follow, the main research topic is development of problem-based learning model to enhance problem-based learning ability for undergraduate students, based on the theme, i explored the concepts and principles, and sorted out the related issues of problem-based learning, problem solving ability etc. My research model is determined as Problem-based learning instructional model, and the research purpose is to examine the factors to promote problem solving ability for undergraduate students, to develop Problem-based learning instructional model to enhance problem solving ability for undergraduate students, to study the results of implementing problem-based learning instructional model to enhance problem solving ability for undergraduate students. According to the research objectives, the factors affecting problem solving ability instructional model and its components are explored, and the teaching plan and student evaluation standards are formulated. Then the Legal Logic course based on this model is implemented. Finally, according to the experimental results, summarizes and discusses the future research.

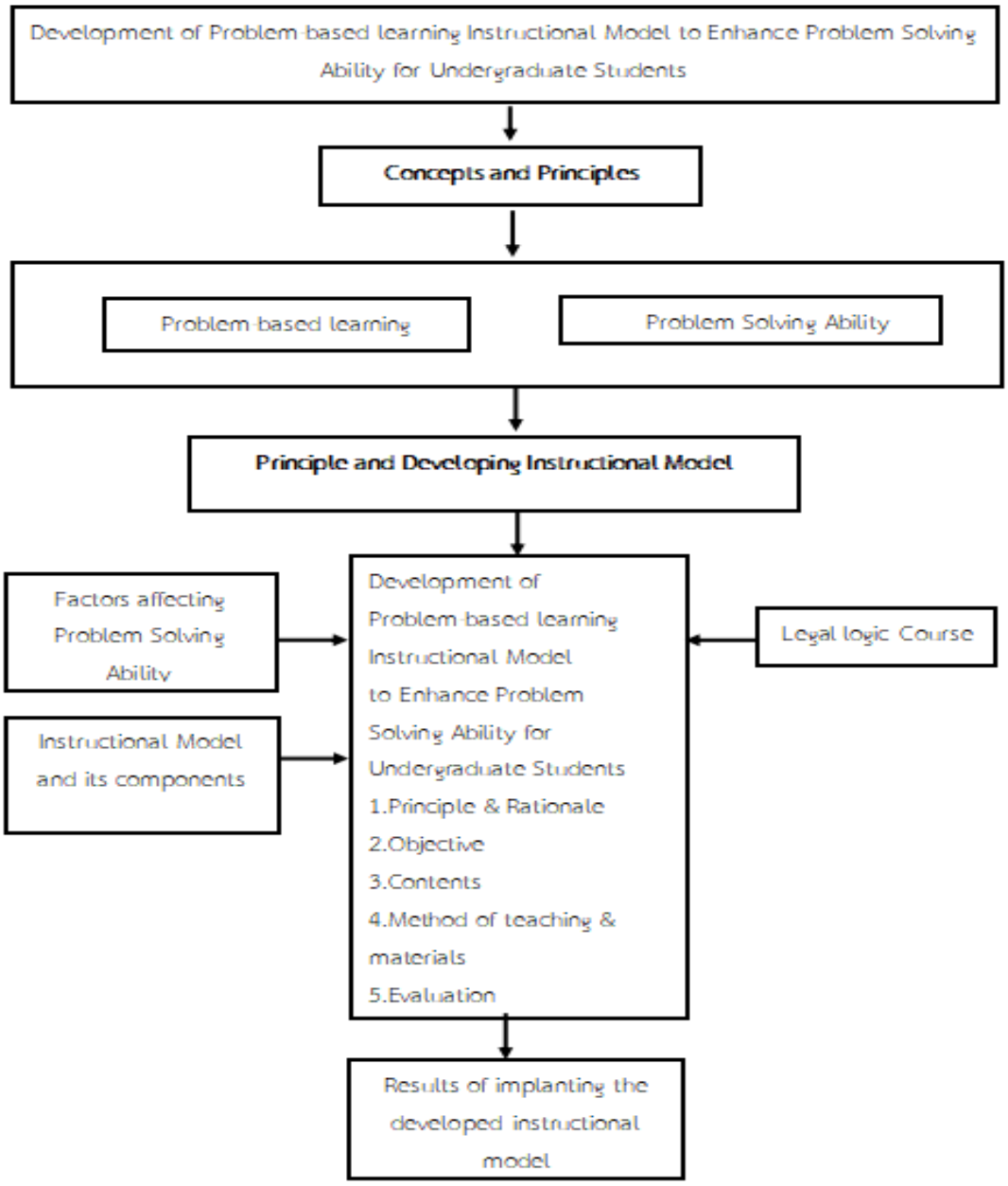


Figure 1.1 Research Framework

Figure 1.1 Research Framework

This part is mainly introduced development problem-based learning instructional model the factors to promote problem solving ability for undergraduate students, through the analysis of students' questionnaire results and teachers' interviews, it is concluded that the factors to enhance problem solving ability are mainly to pay attention to these influencing factors in the process of teaching design and implementation.

Development of Problem based learning Model refers to a relatively stable teaching activity structure framework and activity procedure established under the guidance of a certain teaching model, to enhance undergraduate students' problem solving ability at Guangxi Minzu University from 5 phases, 1) Principle & Rational 2) Teaching Objectives 3) Teaching Contents 4) Teaching Methods of teaching & Materials 5) Evaluation by the experts evaluate.

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

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

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

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

The mode mostly adopts the dialogue and discussion teaching, and the information is cross carried out between teachers and students, and between students and students. The concrete implementation steps are as follows(IQAC Training Literature 20 /21):

Step 1: The formulating the expected learning outcome. Teachers set teaching objectives that are expected to be achieved so that students can identify what they are learning.

Step 2: Understanding the concept of the teaching materials. Teachers first understand the concept of teaching materials and content, so that students can understand the need to grasp the knowledge and faster into the state of learning.

Step 3: Problem-solving Skill training. Teachers will perform a series of exercises to improve problem-solving skills so that students can solve problems more quickly in the curriculum.

Step 4: Designing solutions to the problem. Teachers Guide students to apply relevant knowledge and problem-solving skills, so that students can put forward a variety of feasible problem-solving solutions in various situations.

Step 5: Executing problem solutions. The teacher guides the students to implement the solution through the students' design, and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. The teacher evaluates the solutions and results of the students' problems solutions, so that the students can make clear their problems and make positive adjustments.

For students, Problem-based learning can improve students’ problem solving ability, this model could let the students understand the reasoning method

and practical application of legal logic and help the students to use the reasoning of legal logic to solve the practical legal problems, improving their problem-solving ability. For lectures: For the traditional teaching mode, the new teaching mode is conducive to teachers' timely understanding of students' dynamics and mastery of knowledge points and is more targeted in the process of lesson teaching. For institute: The new teaching method can provide help to other teachers 'teaching, which is of great help to improve teachers' teaching level and improve students' professional knowledge and problem-solving ability.

The researchers have the result from objectives 1: To examine the factors to enhance problem solving ability for undergraduate students. The result from 200 from former students from Guangxi Minzu University, Gaungxi University of Finance and Economics, Wuzhou University, who majoring in Law school who enroll Legal Logic Course in the semester 1 academic year 2022 . and 3 lecturers from Guangxi Minzu University, Gaungxi University of Finance and Economics, Wuzhou University .

Internal factors from students and lecturers

Physical: Students and teachers agree on the importance of learning experience and the accumulation of prior knowledge, and the course of legal logic can improve students' knowledge of the legal profession. It is beneficial to develop their problem-solving ability to apply the useful learning experience to their future study. Teachers' good teaching methods, analytical methods and the preparation of teaching equipment in class can help students understand the course more clearly.

Psychological:

In the teaching of problem-solving learning mode, lecturers and students emphasized the importance of teacher-student interaction. Students 'interest and students' active problem solving is the key to the effectiveness of problem solving ability. At the same time, teachers' external environmental factors also play a certain

role in the teaching process, and the favorable internal and external environment is conducive to improving the problem solving ability of undergraduates. the cooperation of classmates and the encouragement and guidance by teachers will make students have the confidence to explore knowledge more actively.

External Factors form students and lecturers

Teaching Methods: Lecturers and students mainly use the teacher's teaching methods, combined with group cooperation, case analysis, class and after-school homework. 3 lecturers use various teaching materials, including textbooks and online learning resources.

Materials: The teaching materials used by teachers, including intelligent classrooms, multimedia facilities and other learning materials, are conducive to promoting students' learning and enhancing their interest in learning.

Social environment: The three lecturers believe that the well-equipped classroom and interactive learning environment can enhance students' knowledge exploration and improve their problem-solving ability.

Class size: According to the three lecturers in the school of understanding, three lecturers teaching classes is the middle class teaching model, a class of students are about 50. They pay more attention to the learning experience of problem solving and classroom interaction with students.

Evaluation: Three lecturers measure students through classroom group work, after-school assignments, and midterm tests, and one instructor uses case studies, the students' judgment and reasoning ability in case analysis reflects the students' learning effect but lacks data support.

About the Lesson Itself: 1) set the lesson goal(s) at the start of class.2) Choose which activity/part of the lesson worked particularly well/was very well executed. 3) Choose which activity/part of the lesson did not work so well/was not

well executed. And 4) Choose which activity/part of the lesson was particularly difficult/challenging. Evaluation is concerned with assessing the effectiveness of teaching, teaching strategies, methods and techniques. It provides feedback to the teachers about their teaching and the learners about their learning.

Through the above analysis, it is found that among the factors that affect problem solving ability, students' emotion of actively participating about problems is an important factor. Appropriate teaching methods, teaching models and interesting teaching materials can better mobilize students' problem solving ability. At the same time, the environment in which students' problem solving ability includes the external environment of the classroom, the internal environment of the classroom, and a good learning styles are also important factors that affect students' problem solving ability.

The internal factors affecting the problem solving ability for undergraduate students are found that factor to be a high level overall(μ=4.06), Considering each item individually, I was found that No.11 have the highest mean (μ= 4.67), follow factor by No.3 Students feel that this subject can improve their knowledge of the Law (μ=4.56) and the lowest mean is No.4. (μ=3.63).

For external factors affecting Legal Logic course enhance Problem solving ability of undergraduate students at are found at high level overall(μ=3.98). Considering each item, it was found that factor No.21 is the highest mean (μ= 4.41), follow by factor No.17 (μ=4.38) and the fewest mean is factor No.24 (μ=3.76).

The result of questions from 3 lecturers from Guangxi Minzu University, Guangxi University of Finance and Economics, Wuzhou University found that:

No.1 Most of the lecturers was interesting in the Legal Logic course, they chose to teach this course because they believe that the Problem-based learning

instructional model can improve students' Mix ability, including problem solving ability, critical thinking, legal reasoning ability.

No.2 Most of the lecturers before teaching, will Prepare contents, materials and all of the materials for the course.

No.3 Most of the lecturers thought that problem-based learning instruction to enhance students' problem solving ability is very important for this course. The most students 'problem solvinga bility they teach in Legal Logic courses change the traditional instructional model.

No.4 Most of the lecturers believes that the teaching materials is very important for this course, and the lesson plan could help students achieving the instructional objectives. and the good lesson plan could enhance students' problem solving.

No.5 Most of the lecturers believe that problem-based learning instructional model is a new instructional framework which consists of the stable teaching activities and procedures. Such a developed instructional model with 5 components: Principle &Rationale, Objectives, Contents, Methods of teaching & Materials and Evaluation. These five components not only visualize the abstract teaching design theory, but also ensure the efficiency of course design and implementation.

No.6 Most of the lecturers consider that Current measurement and assessment course can't perfectly reflect students' learning effect and knowledge level, they need need instructional model and improve measurement to confirm students' learning level.

No.7 Most of the lecturers believes that the Problem-based learning model is very important for students' problem solving ability. In this course, lecturers could choose situational teaching, they found that the problem-based learning is a teaching

method suitable for the students. And this instructional model can help students' improve their problem solving ability.

No.8 Most of the lecturers consider that the active participation between teacher and students is very important and the the interest is a primary gene for students' learning. Group discussion in class, teachers 'guidance and students' independent study are conducive to improving students' problem-solving ability.

No.9 Most of the lecturers believe that the teaching models, teaching materials and teaching methods affect students' problem solving ability and are important factors. Teachers' diverse choices of teaching methods are conducive to improving students' problem solving ability. The problem-based learning instructional model has irreplaceable value in education and teaching.

No.10 Most of the lecturers believe that appropriate teaching methods can stimulate students' interest in the legal logic course, and stimulating students' learning initiative is an important purpose of using teaching methods. During problem-based learning instructional model, teachers can Integrate various unique teaching methods.

This summary highlights the key findings from the interviews conducted with three lecturers from three different universities teaching Legal Logic course. It offers insights into their teaching approaches, methodologies, challenges, and support needed for effective teaching and learning in the field of law and they are deeply studied in the problem-based learning instructional model.

Through the above analysis, it is found that among the factors that affect problem solving ability, students' emotion of actively participating about problems is an important factor. Appropriate teaching methods, teaching models and interesting teaching materials can better mobilize students' problem solving ability. At the same time, the environment in which students' problem solving ability includes the

external environment of the classroom, the internal environment of the classroom, and a good learning style are also important factors that affect students' problem solving ability.

From above, the researcher will design and be careful to design Problem-based learning instructional model to enhance problem solving ability for undergraduate students.

This part is Objectives, introduced my objectives of hangout, namely, to develop instructional model based on problem-based learning to enhance problem solving ability for undergraduate students, the purpose of the research is mainly from the literature review and previous teaching experience, hoping to use the model to better improve the teaching effect and improve students' problem solving ability.

Contents

This part is Contents, mainly include 3 units and 9 chapter, choose relevant chapters from the textbook based on the teaching objectives. Adjust the teaching content appropriately to align with students' individual development, their current learning status, problem-solving abilities, and societal needs. This ensures that the experiment is conducted in a more scientific and rational manner.

According to the problem solving ability in this study, the researcher chooses Unit 2, Unit 3, Unit 4 for the experiment, The content is shown below:

Unit 2:Logical Basis of Legal Thinking (Part 1) (6 hours)

Chapter 1: Simple proposition (2 hours)

Chapter 2: categorical proposition (1 hour)

Chapter 3: Synthetic reasoning (3 hours)

Unit 3:Logical Basis of Legal Thinking (Part 2) (7 hours)

Chapter 1: Compound proposition (1 hours)

Chapter 2: Composite proposition reasoning (3 hours)

Chapter 3:Hypothetical reasoning (2 hours)

Unit 4:Investigation logic (3 hours)

Chapter 1: Investigative logic (1 hour)

Chapter 2: Investigation conjecture (1 hour)

Chapter 3: Investigation hypothesis(1hour)

This part is Methods of teaching & Materials, mainly introduced how to proceed the class, after the assessment of students' learning situation, the teaching plan is formulated, then the process of teaching implementation is determined, and experts are invited to evaluate and confirm it. In the teaching process, I chose the teaching method based on Problem-based learning technology, which divided into 6 steps: The formulating the expected learning outcome, Understanding the concept of the teaching materials, Problem-solving Skill training, designing solutions to the problem, Executing problem solutions, Summary and evaluation.

Traditional resources: Textbooks, reference books, lesson plans, workbooks, flashcards, charts and supplemental reading materials. Graphic and interactive materials: Physical objects, photographs, illustrations, charts, graphs, maps, multimedia.

Methods of teaching

Problem-based learning means a new teaching model based on constructivism methods, with the purpose of curriculum requirements and the goal of students' ability to solve problems as the main line, taking teacher guidance, teacher-student interaction and cooperation as the basic form, to guide students to solve problems with existing knowledge.

The mode mostly adopts the dialogue and discussion teaching, and the information is cross carried out between teachers and students, and between students and students. The concrete implementation steps are as follows:1)The

formulating the expected learning outcome, 2)Understanding the concept of the teaching materials, 3)Problem-solving Skill training, 4)Designing solutions to the problem,5)Executing problem solutions, 6)Summary and evaluation.

Step 1: **The formulating the expected learning outcome**. Teachers set teaching objectives that are expected to be achieved so that students can identify what they are learning.

Step 2: **Understanding the concept of the teaching materials**. Teachers first understand the concept of teaching materials and content, so that students can understand the need to grasp the knowledge and faster into the state of learning.

Step 3: **Problem-solving Skill training.** Teachers will perform a series of exercises to improve problem-solving skills so that students can solve problems more quickly in the curriculum.

Step 4: **Designing solutions to the problem.** Teachers Guide students to apply relevant knowledge and problem-solving skills, so that students can put forward a variety of feasible problem-solving solutions in various situations. Step 5: Executing problem solutions. The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 5: **Executing problem solutions.**Teacher guide students explore independently and leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

Step 6: **Summary and evaluation.** In this phase the teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer. The teacher evaluates the solutions and results of the students' problems solutions, so that the students can make clear them problems and make positive adjustments.

Materials

Textbooks, reference books, lesson plans, workbooks, flashcards, charts and supplemental reading materials. Graphic and interactive materials: Physical objects, photographs, illustrations, charts, graphs, maps, multimedia.

Based on the problem-based learning instructional model, teaching in the classroom is divided into 6 steps:

Step 1: The formulating the expected learning outcome.

Step 2: Understanding the concept of the teaching materials. Teacher explains the concept of the teaching materials, determine what the students need to learn and where they can acquire the information and tools necessary to solve the problem.

Step 3: Problem-solving Skill training. Teacher divides the students into several groups, Teacher could ask questions along with the students, and serve as a model problem solver. And perform a series of exercises to improve problem-solving skills so that students can solve problems more quickly in the curriculum.

Step 4: Designing solutions to the problem. Teacher could help the students to designing the solutions when they encounter problems and discuss with the students to carry out communication.

Step 5: Executing problem solutions. Teacher guide students explore independently and leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

Step 6: Summary and evaluation. In this phase the teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer.

According to the problem-based learning ability in this study, the researcher chooses Unit 2, Unit 3 and Unit 4 for the experiment. The content is shown below:

Unit 2:Logical Basis of Legal Thinking (Part 1) (6 hours)

Chapter 1: Simple proposition (2 hours)

Chapter 2: Compound proposition (2 hours)

Chapter 3: Synthetic reasoning (2 hours)

Unit 3:Logical Basis of Legal Thinking (Part 2) (7 hours)

Chapter 1: Inductive reasoning (3 hours)

Chapter 2: Analogical reasoning (2 hours)

Chapter 3: Abductive reasoning (2 hours)

Unit 4:Investigation logic (3 hours)

Chapter 1: Investigative logic (1 hour)

Chapter 2: Investigation conjecture (1 hour)

Chapter 3: Investigation hypothesis (1 hour)

Lesson Plan 1

I choose lesson1 as an example to introduce my experiment implementation process, there are 6 hours of class time. The key points of this part are evaluated whether problem-based learning instructional model enhance students' problem solving ability, evaluate whether problem-based learning instructional model improves students' problem solving, evaluate, whether problem-based learning instructional model improves students' problem solving skills, evaluate whether problem-based learning instructional model enhance students' solving ability, mainly the methods of legal logical reasoning.

UNIT 1: Logical Basis of Legal Thinking (Part 1)

Topic: Logical reasoning method (6 hours)

1.Learning Objectives

Item 1. The attitude of problem solving

Standard 1: Confidence to solve the problem

1.Students can enhance their problem solving ability, learn the methods of logical reasoning, the lecturer judges it by class performance and homework.

Standard 2: The motivation to solve problems

2.Students can master the methods and rules of logical reasoning**,** the lecturer judge it by class performance and homework.

Standard 3: Self-control of problem solving

1.Students can use the methods of the logical reasoning, the lecturers judge it by class performance and homework.

2.Contents

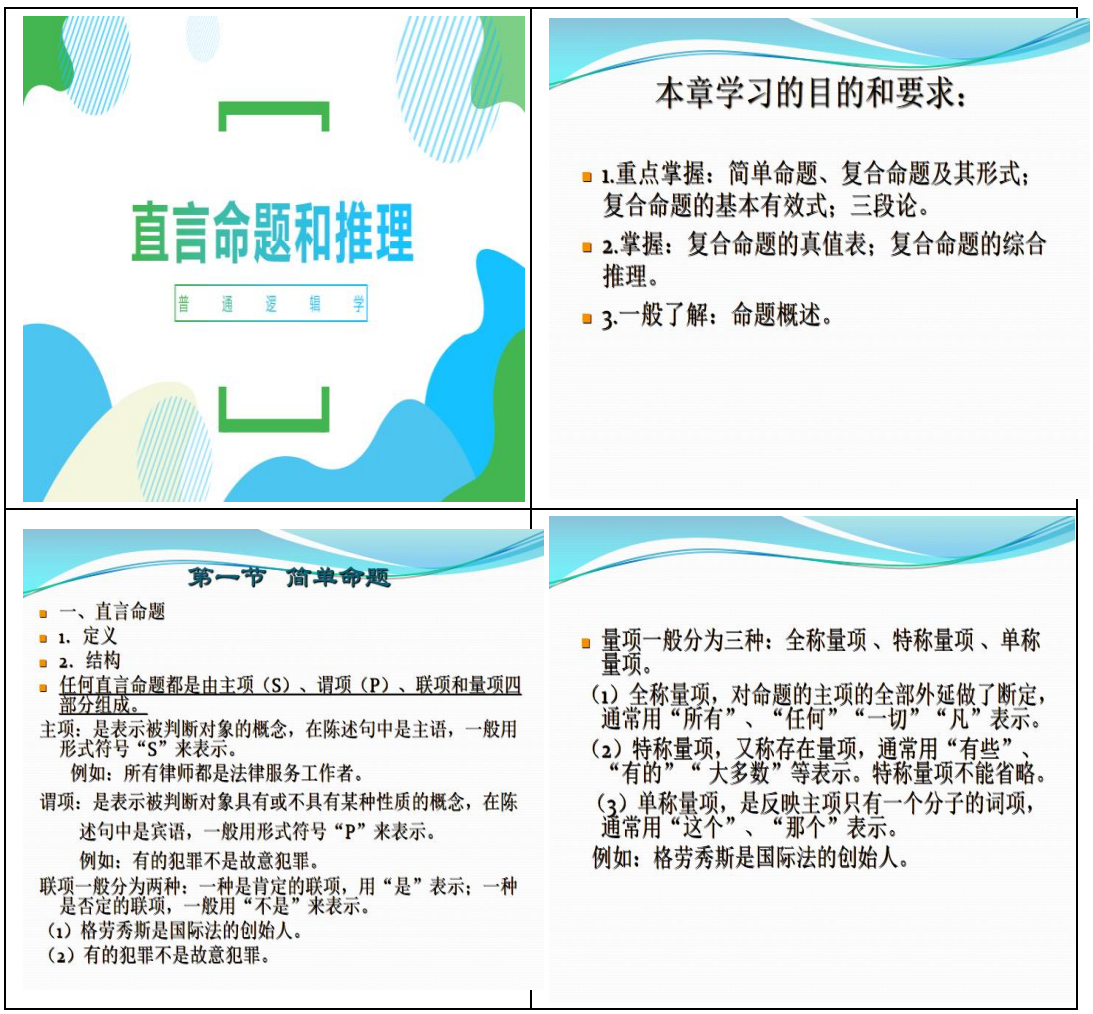
The methods of logical reasoning

3.instructional:Problem-based learning instructional model

First (2 hours)

Step 1: The formulating the expected learning outcome. (15minutes)

1) Explain the Categorical propositional reasoning

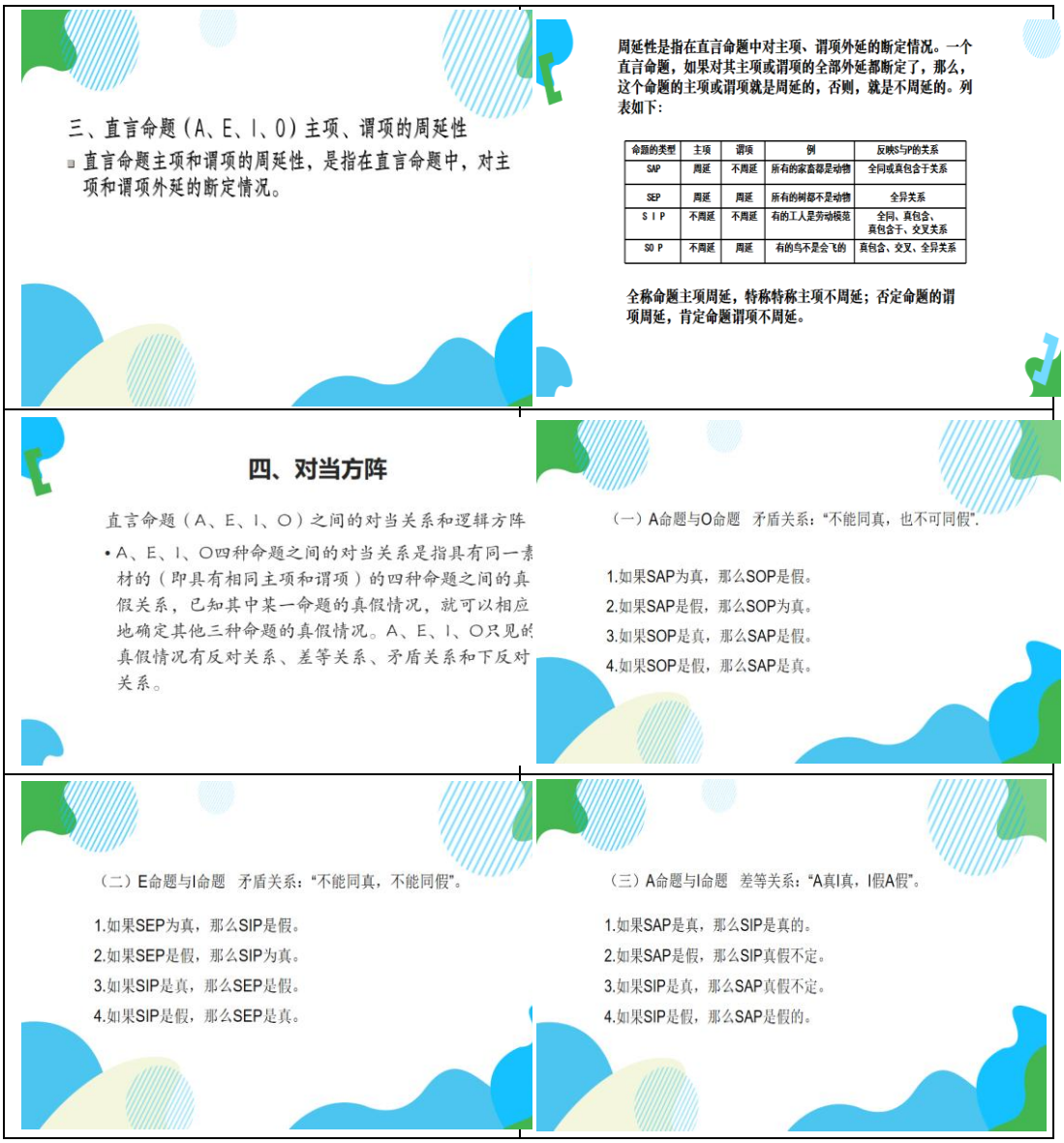


Step 2: Understanding the concept of the teaching materials. (30minutes)

1.Student group discussion

Group the students according to their student number information, and try to be in a group of 5 students.

2.explain the concept of the contents.



（四）E命题与O命题　差等关系："E真O真，O假E假"。

1.如果SEP为真，那么SOP是真的。
2.如果SEP是假，那么SOP真假不定。
3.如果SOP是真，那么SEP真假不定。
4.如果SOP是假，那么SEP是假的。

差等关系

- A-I、E-O的差等关系："可以同真，也可同假"，即在同质的条件下，全**称命题真，则特称命题必真；全称命题假，则特称命题可真可假；特称命题假，则全称命题必假；特称命题真，则全称命题可真可假。**

①全称命题真，则特称命题必真；

- 例如：所有的事物都是运动的。 T
- 有的事物是运动。 T

例如：所有的鱼都不是哺乳动物。 T

- 有些鱼不是哺乳动物。 T

（五）A命题与E命题　反对关系："不能同真，可以同假"。

1.如果SAP为真，那么SEP是真的。
2.如果SAP是假，那么SEP真假不定。
3.如果SEP是真，那么SAP是假的。
4.如果SEP是假，那么SAP真假不定。

（六）I命题与O命题　下反对关系："不能同假，可以同真"。

1.如果SIP是真的，那么SOP真假不定。
2.如果SIP是假的，那么SOP是真的。
3.如果SOP是真的，那么SIP真假不定。
4.如果SOP是假的，那么SIP是真的。

二、直言命题对当关系推理

1.矛盾关系推理

①SAP├¬SOP　⑤¬SAP├SOP
②SOP├¬SAP　⑥¬SOP├SAP
③SEP├¬SIP　⑦¬SEP├SIP
④SIP├¬SEP　⑧¬SIP├SEP

2.反对关系推理

只有两种：
① SAP├¬SEP
② SEP├¬SAP
命题A与E之间，其中一个为真，推知另一个命题为假。

3.下反对关系推理

① ¬SIP├SOP
② ¬SOP├SIP

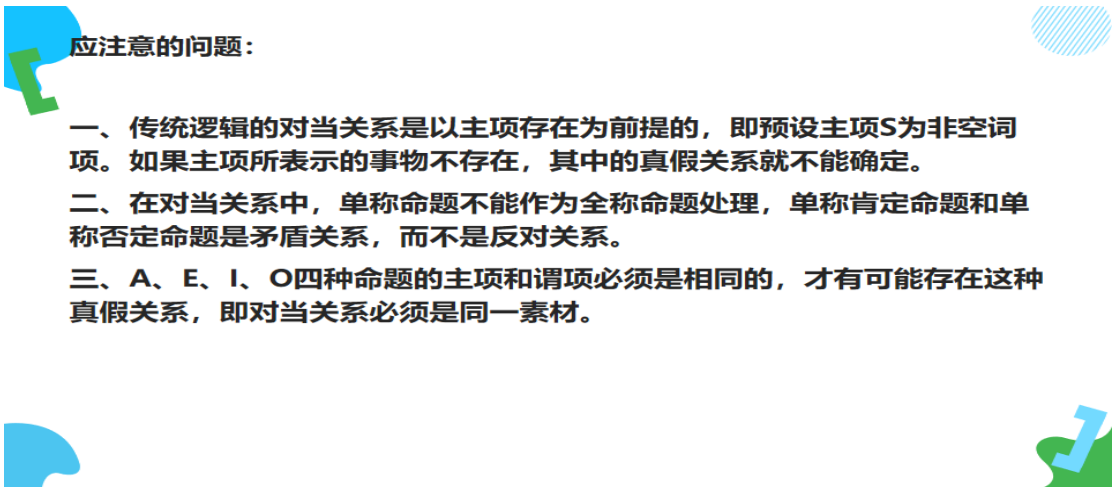
命题I与O之间，其中一个命题为假，推知另一个命题为真。

4. 差等关系推理

①SAP├SIP
②SEP├SOP
③¬SIP├¬SAP
④¬SOP├¬SEP

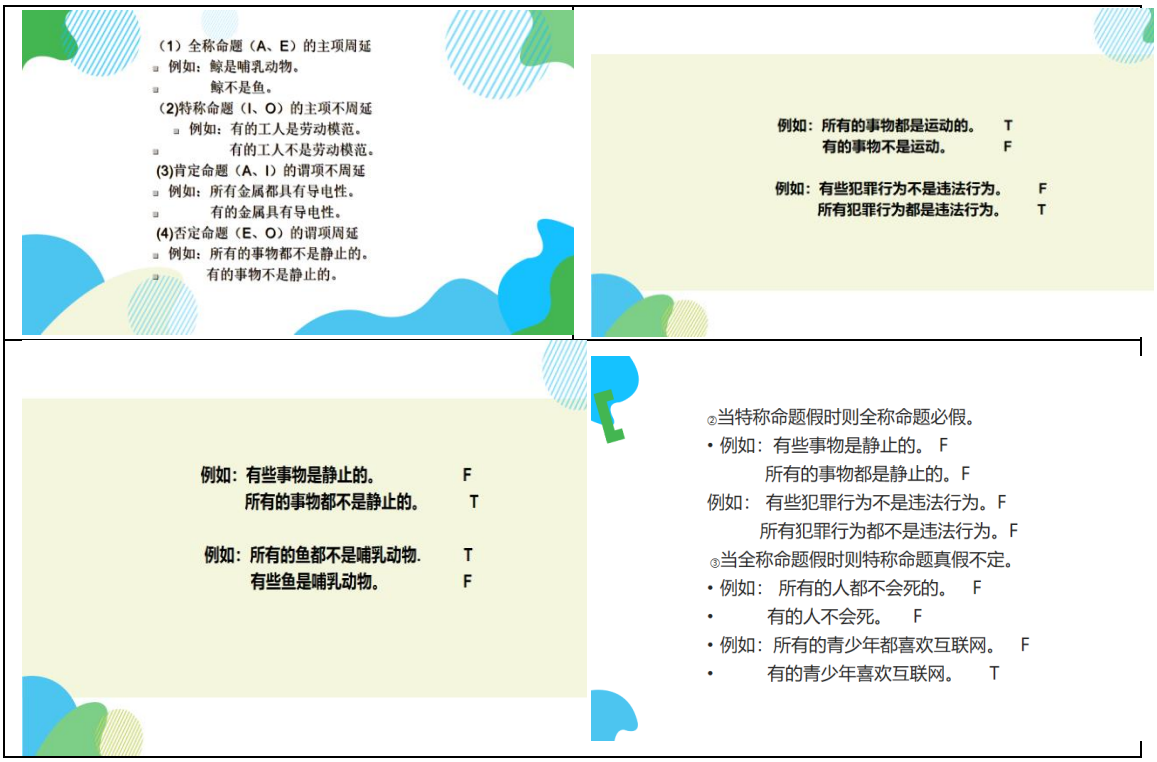
命题A与I、E与O之间，全称命题为真推知特称命题为真，也可以由特称命题为假推知全称命题为假。

1.Introduce confusing concepts and issues that require attention



Step 3: Problem-solving Skill training. (15minutes)

1.Asking questions to the students, explore what they already know about underlying issues related to it.



2.Guide the students to solve problems when they encounter problems and discuss with the students to carry out communication. Students need to find the solving process during the searching.

Questions：

1.1) Assuming that "all the crows are black" is true. Please judge whether the proposition is true or not

A) All of the crows are black

B) Some of the crows are black

C) Some crows are not black

2) Suppose that "some crows are black" is true. Please judge whether the proposition is true or not

A) All of the crows are black.

B) All the crows are not black.

C) Some crows are not black.

D) Suppose "all crows are black" is false. Please judge whether the proposition is true or not

A) All the crows are not black.

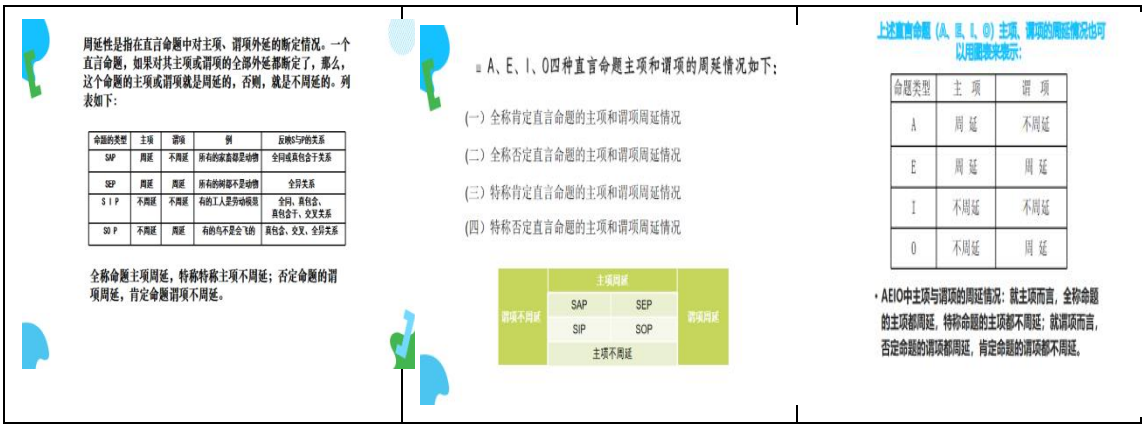
B) Some of the crows are black.

C) Some crows are not black.

Step 4: Designing solutions to the problem. (30minutes)

1.In this phase, each group will write a report on their group's work. At the end of each group explain the concepts contained in the problems raised and the solutions they propose.

2.The teacher leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

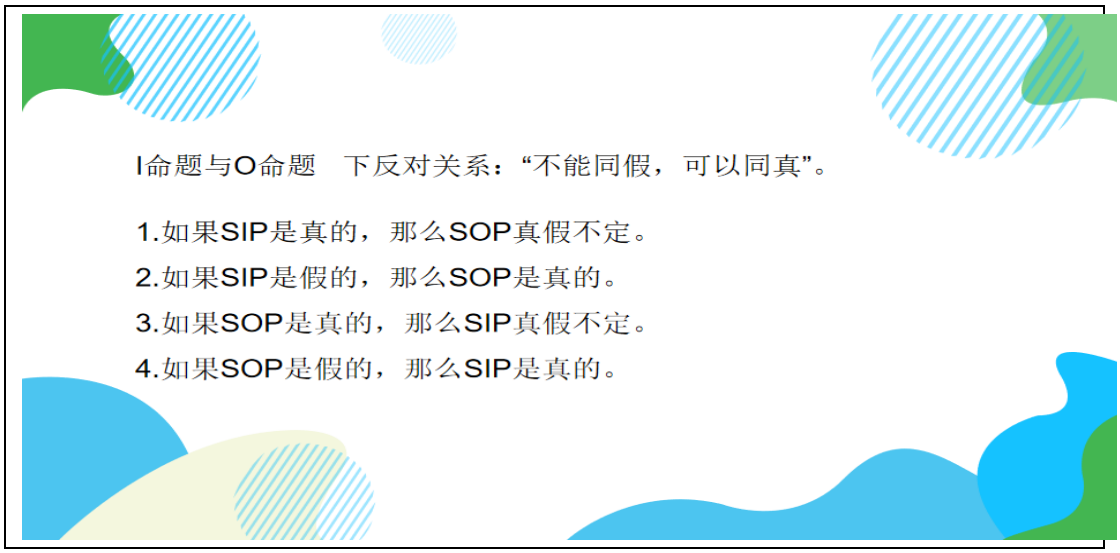


Step 5: Executing problem solutions. (20minutes)

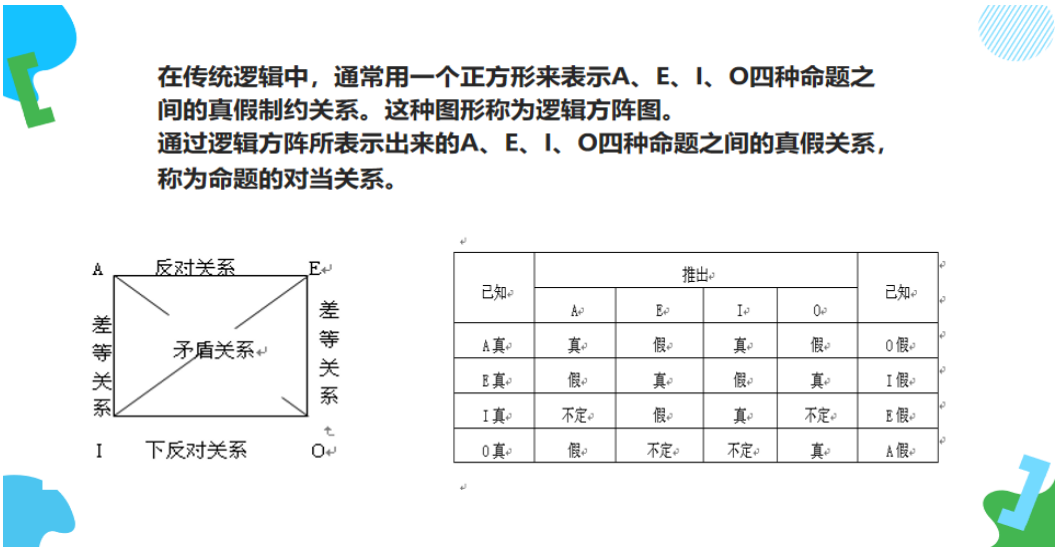
The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. (10minutes)

1. Have the students discover and summarize their case situation.



2.The teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer.



Second hour (1.5 hours)

Step 1: The formulating the expected learning outcome. (10minutes)

1.Explain the Categorical propositional reasoning

2.categorical proposition

Step 2: Understanding the concept of the teaching materials. (20minutes)

1. Explain concept of the teaching materials

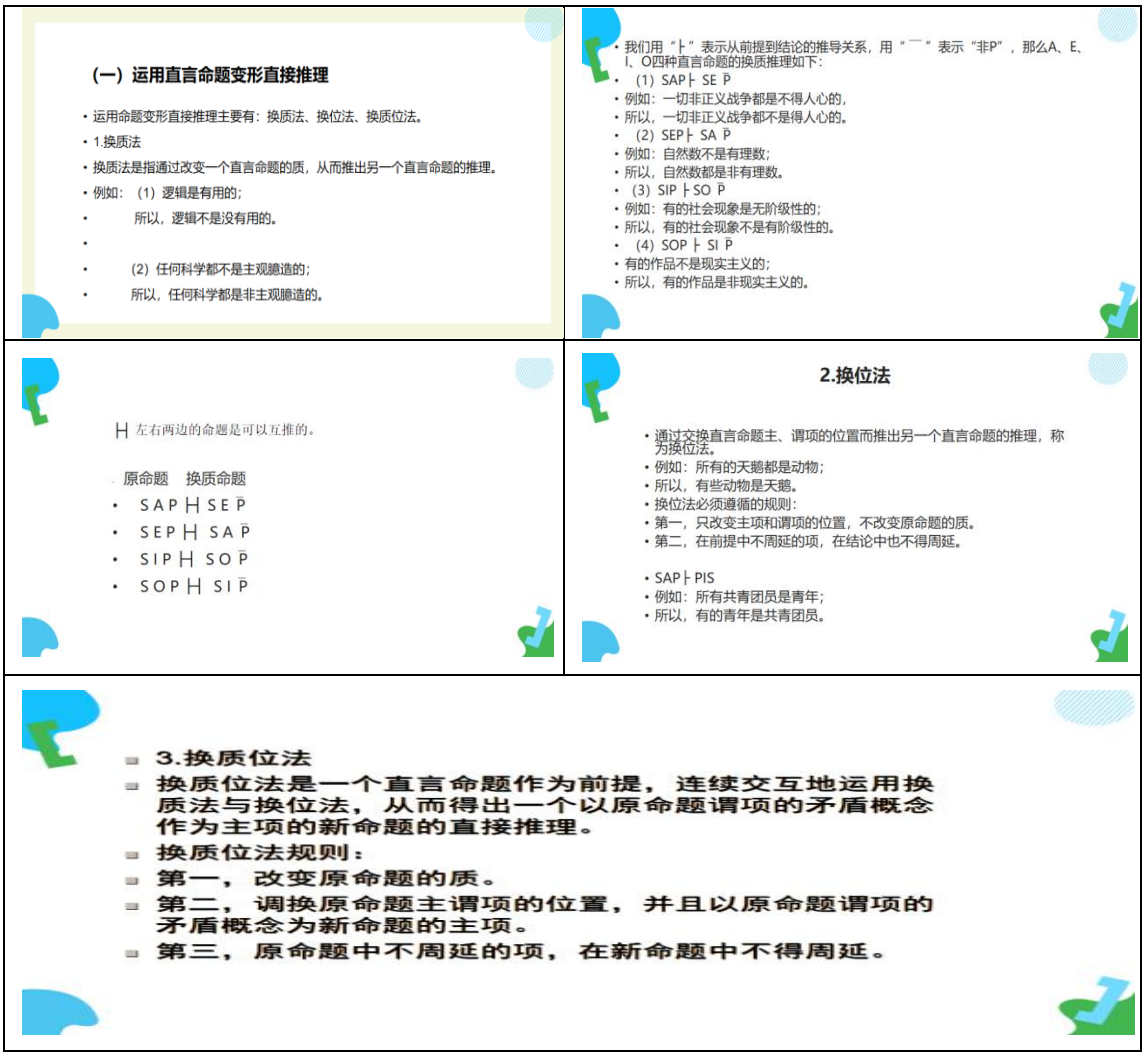
2. Problem-based learning teaching the difficult points.

Step 3: Problem-solving Skill training. (30minutes)

1. Student group discussion

Students are grouped by themselves, and each group is generally controlled at about 5 people, and a class is divided into 10 groups.

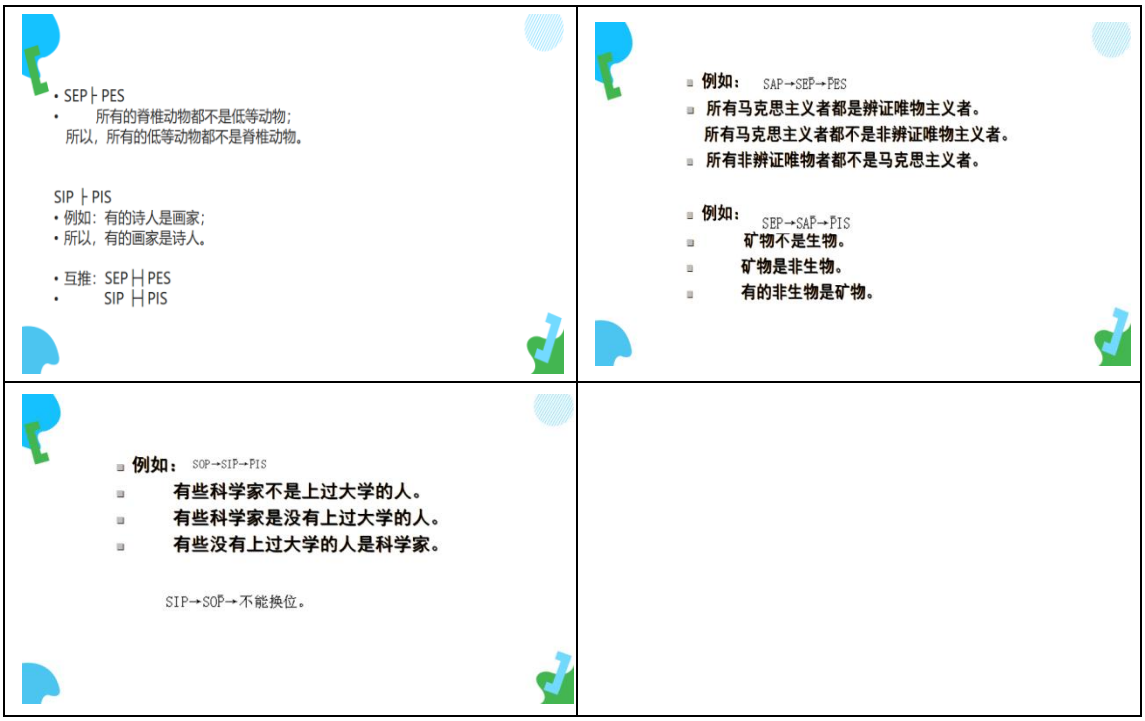
2.Asking questions to the students, explore what they already know about underlying issues related to it.



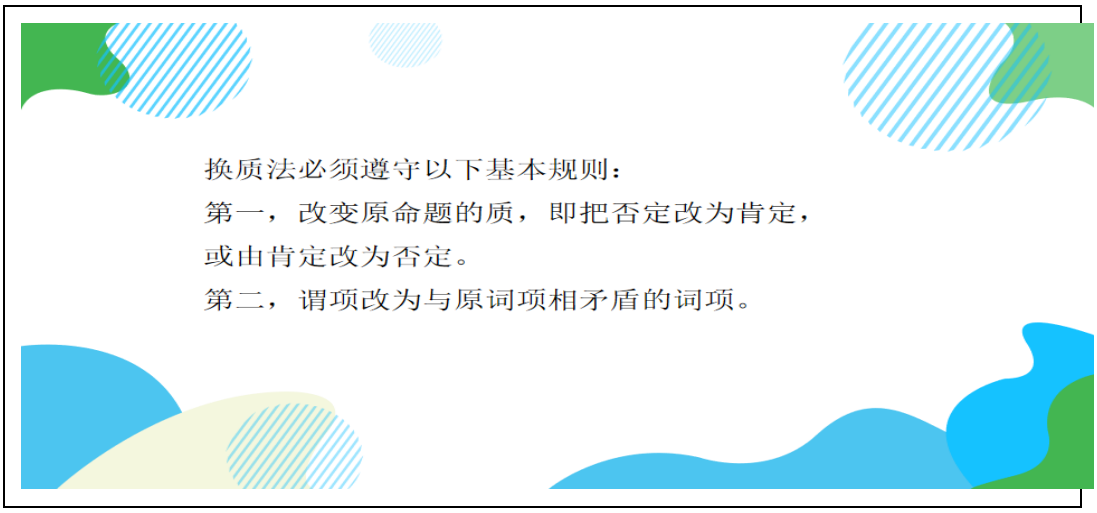
3.Guide the students to solve problems when they encounter problems and discuss with the students to carry out communication. Students need to find the solving process during the searching.

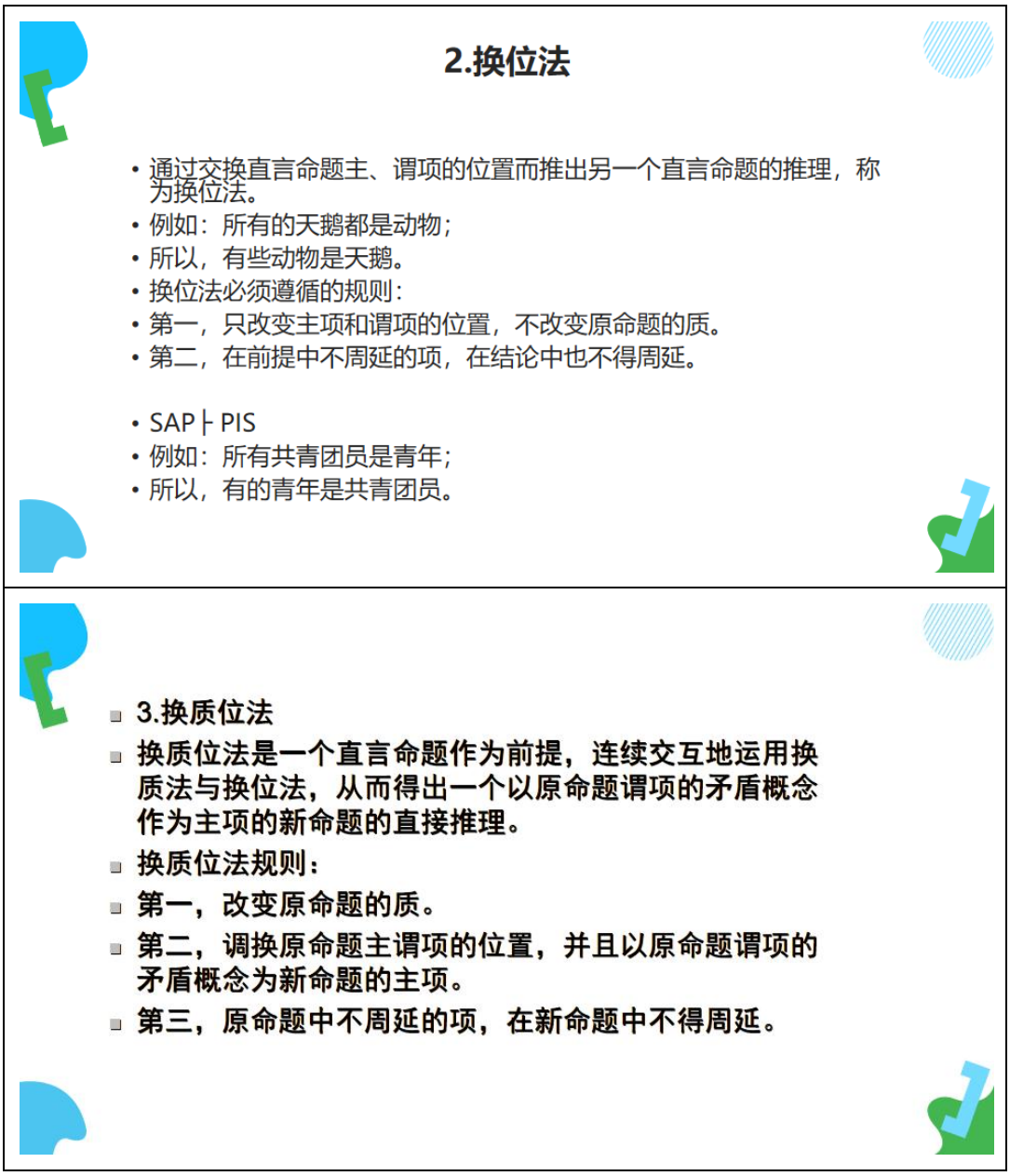
Step 4: Designing solutions to the problem. (20minutes)

1. In this phase, each group will write a report on their group's work. At the end of each group explain the concepts contained in the problems raised and the solutions they propose.



2. The teacher leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.





Step 5: Executing problem solutions. (10minutes)

The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

1. Please apply the following blunt propositions to replacement reasoning and transposition reasoning respectively. If replacement or transposition reasoning cannot be performed, please explain the reasons.

A) All fund egalitarian societies are societies that do not protect individual freedom.

B) There is no unconductive metal.

C) Some insurance companies are not humanitarian organizations.

D) Some athletes have no natural physical advantage.

Step 6: Summary and evaluation. (10minutes)

1.Have the students discover and summarize their case situation.

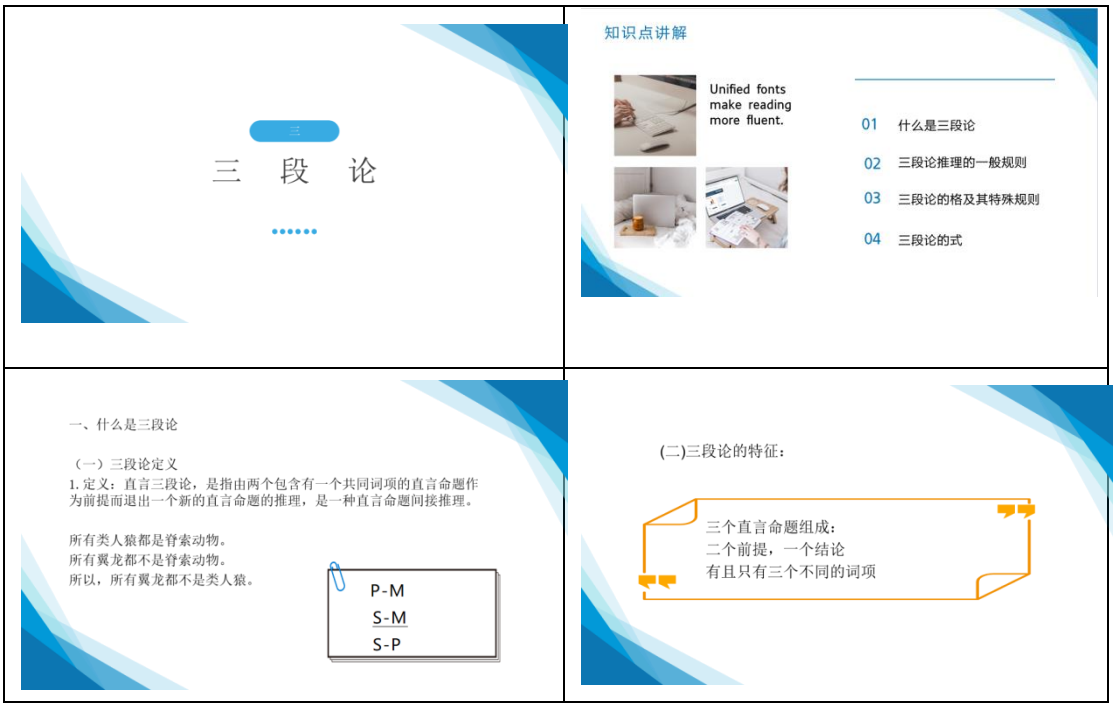
2.The teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer.

Third (2.5 hours)

Step 1: The formulating the expected learning outcome. (30minutes)

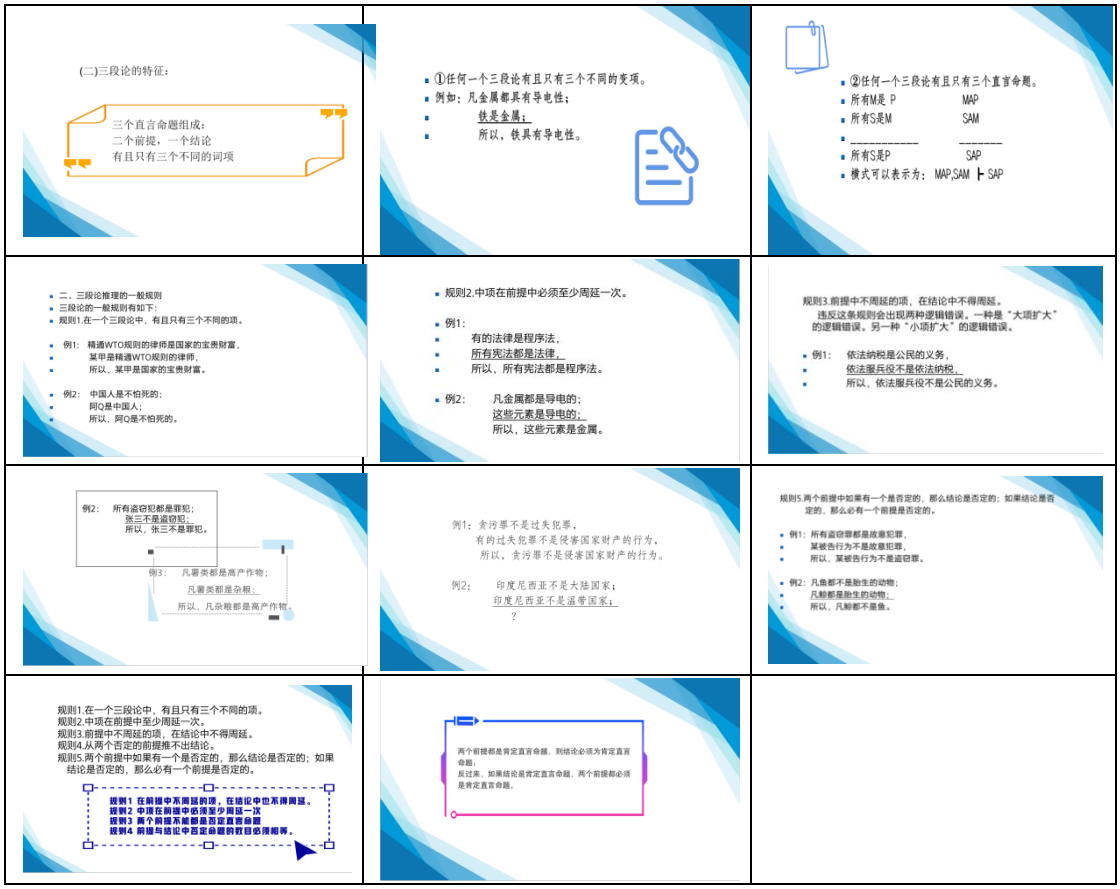
1.Explain the Categorical propositional reasoning

2.Traditional logic



Step 2: Understanding the concept of the teaching materials. (1 hour)

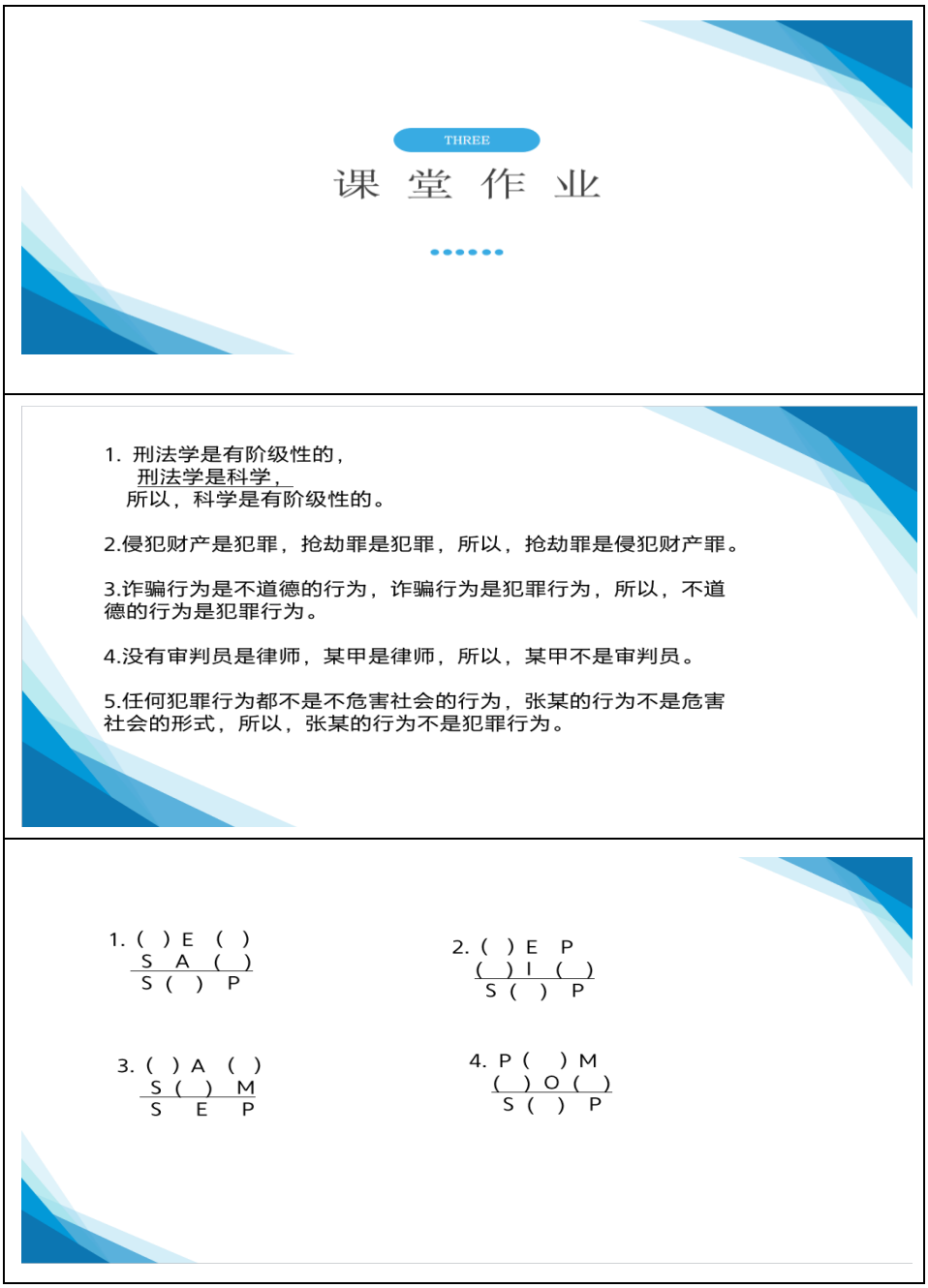
1. Problem-based learning teaching the difficult points.



Step 3: Problem-solving Skill training. (30minutes)

1. Student group discussion

2.Asking questions to the students, explore what they already know about underlying issues related to it.



3.Guide the students to solve problems when they encounter problems and discuss with the students to carry out communication. Students need to find the solving process during the searching.

Step 4: Designing solutions to the problem.(20minutes)

1.In this phase, each group will write a report on their group's work. At the end of each group explain the concepts contained in the problems raised and the solutions they propose.

2.The teacher leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

Step 5: Executing problem solutions. (20minutes)

The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. (20 minutes)

1. Have the students discover and summarize their case situation.

2.The teacher will base on the proposed by each group , Report on their

findings and summary to the students which the best solution and the answer.

Material:

1) Teaching materials

2) Books on Legal Logic Course

3) The relevant case data papers of the court

4)Use the school library and electronic reading room to access information related to the course content

Learning Resources:

1) About the Legal logic course learning videos.

2) Related academic papers

3) Online video learning materials

Question for group

Discuss and answer the following questions:

1.What are the types of direct reasoning for blunt propositions?

2.What are the characteristics and general rules of syllogism reasoning?

3. How to distinguish between syllogism lattices?

4.How to understand the special requirements and existence value of the trial syllogism?

This is the homework for practicing the legal logic reasonable completed by students. Through the evaluation of students' homework before and after class, students' mistakes can be corrected in subtle places, and their shortcomings can be summarized, which will make the problem-based learning teaching more scientific and efficient and enhance students' problem solving ability.

Clip Video

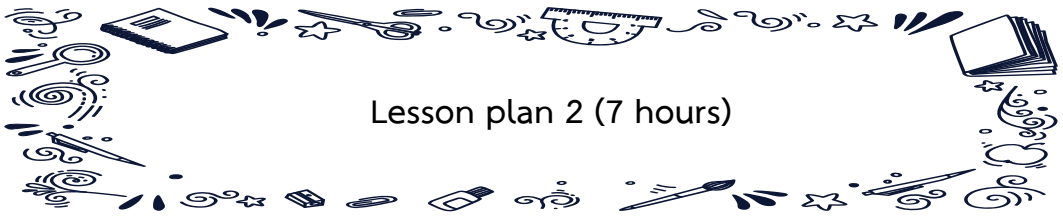
1. https://www.bilibili.com/video/BV12d4y1i7HE/?spm_id_from=333.337.search-card.all.click

2. https://www.bilibili.com/video/BV1Ye411Q78h/?spm_id_from=333.337.search-card.all.click

3. https://www.bilibili.com/video/BV193411F7WU/?spm_id_from=333.337.search-card.all.click

4. https://www.bilibili.com/video/BV1EG411279X/?spm_id_from=333.337.search-card.all.click

5. https://www.bilibili.com/video/BV1Na41167nq/?spm_id_from=333.788.recommend_more_video.3m



Teaching:

Teaching based on problem-based learning instructional model refers to an integrated teaching model that is taught in 6 steps in the classroom:

Step 1: The formulating the expected learning outcome. Teachers set teaching objectives that are expected to be achieved so that students can identify what they are learning.

Step 2: Understanding the concept of the teaching materials. Teachers first understand the concept of teaching materials and content, so that students can understand the need to grasp the knowledge and faster into the state of learning.

Step 3: Problem-solving Skill training. Teachers will perform a series of exercises to improve problem-solving skills so that students can solve problems more quickly in the curriculum.

Step 4: Designing solutions to the problem. Teachers Guide students to apply relevant knowledge and problem-solving skills, so that students can put forward a variety of feasible problem-solving solutions in various situations.

Step 5: Executing problem solutions. The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. The teacher evaluates the solutions and results of the students' problems solutions, so that the students can make clear their problems and make positive adjustments.

First (3 hours)

Step 1: The formulating the expected learning outcome. (15minutes)

1.Explain the Categorical propositional reasoning

2.Categorical propositional reasoning

Step 2: Understanding the concept of the teaching materials. (15minutes)

1.Student group discussion

2.Problem-based learning teaching the difficult points.

Step 3: Problem-solving Skill training. (45 minutes)

1.Asking questions to the students, explore what they already know about underlying issues related to it.

2.Guide the students to solve problems when they encounter problems and discuss with the students to carry out communication. Students need to find the solving process during the searching.

Step 4: Designing solutions to the problem. (45 minutes)

1.In this phase, each group will write a report on their group's work. At the end of each group explain the concepts contained in the problems raised and the solutions they propose.

2.The teacher leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

Step 5: Executing problem solutions. (20minutes)

The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. (10minutes)

1.Have the students discover and summarize their case situation.

2.The teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer.

Second (2 hours)

Step 1: The formulating the expected learning outcome. (30minutes)

1.Explain the Categorical propositional reasoning

2.moods of the syllogism

Step 2: Understanding the concept of the teaching materials. (20minutes)

1.Problem-based learning teaching the difficult points.

Step 3: Problem-solving Skill training. (30minutes)

1.Student group discussion

2.Asking questions to the students, explore what they already know about underlying issues related to it.

3.Guide the students to solve problems when they encounter problems and discuss with the students to carry out communication. Students need to find the solving process during the searching.

Step 4: Designing solutions to the problem. (30minutes)

1.In this phase, each group will write a report on their group's work. At the end of each group explain the concepts contained in the problems raised and the solutions they propose.

2.The teacher leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

Step 5: Executing problem solutions. (20minutes)

The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. (10minutes)

1.Have the students discover and summarize their case situation.

2.The teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer.

Third hour (2 hours)

Step 1: The formulating the expected learning outcome. (10minutes)

1.Explain the Categorical propositional reasoning

2.moods of the syllogism

Step 2: Understanding the concept of the teaching materials. (20minutes)

1.Problem-based learning teaching the difficult points.

Step 3: Problem-solving Skill training. (30minutes)

1.Student group discussion

2.Asking questions to the students, explore what they already know about underlying issues related to it.

3.Guide the students to solve problems when they encounter problems and discuss with the students to carry out communication. Students need to find the solving process during the searching.

Step 4: Designing solutions to the problem. (30minutes)

1.In this phase, each group will write a report on their group's work. At the end of each group explain the concepts contained in the problems raised and the solutions they propose.

2.The teacher leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

Step 5: Executing problem solutions. (20minutes)

The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. (10minutes)

1.Have the students discover and summarize their case situation.

2.The teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer.

Material:

1) Teaching materials

2) Books on Legal Logic Course

3) The relevant case data papers of the court

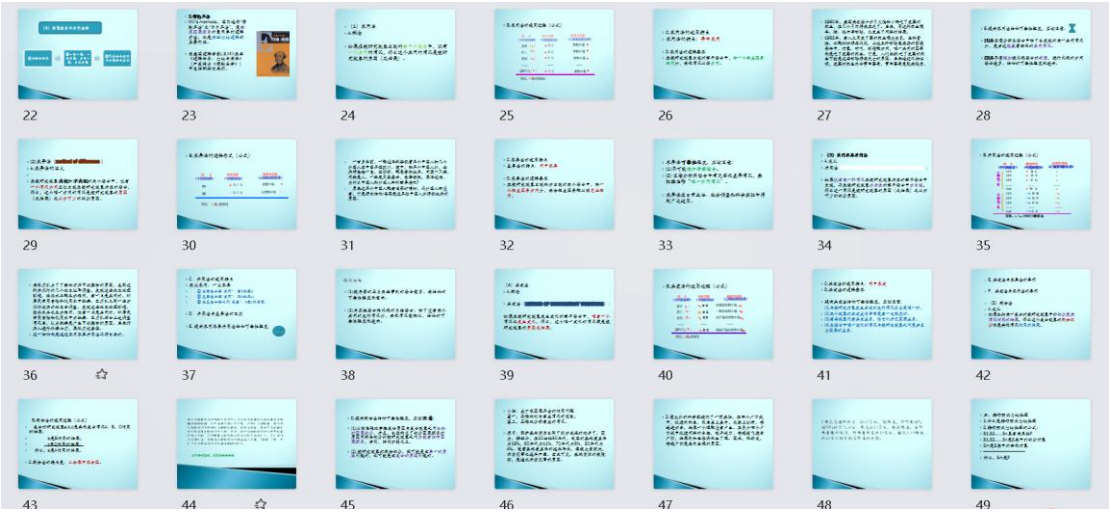
Learning Resources:

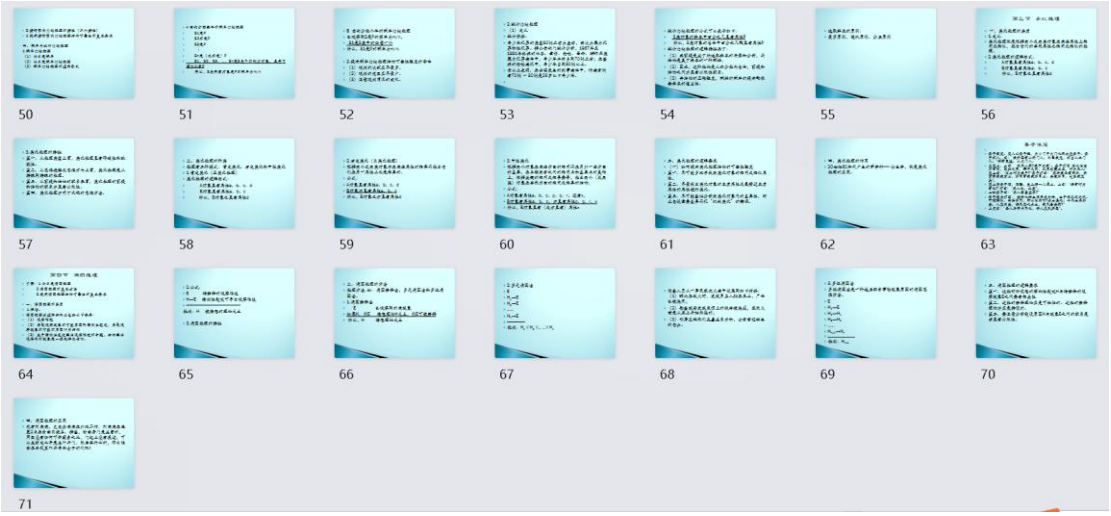
1) About the Legal logic course learning videos.

2) Related academic papers

3) Online video learning materials

Legal logic course PPT pictures





Question for group

1.What are the types of inductive reasoning? What is the difference between them?

2.Brief describe the types and logical structure of analogical reasoning.

3.How to improve the reliability of the analogy reasoning conclusion?

4.What is retroactive reasoning? What are its basic forms?

5.How to improve the reliability of retro-ancestry reasoning conclusions?

This is the homework for practicing the legal logic reasonable completed by students. Through the evaluation of students' homework before and after class, students' mistakes can be corrected in subtle places, and their shortcomings can be summarized, which will make the problem-based learning teaching more scientific and efficient and enhance students' problem solving ability.

Lesson plan 3 (3 hours)

Teaching:

Teaching based on problem-based learning instructional model refers to an integrated teaching model that is taught in 6 steps in the classroom:

Step 1: The formulating the expected learning outcome. (15minutes)

1.Explain the Categorical propositional reasoning

2.Categorical propositional reasoning

Step 2: Understanding the concept of the teaching materials. (15minutes)

1.Student group discussion

2.Problem-based learning teaching the difficult points.

Step 3: Problem-solving Skill training. (45 minutes)

1.Asking questions to the students, explore what they already know about underlying issues related to it.

2.Guide the students to solve problems when they encounter problems and discuss with the students to carry out communication. Students need to find the solving process during the searching.

Step 4: Designing solutions to the problem. (45 minutes)

1.In this phase, each group will write a report on their group's work. At the end of each group explain the concepts contained in the problems raised and the solutions they propose.

2.The teacher leads the students to choose their own methods, independently explore, find out each case and find the relationship between them.

Step 5: Executing problem solutions. (20minutes)

The teacher guides the students to implement the solution through the students' design and improves the students' executive ability of implementing the solution in the process of practice.

Step 6: Summary and evaluation. (15minutes)

1.Have the students discover and summarize their case situation.

2.The teacher will base on the proposed by each group, Report on their findings and summary to the students which the best solution and the answer.

Material:

1) Teaching materials

2) Books on Legal Logic Course

3) The relevant case data papers of the court

Learning Resources:

1) About the Legal logic course learning videos.

2) Related academic papers

3) Online video learning materials

Clip Video:

1.https://haokan.baidu.com/v?pd=wisenatural&vid=5719300034231438248

2.https://haokan.baidu.com/v?pd=wisenatural&vid=5783789791871967036

3.https://www.bilibili.com/video/BV1EV4y1A7VU/

4.https://www.bilibili.com/video/BV1KA411R7tf/?spm_id_from=333.788.recommend_more_video.7

For lesson plan 3

Question for group

1.What are the characteristics of investigative logic?

2.What are the common logical methods of investigation interpretation and investigation speculation? What are its own characteristics?

3.What is the investigative hypothesis? Where is the theoretical significance and the practical significance of the investigative hypothesis?

4.What is the logical process of detecting the hypothesis formation? What logical methods are used?

5.How to understand the logical method of confirmation and falsification of investigative hypothesis?

This is the homework for practicing the legal logic reasonable completed by students.Through the evaluation of students' homework before and after class, students' mistakes can be corrected in subtle places, and their shortcomings can be summarized, which will make the problem-based learning teaching more scientific and efficient and enhance students' problem solving ability.

Evaluation

This part is evaluation, mainly introduced how to evaluate piano performance ability, from which aspects to evaluate it, through literature review and daily teaching experience to determine how to evaluate students and invite experts to confirm the effectiveness of the evaluation standards, hoping that the evaluation of teaching can be more scientific and reasonable.

Problem solving ability refers to the capacity of individuals to identify, analyze, and generate effective solutions to complex problems or challenges. The problem-solving ability of this paper refers to the students have ability in 3 aspects: 1) the methods of logical reasoning, 2)the application of relevant law knowledge,3) problem solving quality.

Items 1: The attitude of problem solving

Standard1: Confidence to solve the problem

Standard2: The motivation to solve problems

Standard3: Self-control of problem solving

Items 2: The methods of problem solving

Standard1: The diversity of problem solutions

Standard2: The rationality of using the relevant knowledge

Standard3: Operability of the problem solutions

Items 3: The quality of problem solving

Standard1: Effectiveness and rationality of problem-solving strategies

Standard2: Efficiency of the problem-solving process

Standard3: Quality of the problem-solving results

Scoring Rubric Form

This is my scoring rubric form, it is mainly adapted according to problem solving ability standard, which is divided into three items and nine standards. The first item is the attitude of problem solving, which is divided into Confidence to solve the problem, The motivation to solve problems, Self-control of problem solving. Three criteria. The second is the methods of problem solving, it is divided into three criteria: The diversity of problem solutions, The rationality of using the relevant knowledge, Operability of the problem solutions. The third is the quality of problem solving, divided into Effectiveness and rationality of problem-solving strategies, Efficiency of the problem-solving process, Quality of the problem-solving results. The ability to correctly establish and grasp legal propositions, The ability to reason legally. Students are assessed for each criterion, with a maximum score of 5 for each criterion and a minimum score of 1 for each criterion, and a maximum total score of 45 for each of the three items.

Item	Score				
	5	4	3	2	1
1.The attitude of problem solving					
Standard 1:The motivation to solve problems	Always have a positive and proactive attitude when facing problems	Often have a positive and proactive attitude when facing problems	Sometimes have a positive attitude when facing problems	Rarely have a positive and proactive attitude when facing problems	Didn't have a positive attitude when facing problems
Standard2: Confidence to solve the problem	Always try to come up with all possible solutions when encountering problems	Often able to come up with all possible solutions when encountering problems	Sometimes can try to come up with all possible solutions when encountering problems	Rarely come up with all possible solutions when encountering problems	Unable to think of possible solutions when encountering problems
Standard 3: Self-control of problem solving	Always believe that can solve problems through hard work when encountering problems	Often believe that can solve problems through hard work when encountering problems	Sometimes believe that can solve problems through hard work when encountering problems	Rarely believe that can solve problems through hard work when encountering problems	Never believe that can solve problems through hard work when encountering problems

Table (continued)

Item	Score				
	5	4	3	2	1
2.The methods of problem solving					
Standard1: The diversity of problem solutions	Always able to find possibilities for problem-solving from various perspectives	Often able to find possibilities for problem-solving from various perspectives	Sometimes able to find possibilities for problem-solving from various perspectives	Rarely able to find possibilities for problem-solving from various perspectives	Never can able to find possibilities for problem-solving from various perspectives
Standard2:The rationality of using the relevant knowledge	Always able to solve problems from professional knowledge	Often able to solve problems from professional knowledge	Sometimes able to solve problems from professional knowledge	Rarely able to solve problems from professional knowledge	Never able to solve problems from professional knowledge
Standard 3:Operability of the problem solutions	Always able to make the best choice from a multitude of problem-solving strategies	Often able to make the best choice from a multitude of problem-solving strategies	Sometimes able to make the best choice from a multitude of problem-solving strategies	Rarely able to make the best choice from a multitude of problem-solving strategies	Never able to make the best choice from a multitude of problem-solving strategies

Table (Continued)

Item	Score				
	5	4	3	2	1
3: The quality of problem solving					
Standard 1:Effectiveness and rationality of problem-solving strategies	Proficient and quickly find all the problems to be solved in the case	Be skilled in finding out most of the problems that need to be solved in the case	Basically can find most of the problems to be solved in the case	Could find out little of problems that need to be solved in the case	Can not find out any problems that the case needs to address
Standard 2:Efficiency of the problem-solving process	Skillfully use all the logical methods to quickly and effectively analyze the problems involved in legal cases	Use all the logical methods to effectively analyze the problems involved in legal cases	Basically use all the logical methods to analyze the problems involved in legal cases	Use some part of the logical method to analyze the problems involved in legal cases	Only can use 1-2 logical methods to analyze the problems involved in legal cases
Standard3:Quality of the problem-solving results	Profitably use all logical reasoning methods to quickly and effectively respond legal cases	Proficient using most logical reasoning methods to correctly solve legal cases	Basically use most of the logical reasoning methods to solve the legal cases	Basically use a small part of the logical reasoning methods to solve the legal cases correctly	Use 1-2 logical reasoning methods, but can not correctly solve the legal cases

After-class manual(report)requirements

Directions: Write about basic knowledge of legal logic reasoning method, using pedals(report).

1.the methods of logical reasoning, Practice alone to master the legal logic reasoning methods and complete the mind map of the methods of logical reasoning.

2.the application of relevant law knowledge

3. problem solving quality.

Evaluation: The mind maps of legal logic reasoning method, using pedals presented in the form of an after class manual (report).

Directions: Write about legal logic reasoning method, using pedals after-class manual (report) individual,

1.the methods of logical reasoning

2.the application of relevant law knowledge

3.problem solving quality.

4. Learning material

1)PPT presentation

2)Whiteboard/blackboard and pens

3)Computer/Tablet Mobile Phone

4)internet resources

5.Learning resources

1) the legal logic reasoning methods learning videos

2)Typical case data papers

3)Related academic papers.

6.Evaluation and Assessment

Evaluation by scoring score.

6.Note after teaching

Two result: Write about the mind maps of playing method, using classroom work after-class manual (report) individual, send the record about problem solving ability to teacher.

The problem: There are problems such as knowledge forgetting, unclear

structure, and the technique is not used proficiently.

Solving the problem: Clarify the requirements of the manuals, provide practice manuals, conduct sample sharing, and provide exercises and guidance to problem solving ability.

Appendix D

The Results of the Quality Analysis of Research Instruments

Assessment of confirm the quality of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability

Assessor:

Position:

Workplace:

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.

Assessment Items	Rating Results		
	Agree	Disagree	Remarks
Utility Standard 1. Problem-Based Learning Instructional Model to Enhance Problem Solving Ability			
2. Problem-Based Learning Instructional Model to Enhance Problem Solving Ability			
3. Problem-Based Learning instructional model includes necessary and enough contents.			
4. Problem-Based Learning instructional model promotes to enhance problem solving ability more compared to traditional teaching.			
5. Problem-Based Learning instructional model increases the problem solving ability of students.			
Feasibility Standard 1.The lecturer can apply Problem-Based Learning instructional model to enhance problem solving ability to their work and it is worth the time for actual use.			
2. The lecturer can develop the students to enhance problem solving ability from using Problem-Based Learning instructional model.			
3.The Problem-Based Learning instructional model to enhance problem solving ability proficiency is easy to use.			
4.The students always develop their learning all time by Problem-Based Learning instructional model to enhance problem solving ability.			
5. The students are comfortable in learning by themselves with Problem-Based Learning instructional model to enhance problem solving ability.			
Propriety Standard 1. Problem-Based Learning instructional model to enhance problem solving is appropriate for lecturers to use assessment results to improve the students.			
2. Problem-Based Learning instructional model to enhance problem solving ability is appropriateness for students to create knowledge by themselves.			
3. Problem-based learning instructional model to enhance problem			

Assessment Items	Rating Results		
	Agree	Disagree	Remarks
solving ability is convenient to use.			
4. Problem-Based Learning instructional model to enhance problem solving ability is a systematic process to use.			
5. Problem-Based Learning instructional model to enhance problem solving ability is clear and suitable for use in learning and students development.			
Accuracy Standard 1. Problem-Based Learning instructional model to enhance problem solving ability is comprehensively analyzed from different contexts and sufficient for the synthesis of patterns.			
2. Problem-Based Learning instructional model to enhance problem solving ability has a clear process.			
3. Problem-Based Learning instructional model to enhance problem solving ability are described and the acquisition is clear.			
4. Problem-Based Learning instructional model to enhance problem solving ability use techniques and tools which acquires accurate information and communication.			
5. Problem-Based Learning instructional model to enhance problem solving ability is a correct and comprehensive learning system.			

Sign .....

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Evaluation Results of IOC for Factor Analysis (For Student)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Section 1	Common data of the respondent	+1	+1	+1	+3	1.00	Valid
1	Gender A. Male B. Female	+1	+1	+1	+3	1.00	Valid
2	A.From Guangxi Minzu University B.From Guangxi University of Finance and Economic C. From Wuzhou University	+1	+1	+1	+3	1.00	Valid
3	A. 18 yrs. B. 19 yrs. C. 20 yrs. D. 21 yrs.	+1	+1	+1	+3	1.00	Valid
Internal factors							
1	Students believe that the contents of legal reasoning in Legal Logic course can enhance their ability to solve legal problems.	+1	+1	+1	+3	1.00	Valid
2	Students are very interested in Legal Logic Course.	+1	+1	+1	+3	1.00	Valid
3	Students feel that this subject can improve their knowledge of the Law.	+1	+1	+1	+3	1.00	Valid

Table (Continued)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Internal factors							
4	Students believe that teachers should provide more guidance on their problems in class.	+1	+1	+1	+3	1.00	Valid
5	Students know that the course of legal logic is an important compulsory course for law majors.	+1	+1	+1	+3	1.00	Valid
6	Students believe that the learning resources can improve problem solving ability in legal logic courses.	+1	+1	+1	+3	1.00	Valid
7	Students like lecturers that can explain many professional practical examples.	+1	+1	+1	+3	1.00	Valid
8	Students can quickly connect their knowledge and experiences in the process of problem solving problems.	+1	+1	+1	+3	1.00	Valid
9	Students feel that the assignments assigned by the lecturers and the feedback can help students better apply what they have learned.	+1	+1	+1	+3	1.00	Valid

Table (Continued)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Internal factors							
10	Students will compare the advantages of different problem solutions, combine the actual situation, finally choose the most Is the plan.	+1	+1	+1	+3	1.00	Valid
11	Students will take the initiative to summarize their learning and apply the useful experience to their future study.	+1	+1	+1	+3	1.00	Valid
12	Students can through problem solving by the case analysis method and instrument tools in the legal logic course.	+1	+1	+1	+3	1.00	Valid
13	Students are satisfied with the cooperation in the classroom in legal logic course.	+1	+1	+1	+3	1.00	Valid
14	Students enjoy a classroom atmosphere where there is a lot of interaction between teachers and students.	+1	+1	+1	+3	1.00	Valid

Table (Continued)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Internal factors							
15	Students are not sure if this course will be helpful for their future careers.	+1	+1	+1	+3	1.00	Valid
External factors							
16	The lecturers' teaching model enables students to understand content clearly.	+1	+1	+1	+3	1.00	Valid
17	The lecturers can guide students to recognize that learning courses are assistance for future career development.	+1	+1	+1	+3	1.00	Valid
18	The lecturer selects appropriate teaching methods based on the legal logic course.	+1	+1	+1	+3	1.00	Valid
19	The lecturers choose suitable teaching materials resources.	+1	+1	+1	+3	1.00	Valid
20	The lecturers design learning tasks encourage the students' enthusiasm.	+1	+1	+1	+3	1.00	Valid
21	The use of multimedia classrooms can enhance students' interest in learning to achieve the teaching objectives.	+1	+1	+1	+3	1.00	Valid

Table (Continued)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
External factors							
22	Classroom environment affects students' learning enthusiasm.	+1	+1	+1	+3	1.00	Valid
23	The lecturers can stimulate students' interest , such as debate in Moot court	+1	+1	+1	+3	1.00	Valid
24	The multimedia materials teaching can enhance undergraduate students' Problem solving ability	+1	+1	+1	+3	1.00	Valid
25	The availability of learning spaces can affect students interest in Legal Logic courses.	+1	+1	+1	+3	1.00	Valid
26	As a learning place, Moot court can improve students' interest in learning legal logic course.	+1	+1	+1	+3	1.00	Valid
27	The lecturers pay more attention to the problem-solving ability of students in legal logic courses.	+1	+1	+1	+3	1.00	Valid
28	The textbook provides practical, Professional materials for students.	+1	+1	+1	+3	1.00	Valid

Table (Continued)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
External factors							
29	Provides a stable high-speed network anytime, anywhere on campus as a teaching guarantee supports students' study	+1	+1	+1	+3	1.00	Valid
30	The environments is clean, with desks,chairs, blackboards, podiums, computers, projectors, large screens, loudspeakers with other multimedia facilities to facilitate the teaching process.	+1	+1	+1	+3	1.00	Valid

Note: Valid when ≥ 0.50.

Evaluation Results of IOC for Factor Analysis (For Lecturers)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Section 1	Common data of the respondent	+1	+1	+1	+3	1.00	Valid
1	Gender C. Male D. Female	+1	+1	+1	+3	1.00	Valid
2	A.From Guangxi Minzu University B.From Guangxi University of Finance and Economic C. From Wuzhou University	+1	+1	+1	+3	1.00	Valid
3	Experience teaching A.below 3 yrs. B. 3-6 yrs. C.7- 9 yrs . D. over 9 yrs.	+1	+1	+1	+3	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	+3	1.00	Valid
2	How do you prepare to teach this subject? (Preparing contents, materials, teaching location, etc.)	+1	+1	+1	+3	1.00	Valid

Table (Continued)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Questions							
3	What are the most students 'problem when you teach in Legal LogicAnd how you ?course ?solve the problem	+1	+1	+1	+3	1.00	Valid
4	Do you always manage teaching according to your lesson plan? If you cannot teach according to your lesson plan, how do you solve the problem to enhance students achieving the goal?	+1	+1	+1	+3	1.00	Valid
5	What methods do you use to help students solve problems in class when they are unable to solve them.	+1	+1	+1	+3	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	+3	1.00	Valid

Table (Continued)

No.	Item	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Questions							
7	Can you tell me what kind of ProblemBased Learning to enhance theirproblem solving?ability	+1	+1	+1	+3	1.00	Valid
8	Previously, what problems do you meet in your teaching, and how do you find the solution?	+1	+1	+1	+3	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	+3	1.00	Valid
10	Can you tell me What is the best way to teach students' problem-solving abilities in a logical approach classroom?	+1	+1	+1	+3	1.00	Valid

Note: Valid when ≥ 0.50.

Evaluation Results of Instructional Model Appropriateness Evaluation

No.	Development of Problem-Based Learning Instructional Model to Enhance Problem Solving Ability for Undergraduate Students	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 appendix 3 above, the appropriateness of Problem-based learning instructional model is unanimously confirmed by 5 experts in terms of utility (100%), feasibility (100%), propriety (100%), and accuracy (100%).

Evaluation Results of Instructional Model Rubric Scoring Evaluation

Learning objectives	No.	Experts' rating			Total	Mean	Results
		Expert 1	Expert 2	Expert 3			
Learning objectives 1:The attitude of problem solving	1	+1	+1	+1	+3	1.00	Valid
	2	+1	+1	+1	+3	1.00	Valid
	3	+1	+1	+1	+3	1.00	Valid
Learning objectives 2:The methods of problem solving	1	+1	+1	+1	+3	1.00	Valid
	2	+1	+1	+1	+3	1.00	Valid
	3	+1	+1	+1	+3	1.00	Valid
Learning objectives 3:The quality of problem solving	1	+1	+1	+1	+3	1.00	Valid
	2	+1	+1	+1	+3	1.00	Valid
	3	+1	+1	+1	+3	1.00	Valid

Appendix E

Certificate of English

BANSOMDEJCHAOPRAYA
RAJABHAT UNIVERSITY

This is to certify that

Mrs. Li Siqin

Achieved BSRU English Proficiency Test (BSRU-TEP) level

C2

Given on 25th January 2021

(Assistant Professor Dr Kulsirin Aphiratvoradej)

Director

Appendix F

The Document for Acceptance Research

MHESI 8038.1/10

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 PROBLEM-BASED LEARNING INSTRUCTIONAL MODEL TO ENHANCE PROBLEM SOLVING ABILITY FOR UNDERGRADUATE STUDENTS
Writer	Li Siqin, Narongwat Mingmit, Areewan Iamsa-ard and Sarayut Sethakhajorn
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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