CURRICULUM EVALUATION OF BACHELOR'S DEGREE OF INSTALLATION ENGINEERING PRICING AT SICHUAN UNIVERSITY OF SCIENCE AND ENGINEERING USING CRITERION BASED ON TYLER MODEL

LI JIANG

A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR THE DEGREE OF MASTER OF EDUCATION
PROGRAM IN CURRICULUM DEVELOPMENT
AND INSTRUCTIONAL INNOVATION
FACULTY OF TECHNICAL EDUCATION
RAJAMANGALA UNIVERSITY OF TECHNOLOGY THANYABURI
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วิทยานิพนธ์ฉบับนี้เป็นงานวิจัยที่เกิดจากการค้นคว้าและวิจัย ขณะที่ข้าพเจ้าศึกษาอยู่ในคณะครุศาสตร์อุตสาหกรรม มหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี ดังนั้น งานวิจัยในวิทยานิพนธ์ฉบับนี้ถือเป็นลิขสิทธิ์ของมหาวิทยาลัยเทคโนโลยีราชมงคลธัญบุรี และข้อความต่าง ๆ ในวิทยานิพนธ์ฉบับนี้ ข้าพเจ้าขอรับรองว่าไม่มีการคัดลอกหรือนำงานวิจัยของผู้อื่นมานำเสนอในชื่อของข้าพเจ้า

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Thesis Title	Curriculum Evaluation of Bachelor's Degree of Installation Engineering Pricing at Sichuan University of Science and Engineering Using Criterion Based on Tyler Model
Name – Surname	Mrs. Li Jiang
Program	Curriculum Development and Instructional Innovation
Thesis Advisor	Assistant Professor Pranom Punsawai, Ph.D.
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5 April 2023

Thesis Title	Curriculum Evaluation of Bachelor's Degree of Installation Engineering Pricing at Sichuan University of Science and Engineering Using Criterion Based on Tyler Model
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ABSTRACT

This research aimed to evaluate the curriculum of installation engineering pricing at Sichuan University of Science and Engineering using the Tyler model, which included goals, objectives, learning experiences, and outcomes.

The population consisted of 1,402 individuals and 300 samples were selected using stratified random sampling from five groups of installation engineering pricing at Sichuan University of Science and Engineering. These groups included 4 curriculum instructors, 19 instructors, 111 students, 161 graduate students, and 5 graduate users. Data was collected using a questionnaire with a 5-point Likert scale, with validity values (IOC) ranging from 0.66 to 1.00, and a reliability value of 0.90. The data was analyzed using percentages, means, and standard deviations.

The results revealed that the curriculum evaluation of the bachelor's degree in installation engineering pricing at Sichuan University of Science and Engineering, based on the Tyler model criteria, was overall at a high level. When considering all four aspects, including the goals, objectives, learning experiences, and outcomes, it received a high level of evaluation.

Keywords: curriculum evaluation, installation engineering pricing, Tyler model

Acknowledgements

For this thesis, First and foremost, I would like to express my sincere gratitude to my thesis advisor, Assistant Professor Dr. Pranom Punsawai, for the invaluable guidance and encouragement provided throughout my research journey.

Secondly, I would like to thank to the thesis committees, Associate Professor Dr. Somchai Sinok, Assistant Professor Dr. Rossarin Jermtaisong and Dr. Porpirom Lhongsap. For their insightful comments and valuable suggestions.

Thirdly, I would like to extend my heartfelt thanks to experts of questionnaire evaluation: Associate Professor Dr. Tiwat Maneechote, Associate Professor Dr. Rewadi krahomvong and Dr. Sujin Nukaew. For their valuable comments and helpful suggestions.

Fourthly, I would like to express my profound gratitude to my colleagues from the College of Civil Engineering. I extend my thanks to Mr. Bi Chao, Mrs. Zhao Yuandi, and Mrs. Zhang Jinqiu for their assistance in the questionnaire collection process, which enabled me to successfully complete and distribute the questionnaire. Without your insightful input and collaborative brainstorming, the achievements of my research would not have been possible today.

Finally, I would like to express my heartfelt gratitude to my parents for giving me life, raising me, and being my first teachers. I can only hope to repay their boundless love through my own continuous efforts.

Li Jiang

Table of Contents

Table of Contents (Continued)

List of Tables

List of Tables (Continued)

Page

List of Figure

CHAPTER 1
INTRODUCTION

1.1 Background and Problem Statement

The development of the economy promoted the growth of the construction industry. With the rapid expansion of China's construction sector, the scale of projects increased, and the number of building floors grew, leading to a gradual rise in the importance of installation engineering pricing in project investments, accounting for approximately 40% to 70%. It held a significant position (Yu Chunyi, 2018, p.253). The country's demand for construction professionals also showed a year-on-year upward trend, with the pricing of installation engineering playing a crucial role in the industry's development. Observing the patterns in college entrance examination applications in recent years, installation engineering pricing emerged as a popular major in prestigious universities (Han Jinsung, 2021, p.3). Various investigations at graduate fairs and talent recruitment networks revealed a significant market demand for graduates with majors in installation engineering pricing (Yang Chunyan, 2022, p.124).

Installation engineering pricing was a robust university curriculum, which served as a compulsory course for undergraduate installation engineering pricing students and as a degree program for installation engineering pricing majors. The curriculum aimed to train engineering practitioners who were capable of analyzing and solving installation engineering pricing problems using accurate and rational methods. It was designed to provide students with foundational knowledge and comprehensive application skills in civil engineering technology and management, economics, and legal aspects related to installation engineering pricing management. Additionally, the curriculum aimed to provide basic training for students aspiring to become cost engineers (Han LiHong, 2012, p.112).

In recent years, the course of installation engineering pricing has been developing very rapidly, but at the same time, it also reveals some problems, the teaching mode of installation engineering pricing is boring, the interaction between teachers and students is not strong; the proportion of practical teaching is not high, the lack of practical training; the teaching content is lagging, the lack of connection with the

installation engineering pricing engineer position (Du Yuanyuan et al., 2021, pp.136-164). Not only that, but there is also a lack of fine selection of teaching materials, favoring theoretical lectures; teachers' teaching methods are single, and students' learning motivation is weak; curriculum evaluation lacks characteristics and is formal, etc.

The Ministry of Education of the People's Republic of China issued the Implementation Plan for the Audit and Evaluation of Undergraduate Education in General Higher Education Institutions (2021-2025) in 2021, which mandated the continuous improvement and enhancement of talent cultivation, as well as the establishment of internal quality assessment systems within universities (Ministry of Education, PRC, 2021). In 2020, the State Council of China released a comprehensive plan for deepening education evaluation reform in the new era, stating that "Education evaluation determines the direction of education development, and the type of evaluation framework in place guides the operation of educational institutions" (State Council, PRC, 2020). Curriculum evaluation, as one of the specific methods of assessing teaching quality, has gained significant traction within domestic universities in China and continues to exhibit substantial developmental momentum.

Between 1933 and 1941, Tyler, the "father of curriculum evaluation" in the United States, and his colleagues embarked on a significant "eight-year study." Building upon this study and the critique of the prevailing examination-centered perspective, Tyler formulated a novel definition of curriculum evaluation, introducing a goal-based curriculum evaluation model. The renowned Tyler evaluation model has left a lasting impact, and research in curriculum evaluation as an emerging professional field has yielded fruitful results in a span of just over half a century (Feng Shengyao, 1996, pp.54-56).

To utilize Tyler's Goal-based Approach for conducting a scientific and rational curriculum evaluation of the installation engineering pricing curriculum, thus enhancing the quality of curriculum instruction. The outcomes of the curriculum evaluation were employed to guide teachers in developing and implementing curriculum plans, thereby elevating the teaching proficiency of installation engineering pricing educators and fostering professional advancement.

In summary, the installation engineering pricing curriculum had issues such as inappropriate selection of teaching materials, a monotonous teaching mode, and limited teaching methods. There was a lack of teacher-student interaction and low student motivation. Additionally, the proportion of practical teaching was low, and there was a deficiency in practical training. The teaching content was outdated and not adequately connected to the role of an installation cost engineer. It was necessary to conduct a curriculum evaluation using the Goal-based Approach by the Tyler model. This evaluation provided an opportunity to enhance the quality of curriculum instruction. The outcomes of the curriculum evaluation were utilized to guide teachers in preparing and implementing curriculum plans. This approach aimed to improve the teaching proficiency of installation engineering pricing educators and facilitate the advancement of the profession.

1.2 Purpose of the Study

To evaluate the curriculum of installation engineering pricing at Sichuan University of Science and Engineering using the Tyler model, which includes goals, objective, learning experience, and outcome.

1.3 Scopes of the Study

1.3.1 Population and Sample

The installation engineering pricing curriculum at Sichuan University of Science and Engineering was evaluated using a population consisting of five groups: course instructors, instructors, students, undergraduate students, and graduate users. The population size was 1,402, and a stratified random sampling method was used to select 300 samples. The sample consisted of 4 curriculum instructors, 19 instructors, 111 students, 161 undergraduate students, and 5 graduate users.

1.3.2 Scope of Contents

The goal-based approach by Tyler of curriculum evaluation was divided into four sections: Goals, Objective, Learning Experience, Outcome.

1.3.3 Scope of Time

The study will be conducted from September 2022 to March 2023.

1.4 Definition of Terms

For the sake of clarity, the following terms were conceptually and operationally defined.

1.4.1 Curriculum evaluation was a scientific method used to assess the extent to which the objectives of a curriculum, its development, and implementation achieved educational goals. It involved examining specific criteria and information about the curriculum system to determine the effectiveness of the curriculum design and make informed decisions for curriculum improvement.

1.4.2 The goal-based approach by Tyler for curriculum evaluation was an evaluation model developed by American evaluation expert Tyler in the 1930s and 1940s, with a focus on assessing the achievement of curriculum objectives. The evaluation criteria were based on the extent of goal attainment, and evaluation methods could vary, no longer limited to written tests. The purpose of evaluation was to enhance curriculum improvement.

1.4.3 Goals were broad educational objectives that encompassed the goals of the educational program.

1.4.4 Objective was the starting point of curriculum development and the ultimate direction of the entire process, considered the soul of the curriculum.

1.4.5 Learning Experience was the only means of achieving educational goals and the organic composition of curriculum development.

1.4.6 Outcome was the course evaluation that provided feedback on whether the course objectives had been achieved and included knowledge, skills, and student behaviors.

1.4.7 Sichuan University of Science and Engineering was a comprehensive higher education institution with a long-standing history in undergraduate and graduate education. It offered a range of disciplines, including civil engineering, installation engineering pricing, water supply and drainage science and engineering, and intelligent construction.

1.4.8 Installation engineering pricing was an emerging discipline that integrated economics, management, and civil engineering principles. It aimed to develop individuals with a strong foundation in moral values, intellect, physique, and aesthetics.

The program provided a comprehensive higher education experience, equipping students with modern theories, methods, and techniques in installation engineering pricing management. Graduates received essential training as cost engineers and consulting (investment) engineers, enabling them to make informed investment decisions and effectively manage installation engineering pricing in construction projects. They also acquired practical skills and fostered an innovative mindset. This program prepared technical professionals with expertise in installation engineering pricing management and proficiency in preparing pricing documents for construction enterprises and project budgeting units.

1.5 Conceptual Framework

Since the research paper employed an experimental research design, the framework below served as the researcher's guide in the conduct of the study.

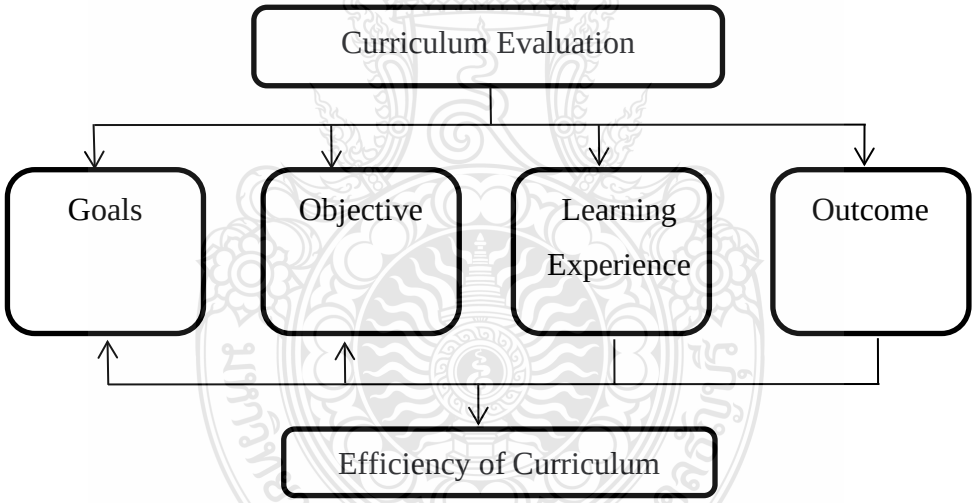

Figure 1.1 Conceptual Research Framework

1.6 Contribution to Knowledge

1.6.1 It was important for teachers to monitor student progress in order to assess whether students were achieving the expected progress. This allowed teachers to make necessary adjustments to instructional plans and strategies accordingly.

1.6.2 Analyzing student performance enabled teachers to evaluate the effectiveness of their teaching. The effectiveness of teaching played a crucial role in guiding teachers' decisions on whether to maintain the current program or make modifications to enhance it.

1.6.3 Evaluating the overall implementation of the curriculum was beneficial in identifying the strengths and weaknesses of the curriculum. This evaluation process facilitated comprehensive reform and development of the curriculum.

CHAPTER 2
REVIEW OF THE LITERATURE

This chapter focused on reviewing the previous studies related to the following area relevant to this research.

2.1 Curriculum Evaluation

2.1.1 Definition of curriculum evaluation

Curriculum evaluation was a process of value judgment and served as a crucial means of identifying curriculum development and construction. The methods of evaluation were diverse, and the scope of evaluation encompassed various curriculum elements.

Gong Liming (2005, pp.50-53) discussed school-based curriculum evaluation as both an orientation mechanism and a quality monitoring process that ran through the entire process of school-based curriculum development. School-based curriculum evaluation was an essential component of curriculum development, serving as both an orientation mechanism and a quality control process. Its main purpose was to meet the developmental needs of diverse students, reflect the unique characteristics of the school, enhance teachers' curricular competence, and promote the democratization of education.

Lin Na (2006, pp.34-36) explained that curriculum evaluation was a necessary tool for identifying curriculum development and construction, and it played an essential role in promoting curriculum optimization and improving teaching quality. Through the careful organization of various curriculum evaluation activities, their design, implementation, and management, high efficiency, reliability, and high-quality curriculum evaluation could be achieved. The full utilization of curriculum evaluation in supervision and motivation, the evaluation of learning to promote teaching and teaching management functions, and the mobilization of the initiative and enthusiasm of schools, teachers, and students in all aspects were emphasized to ensure and promote the complete realization of talent training objectives.

Li Feng (2011, pp. 40-41, 87) stated that curriculum evaluation was the value judgment of the school curriculum. It involved activities of qualitative description and quantitative measurement of curriculum design, curriculum conditions, curriculum implementation process, and curriculum implementation results, based on predetermined talent cultivation goals, to make value judgments and seek ways to improve the curriculum. The curriculum evaluation system referred to a set of index systems that could qualitatively and quantitatively assess the value of the curriculum. It was built around curriculum development and design, curriculum development conditions, curriculum implementation process, and curriculum implementation results.

Curriculum evaluation provided helpful information for the curriculum plan. Song Shuyan (2019, pp.90-92) described curriculum evaluation as a systematic project, which was an integral part of EQE (Education Quality Enhancement). It involved systematically investigating and describing the extent to which the school curriculum met the needs of society and individuals and making value judgments based on that. Curriculum evaluation aimed to improve the actual or potential value of the curriculum and achieve continuous value-added education. Through curriculum evaluation, valuable information was provided for the revision of curriculum plans, and services were offered to curriculum decision-makers, implementers, and related personnel to attain curriculum training goals, adapt to social needs, and cater to the physical and mental development of students.

Wen Xuejun (2004, pp.1-4) stated that curriculum evaluation was essential in guiding and monitoring the quality of curriculum implementation. Since the 1980s, countries worldwide had been rethinking and reorienting various aspects of the curriculum, including its structure, functions, resources, and rights, and had initiated a series of robust curriculum reforms. Simultaneously, an increasing number of countries had realized that establishing an evaluation system and model compatible with curriculum changes was a necessary condition for achieving those changes. Consequently, curriculum evaluation reform became an integral part of curriculum reform efforts worldwide.

It was concluded that curriculum evaluation was a scientific method of checking whether and to what extent the objectives of the curriculum, its development, and implementation had achieved the educational goals based on specific criteria and information about the curriculum system. Its purpose was to determine the effectiveness of the curriculum design and make decisions to improve the curriculum accordingly.

2.1.2 Classification of Curriculum Evaluation

There were various classification of curriculum evaluations, based on different evaluation purposes, evaluation objects, and evaluation methods.

1) Curriculum Evaluation based on different evaluation purposes, course evaluation can be classified into diagnostic evaluation, formative evaluation, and summative evaluation.

He Zhiming (2020, pp.106-107) paper could be divided into classification of curriculum evaluations was diagnostic evaluation, formative evaluation, and summative evaluation according to the different roles of evaluation in teaching activities. Diagnostic evaluation was the first step to understand the basis and starting point of our curriculum implementation. Formative evaluation involved the testing and evaluation we conducted during the implementation of the curriculum to improve our implementation program. Summative evaluation, also known as summative assessment, was an evaluation that was carried out at the end of the course to assessment the extent to which students had acquired knowledge, developed abilities, and applied skills.

2) Course Evaluation based on different evaluation objects, course evaluation can be broadly categorized into student evaluation, teacher evaluation, school evaluation, and narrow-scope course evaluation.

Yang Xiao and Yang Hui (2020, pp.27-32) explained that classification of curriculum evaluations was student assessment, which was an integral part of a student's growth process of self-knowledge, self-reinvention, and self-identity, and it was also one of the aspects of fundamental education curriculum reform that could not be ignored. Modern student assessment adhered to the concept of "student-centered" assessment, which aimed to stimulate positive learning motivation and promote improved learning and comprehensive and coordinated development.

Zhang Li (2012, pp.51-53) stated that classification of curriculum evaluations was teacher evaluation, which was a method of measuring, assessing, appraising, and evaluating. The evaluation criteria were used to assess the outcomes and processes of teachers' work tasks, practical effects, professional quality, and professional attitudes. Based on these evaluations, suggestions were provided to teachers for further improving teaching quality and educational effectiveness.

Guo Guanping and Wang Lixing (2004, pp.51-53) discussed classification of curriculum evaluations was school evaluation, as the evaluation of school running conditions, school running level, school running quality, etc., with the aim of guiding school operations and improving the quality of talent training.

3) Curriculum Evaluation based on different evaluation methods, evaluation can be categorized into quantitative evaluation and qualitative evaluation.

Li Hongwei (2014, pp.110-113) stated that classification of curriculum evaluations was qualitative evaluation and quantitative evaluation. Qualitative evaluation means that the evaluator made value judgments on the attributes of the evaluated object based on their subjective experience, observation, and acquired literature. This included rating the merits and writing comments. On the other hand, quantitative evaluation involved the use of quantitative methods such as educational measurement, statistics, and fuzzy mathematics to collect, analyze, and process relevant data. Its aim was to describe the characteristics of the evaluated object numerically and make value judgments. In actual evaluation activities, qualitative and quantitative

evaluations were used alternately, complementing each other. Quantitative evaluation served as the basis for qualitative evaluation, while qualitative evaluation served as the starting point, result, and purpose of quantitative evaluation.

They concluded that classification of curriculum evaluations was could be in various ways, such as evaluation purposes, object, methods, etc. Evaluators could choose the corresponding classification according to their own needs.

The conclusion that classification of curriculum evaluation was a process of value judgment. Value judgment required the reflection of the evaluator's values and subjective desires based on factual descriptions. Different evaluation subjects would yield different judgments. The approach to curriculum evaluation was diverse and could be quantitative or qualitative. The scope of curriculum evaluation was comprehensive, encompassing the curriculum plan, the teachers, students, and schools involved in its implementation, as well as the outcomes of curriculum activities and the development of students and teachers.

2.2 Goal-based Approach by Tyler of Curriculum Evaluation

2.2.1 Goal-based approach by Tyler of definition

Goal-based approach by Tyler was primarily based on the process of goal achievement and the evaluation criteria of teaching objectives.

Zhao Yihan (2018, pp.739) described Goal-based approach by Tyler was not an independent evaluation model; it needed to be closely integrated with each educational process. The concept of educational evaluation in this paper. To conduct educational evaluation, it was necessary to first analyze the goals that education should achieve and then evaluate the educational outcomes based on these goals. It served as a foundation for evaluation, but its purpose extended beyond evaluation alone. By using goals as the evaluation criteria, it was necessary to consider all aspects of education when establishing the goals, from instructional design to specific teaching processes, and carry out educational evaluation within the framework of these goals.

Liu Zongchao and Yu Dongxiao (2016, pp.38-39) stated that Goal-based approach by Tyler was that involved the combination of course evaluation and course objectives. Accord objectives, and the evaluation process could be conducted more

efficiently once the course obng to Tyler's model, course evaluation was closely linked to course objectives were established. Therefore, curriculum objectives served as the core of Tyler's curriculum model. Additionally, Tyler's course evaluation model emphasized that course evaluation should encompass at least two aspects: firstly, during the early stage of curriculum design, and secondly, towards the end of the course to assess the changes that occurred during the learning period.

They concluded that the Goal-based approach by Tyler was the purpose of evaluation was to enhance the curriculum. The evaluation criterion was the extent of goal achievement, and the evaluation methods could vary, no longer limited to written tests. The Tyler evaluation model was simple, straightforward, easy to understand, and implement. Its creation and establishment marked the inception of educational evaluation and the beginning of curriculum evaluation models, signifying the significance of curriculum evaluation in the field of curriculum research.

2.2.2 Steps of Goal-based approach by Tyler

Most of the steps of Goal-based approach by Tyler were related to goals, and this model regarded curriculum evaluation as the process of assessing the extent to which educational goals were achieved.

Hu Yaozong (2001) discussed that Goal-based approach by Tyler combined theoretical approaches and empirical studies of program activities. He established a complete evaluation process consisting of four steps:

1) Determining evaluation goals was a key aspect emphasized by Tyler. He reiterated that the purpose of evaluation was to assess the extent to which pre-determined curricular goals were being achieved. Therefore, the evaluation goals were aligned with the initially determined goals.

2) Identifying the evaluation context was emphasized as an important aspect. Since the goals themselves were behavioral in nature, it was evident that the evaluation should also be behavioral-focused. Therefore, it was crucial to identify the contexts in which students had the opportunity to demonstrate the types of behaviors implied by the educational goals.

3) The third step involved designing evaluation instruments that were aligned with the evaluation context. For instance, tests could be used to assess

knowledge acquisition, while observation and documentation could be employed to evaluate students' social adjustment skills. It was essential for the evaluation instruments to be appropriate and in accordance with the specific context of evaluation.

4) The use of evaluation results can, first and foremost, help in understanding the actual outcomes of the program. That is, it reveals how well the educational objectives were achieved and indicates areas where the program can be enhanced. Thorough research has led to the development of specific principles, steps, requirements, and procedures for each issue of the Tyler Principles. This has resulted in a relatively comprehensive, systematic, and practical model.

According to Yang Lei and Zhu Dequan (2019, pp.71-74), Tyler asserted that "the evaluation process begins with the goals of the educational program. Since the purpose of evaluation is to assess the degree of achievement of educational goals, a set of evaluation procedures is required to provide evidence for each type of behavior implied by the major educational goals. The development of evaluation tools forms the central part of the evaluation". They further explain that the Goal-based approach by Tyler follows a five-stage process:

1) Clear definition of the behaviors demanded by the educational objectives.

2) Designing educational scenarios that offer ample opportunities for each student to demonstrate the expected behaviors aligned with the educational objectives.

3) Developing a set of tools to capture records of student behaviors in test situations.

4) Identifying the names or units used to summarize or assess the resulting behavioral records. This involves defining the characteristics of the behavioral aspects to be assessed and selecting appropriate units for measurement or summarization.

5) Determining the objectivity, reliability, and validity of the developed assessment instrument. The evaluation results obtained through the assessment instrument serve as a critical judgment of the extent to which the current educational program accomplishes the desired educational goals. These results from the fundamental basis for revising or improving curricula and teaching programs.

Wang Lu (2014, pp.20-22) described Tyler's ideas on curriculum evaluation, which were influenced by the behaviorist psychology prevailing in the United States at that time. Tyler believed that education aimed to modify human behavior patterns, and evaluation played a crucial role in determining the extent of behavior change. Based on these principles, he proposed Goal-based approach by Tyler follows a four-stage process:

1) Establishing evaluation objectives: Defining educational objectives is a crucial step in the evaluation process. Evaluation aims to assess the degree to which educational goals are achieved, making pre-established evaluation objectives essential.

2) Defining the evaluation context: The only way to determine whether a student has acquired a behavior is by providing situations where they can demonstrate it. This involves finding appropriate contexts where the desired behavior can be observed.

3) Testing assessment tools: Once the educational goals and evaluation contexts are established, it is necessary to test the assessment tools. This involves determining whether the tools effectively capture the desired behavior as outlined by the educational objectives.

4) Using evaluation results: The evaluation results serve as a judgment of the alignment between the desired goals and the actual outcomes. Through comparative analysis of the collected data, the extent of change in students' behavior can be estimated. This analysis also helps identify strengths and weaknesses in the curriculum, leading to the formulation of hypotheses to explain these observations. These hypotheses are then tested in the actual educational process, aiming to enhance curriculum design.

Overall, the steps of Goal-based approach by Tyler emphasized the importance of clearly defined objectives, appropriate evaluation contexts, effective assessment tools, and the utilization of evaluation results to improve curriculum design.

It is concluded that Goal-based approach by Tyler can be roughly divided into four steps. These steps are as follows:

1) Determining evaluation objectives: This step involves establishing the specific objectives for the evaluation process.

2) Determining evaluation situations: Here, the appropriate situations or contexts are identified for assessing the desired outcomes.

3) Determining assessment tools: This step focuses on selecting the suitable tools and methods for evaluating the desired outcomes within the identified situations.

4) Using evaluation results: Finally, the evaluation results are utilized to assess the extent to which the objectives have been achieved and to provide insights for improvement.

The sequence of these steps is clear, logical, concise, and compact. The simplicity of the model makes it easily understandable, acceptable, and adaptable. As a result, it continues to serve as a standard evaluation model in various countries, holding significant practical value.

2.3 Installation Engineering Pricing Curriculum

2.3.1 The content of the installation engineering pricing curriculum

Zhao Huiping (2022, pp.228-230) discussed the significance of installation engineering pricing curriculum was that works in the field of installation engineering pricing profession. This course is considered a vital component of the profession, encompassing theoretical and practical aspects while integrating multiple disciplines. It covers essential skills required for installation cost estimation and serves as mandatory content for the National Qualification Examination for Cost Engineers, specifically in the installation engineering direction. The course's influence on students' careers is profound, as it provides them with crucial knowledge and expertise necessary for their professional growth.

Deng Taiping (2021, pp.216-217) stated that the curriculum of Installation Engineering Pricing was that holds a central position within the curriculum of installation engineering pricing offered in colleges and universities. As the construction industry has implemented a market access system for construction practitioners, the measurement and pricing of installation engineering have gained significant importance. Consequently, this course has become an integral component of

the professional examination for registered cost engineers, highlighting its essential role in preparing students for successful careers in the field.

Dai Duanming and Yang Yingying (2017, pp.140-142) emphasized that the "Installation Engineering Pricing" curriculum was a fundamental skills course within the discipline of installation engineering pricing. The primary focus of the teaching curriculum should be on developing students' proficiency in essential skills such as reading drawings, itemizing lists, calculating quantities, and pricing lists, which are necessary for construction, plumbing, and installation project pricing. Through studying this course and engaging in practical exercises, students should gain the ability to prepare bills of quantities and bidding budgets effectively.

Cai Xuemei et al. (2015, pp.7040-7041) stated that the curriculum "Installation Engineering Pricing" was that holds a central position within the curriculum of installation engineering pricing. This course aims to cultivate students' proficiency in measuring and pricing aspects of hydropower projects. As China's hydropower industry continues to evolve, there is an increasing demand for effective cost control and management. Possessing accurate measurement and pricing capabilities is crucial for enhancing enterprise profitability and reducing wasteful practices. Therefore, the significance of this course has garnered greater attention from enterprises.

It can be concluded that the "Installation Engineering Pricing" curriculum was holds a central position within the curriculum of installation engineering pricing. This course aims to train students in the measurement and pricing aspects of hydropower engineering installations. Moreover, it serves as a mandatory course for individuals pursuing a career in installation engineering pricing and for candidates preparing for related licensing examinations.

2.4 Relevant Researche

2.4.1 Domestic research

Yang Xiao (2009, pp.66-68) expounded that Goal-based approach by Tyler was one of the important pioneers in the field of education and curriculum evaluation. By studying Tyler's works from different periods, it can be observed that his evaluation perspectives still provided valuable insights for the evaluation of language

curriculum. In terms of evaluation purposes, it was not only about assessing the achievement of goals but also about facilitating student development. Regarding evaluation types, emphasis was placed not only on outcome evaluation but also on process evaluation. In terms of evaluation content, it encompassed not only explicit behaviors but also implicit behaviors such as emotions and attitudes. Moreover, Tyler emphasized the importance of diversifying evaluation methods.

Wang Biao (2022) conducted a study on the course evaluation method using goal attainment as the basis, with the C++ object-oriented programming course serving as an example. The research paper begins by introducing the teaching objectives of the C++ object-oriented programming course. Subsequently, the course evaluation method based on goal attainment is discussed. An example is provided to illustrate the implementation of this evaluation method. Finally, the paper concludes by summarizing its main findings. The implementation of the evaluation method demonstrated that it effectively reflected the teaching situation in the class. While the entire class passed the overall assessment of the course, the average score was not particularly high. This suggests that teaching measures need to be improved in future course instruction. The study highlights the importance of evaluating course objectives and making necessary adjustments to enhance teaching effectiveness.

Piao Shengyu (2008) Goal-based approach by Tyler theory was developed based on psychology to meet the needs of the political and economic development in the 1940s in the United States. It gradually formed through years of research and practice. The "Tyler Model" first emphasized the close relationship between educational goals, curriculum design, and the evaluation process. Tyler believed that the purpose of evaluation was to comprehensively examine whether learning experiences effectively produced the desired outcomes and to guide teachers in achieving those expected results. Evaluation design aimed to obtain evidence of student behavioral changes. Therefore, any appropriate evaluation method that provided evidence of the expected behaviors related to educational goals was considered valid. The behaviorally-oriented curriculum evaluation model advocated by Tyler quickly gained popularity in the field of education in the United States and later spread to various countries in Western Europe, igniting a wave of educational evaluation. Even in today's landscape

with an increasing number of evaluation models, Tyler's model still holds a significant position in the field of curriculum evaluation.

2.4.2 Foreign research

Cruickshank V. (2018, pp.34-35) elaborated on the enduring impact of Goal-based approach by Tyler in the field of curriculum development since its publication in 1949. Despite its age, the model continues to exert a significant influence, underscoring the relevance of the fundamental questions upon which Tyler's model was built. This discussion paper explores Tyler's (1949) objectives curriculum model, focusing on its strengths and weaknesses, as well as its contemporary applicability. The analysis is situated within the context of the health and physical education subject area.

Fundi, S. K. (2015) conducted a curriculum evaluation utilizing Tyler's Goal Attainment Model or Objectives-Centered Model. This paper aims to describe the Goal-based approach by Tyler, with a specific focus on its evaluative component. The evaluation analysis was performed using the DeKalb County Science Curriculum, with a particular emphasis on the outcomes data of Dunwoody High School students in the subjects of physical science and biology. The decision to evaluate the DeKalb County science curriculum was driven by a keen interest in understanding its effectiveness. To carry out the evaluation, two courses (biology and physical science) with End-of-Course Tests (EOCT) were selected. Achievement test data, specifically the EOCT results, were employed to evaluate the performance of students in these two subjects. The study findings highlighted the significant role of technology in facilitating student learning and achievement on the EOCT. Dunwoody High School adopted the flipped classroom model, supported by three fully equipped computer labs. Furthermore, the science department possessed one hundred STEM LAB laptops, fifty iPads, and eighty hand-held student response systems. These resources provided opportunities for students to apply their knowledge through engaging with gizmos and virtual labs. The author believes that the integration of traditional classroom instruction with virtual learning environments aids students in meeting the science curricular objectives set by both the county and the state.

Ukessays (2021) conducted an analysis on Goal-based approach by Tyler, which serves as the foundation for the evaluation practices implemented in the

modern education system across various schools, universities, and academic institutions. The model's origins can be traced back to Ralph Tyler's renowned work, "Basic Principles of Curriculum" (1949/50) and subsequent Instructions. Tyler's model was influenced by the Eight-Year Study (1933-1941), a national program involving 30 secondary schools and 300 colleges and universities. This program aimed to address the limitations and inflexibility observed in the high school curriculum (Tyler, 1969). Tyler's model was distinguished by its simplicity while embodying a groundbreaking initiative to redefine the approach to modern education. In this essay, the focus is placed on the curriculum of Humanities and Social Sciences at the 7th grade level in Australia. The analysis suggests that the humanities and social sciences curriculum should be adapted to foster the development of concepts that facilitate rational actions and understanding.

The conclusions of the literature review indicate that Goal-based approach by Tyler involves making value judgments and seeking ways to improve aspects related to curriculum planning, implementation, and outcomes. This process entails systematically collecting pertinent information and utilizing qualitative and quantitative methods based on specific evaluation criteria. There exist different types of curriculum evaluation, with Tyler's goal evaluation being one of the earliest models. Evaluating the installation engineering pricing curriculum using Tyler's goal evaluation will provide insights and recommendations for enhancing the curriculum.

CHAPTER 3
RESEARCH METHODOLOGY

The research on curriculum evaluation of installation engineering pricing by using the Goal-based Approach by Tyler, both quantitative and qualitative was used with details of research methodology as follows,

3.1 Population and Sample

3.2 Research Instrument

3.3 Instrument Development

3.4 Data Collection

3.5 Data analysis

3.6 Statistics used in research

3.1 Population and Sample

3.1.1 Population

The installation engineering pricing curriculum at Sichuan University Science and Engineering is evaluated using a population consisting of five groups: curriculum instructors, instructors, students, undergraduate students, and graduate users. The population size is 1,402.

3.1.2 Sample

A stratified random sampling method was used to select 300 samples. The sample consists of 4 curriculum instructors, 19 instructors, 111 students, 161 undergraduate students, and 5 graduate users.

Table 3.1 The sample group in the curriculum evaluation installation engineering Pricing.

Group	Population	Sample
1. Curriculum instructors	4	4
2. Instructors	19	19
3. Students	345	111
4. undergraduate students	924	161
5. Graduate users	110	5
Total	1,402	300

3.2 Research Instrument

3.2.1 Use questionnaires to collect quantitative data

The instruments used to collect quantitative data were four questionnaires with the following details:

1) Questionnaire for curriculum instructors installation engineering pricing. The course evaluation questionnaire is divided into 3 parts, parts 1 General information of respondent, Parts 2 comments on the curriculum, and parts 3 problems and suggestions. The Rating scale is divided into 5 levels, from the lowest to the highest.

2) Questionnaire for instructors installation engineering pricing. The course evaluation questionnaire is divided into 3 parts, parts 1 General information of respondent, Parts 2 comments on the curriculum, and parts 3 problems and suggestions. The Rating scale is divided into 5 levels, from the lowest to the highest.

3) Questionnaire for students installation engineering pricing. The course evaluation questionnaire is divided into 3 parts, parts 1 General information of respondent, Parts 2 comments on the curriculum, and parts 3 problems and suggestions. The Rating scale is divided into 5 levels, from the lowest to the highest.

4) Questionnaire for graduate students installation engineering pricing. The course evaluation questionnaire is divided into 3 parts, parts 1 General information of respondent, Parts 2 comments on the curriculum, and parts 3 problems and suggestions. The Rating scale is divided into 5 levels, from the lowest to the highest.

5) Questionnaire for graduate users installation engineering pricing. The course evaluation questionnaire is divided into 3 parts, parts 1 General information of respondent, Parts 2 comments on the curriculum, and parts 3 problems and suggestions. The Rating scale is divided into 5 levels, from the lowest to the highest.

3.3 Instrument Development

3.3.1 Questionnaire

The researcher created the following details for the installation engineering pricing course evaluation questionnaire.

1) Research Goal-based Approach by Tyler course assessment literature to identify a framework for course assessment.

2) Develop a list of questions for each questionnaire part and develop draft.

3) Submit the questionnaire (draft) for evaluating installation engineering pricing to the instructor for review and recommendations.

4) Revise the questionnaire for evaluation of installation engineering pricing based on the suggestions given by the supervisor.

5) Based on the consultant's recommendations, the revised questionnaire was taken to 3 experts to check the validity of the content (Content Validity) and to find the Index of Item Objective Congruence (IOC) with validity values ranging from 0.66 to 1.00. by having each expert comment on and rate each question.

6) Improve the questionnaire for evaluation of installation engineering pricing based on the recommendations given by the 3 experts

7) Try out the questionnaire with a non-sample group of 30 people to reliability value of 0.90.

8) Complete questionnaire for evaluation of installation engineering pricing for use with the sample group.

3.4 Data Collection

3.4.1 Questionnaire data

Researchers collected data questionnaire to evaluate the curriculum for installation engineering pricing, as follows:

1) Request permission from the Graduate School needs to be made to collect data with the sample group.

2) The researcher collects the data by online from February to March 2023.

3) Check the completeness of the returned questionnaires.

3.5 Data analysis

3.5.1 Questionnaire data analysis

Quantitative data analysis using descriptive statistics, Percentages (%), Means, and Standard Deviations. Mean will have 5 levels of mean to be interpreted as follows.

4.50 - 5.00 Highest Level

3.50 - 4.49 High Level

2.50 - 3.49 Moderate Level

1.50 - 2.49 Low Level

1.00 - 1.49 Lowest Level

3.6 Statistics Used in Research

3.6.1 Basic statistics, Percentages (%), Means and Standard Deviations.

1) The formula used to calculate this percentage is:

$$\mathrm{P} = \frac{f}{N} \times 100$$

P represent Percentage.

f represent Frequency.

N represent Total frequency.

2) The formula for the arithmetic Mean (M) in this research is:

$$\overline{X} = \frac{\sum X}{N}$$

$\overline{X}$ represents arithmetic Mean.

$\sum X$ represents the total sum of the data

N represents the size of the sample.

3) The formula of Standard Derivation (S.D.) in the research was:

$$S.D. = \sqrt{\frac{\sum(x - \overline{X})^2}{N}}$$

SD. represents Standard Derivation.

x represents Student Score.

$\overline{X}$ represents Mean Score.

N represents Number of students.

3.6.2 Statistics for quality inspection of tools, Validity (IOC), and Reliability (Cronbach's alpha).

1) The IOC (Item Objective Congruence) formula should follow the formula

$$IOC = \frac{\sum R}{N}$$

IOC represents the Conformity Index.

$\sum R$ represents the sum of expert opinion scores.

N represents the number of experts.

Configuration expert scores were:

+1 means the test measures are precisely the evaluate objective.

0 means the Uncertainty the test measures are precisely what the evaluate objective.

-1 means the test does not measure are precisely the evaluate objective.

2) The formula for calculating the reliability of the results is:

$$\alpha = \frac{k}{k-1}\left\{1 - \frac{\sum Ss_i^2}{s_t^2}\right\}$$

α	represents	Tool confidence
K	represents	Number of tool clauses
S_i^2	represents	Variances of each item
S_t^2	represents	Variance of the total score

CHAPTER 4
RESEARCH RESULT

This research curriculum evaluation of Bachelor degree of installation engineering pricing, Sichuan University of Science and Engineering. using Goal-based approach by Tyler. research result follow:

4.1 The Results of Personal Information

4.2 The Results of Comment on Curriculum Goals

4.3 The Results of Comment on Curriculum Objective

4.4 The Results of Comment on Curriculum Learning Experience

4.5 The Results of Comment on Curriculum Outcome

4.6 The Results of Comment on Curriculum Total of TYLER Model

4.1 The Results of Personal Information

Table 4.1 Number and percentage of personal information for curriculum instructors

List/Question	Number	Percentage **(%)**
1. Gender		
1.1 Male	1	25
1.2 Female	3	75
total	4	100
2. Age		
2.1 26-30 years old	1	25
2.2 31-40 years old	1	25
2.3 40+ years old	2	50
total	4	100

Based on the provided table 4.1, it appeared that within the Curriculum instructors category, 3 individuals identified as female, accounting for 75% of the total instructors in that category. Moreover, 2 individuals were 40 years old or older, representing 50% of the instructors in that age group.

Table 4.2 Number and percentage of personal information for instructor

List/Question	Number	Percentage **(%)**
1. Gender		
1.1 Male	11	57.89
1.2 Female	8	42.11
total	19	100
2. Age		
2.1 26-30 years old	4	21.05
2.2 31-40 years old	9	47.37
2.3 40+ years old	6	31.58
total	19	100

According to the provided table 4.2, there were 11 male instructors, which accounted for 57.89% of the total instructors. Furthermore, there were 9 instructors within the age range of 31-40 years old, representing 47.37% of the total instructors.

Table 4.3 Number and percentage of personal information for students

List/Question	Number	Percentage **(%)**
1. Gender		
1.1 Male	33	29.73
1.2 Female	78	70.27
total	111	100
2. Grade		
2.1 Grade 1	40	36.04
2.2 Grade 2	20	18.02
2.3 Grade 3	42	37.84
2.4 Grade 4	9	8.11
total	111	100

Based on the given table 4.3, it was observed that the category of students comprised 78 female individuals, which accounted for 70.27% of the total student population. Furthermore, there were 42 students enrolled in Grade 3, representing 37.84% of the overall student body.

Table 4.4 Number and percentage of personal information for undergraduate students

List/Question	Number	Percentage **(%)**
1. Gender		
1.1 Male	97	60.25
1.2 Female	64	39.75
total	161	100
2. Age		
2.1 25-years old	135	83.85
2.2 26-35 years old	25	15.53
2.3 36+years old	1	0.62
total	161	100
3. Graduation time		
3.1 2022 year	65	40.37
3.2 2021year	44	27.33
3.3 2020year	38	23.60
3.4 other	14	8.70
total	161	100
4. Type of work unit		
4.1 school	31	19.25
4.2 State enterprise or institution	93	57.76
4.3 Private enterprise	37	22.98
total	161	100
5. Work related to specialty		
5.1 Professional counterpart	92	57.14
5.2 Use to get professional	36	22.36
5.3 Have some connection with	21	13.04
5.4 irrelevant	12	7.45
total	161	100

According to the provided table 4.4, the category of undergraduate students consisted of 97 male students, which accounted for 60.25% of the total undergraduate

student population. Moreover, there were 135 students who were 25 years old, representing 83.85% of the undergraduate students. Furthermore, within the undergraduate student group, 65 individuals graduated in the year 2022, making up 40.37% of the total. Additionally, 93 students were employed in state enterprises or institutions, accounting for 57.76% of the undergraduate students. Furthermore, 92 students were involved in professional roles, representing 57.14% of the total undergraduate student population.

Table 4.5 Number and percentage of personal information for graduate users

List/Question	Number	Percentage **(%)**
1. Type of unit		
1.1 State-owned enterprise	3	60
1.2 Private enterprise	2	40
1.3 Foreign enterprise	0	0
total	5	100
2. The industry of unit		
2.1 Real estate	1	20
2.2 Construction	4	80
2.3 Geo-mining	0	0
total	5	100
3. Hired by your unit in the past 5 years		
3.1 3-5 people	1	20
3.2 6-10 people	2	40
3.3 more than 10 people	2	40
total	5	100
4. The demand for installation engineering pricing professionals in your unit in the next 5 years		
4.1 3-5 persons	4	80
4.2 6-10 persons	1	20
4.3 10 persons or more	0	0
total	5	100

Based on the provided table 4.5, it was observed that within the category of graduate users, there were 3 units that belonged to state-owned enterprises, accounting for 60% of the total. Additionally, there were 4 units that belonged to the construction industry, representing 80% of the total. It can be observed that in the past 5 years, there were 2 units that recruited 6-10 people, accounting for 40% of the total number of units. Additionally, there were 2 units that recruited more than 10 people, also accounting for 40% of the total units. Looking ahead to the demand in your unit for the next 5 years, it was noted that 4 units (80%) were anticipating the need to hire 3-5 persons.

4.2 The Results of Comment on Curriculum Goals

Table 4.6 Mean and standard deviation of Goals **c**omment on curriculum for curriculum instructors

Goals	Mean	S.D.	Level
1. The school will conduct in-depth industry and enterprise research before setting professional training objectives	4.25	0.43	High
2. The specialties offered by the school have good adaptability with the economic development of the region where they are located	3.5	0.86	High
3. The school will adjust the professional settings and talent training programmes in a timely manner according to the feedback from enterprises and the needs of local economic development	4.00	0	High
Total Average	3.92	0.43	High

Based on the provided information, the evaluation of the goals yielded an overall average value of 3.92, accompanied by a standard deviation of 0.43. This indicates that the curriculum instructors hold a high ($\overline{X}$ =3.5 to 4.25) overall evaluation of the goals. Specifically, the evaluation for the goal "The school will conduct in-depth industry and enterprise research before setting professional training objectives" obtained the highest

rating ($\overline{X}$ =4.25), with a standard deviation of 0.43. The level of evaluation for this goal is considered high.

Table 4.7 Mean and standard deviation of Goals comment on curriculum for instructor.

Goals	Mean	S.D.	Level
1. The number of degree committees and special professors and doctoral supervisors account for a reasonable proportion of teachers.	3.26	0.90	Moderate
2. The proportion of teachers with high titles, high academic qualifications and young teachers to teachers is reasonable.	3.89	0.55	High
3. A reasonable proportion of teachers are provincial key and provincial outstanding teachers.	3.31	0.72	Moderate
4. The proportion of bilingual courses offered by teachers is reasonable.	3.79	0.89	High
5. The proportion of full professors participating in undergraduate teaching is reasonable.	3.78	0.83	High
Total Average	3.61	0.78	High

Based on the information provided in the table 4.7, the average value for the evaluation of the goals is 3.61, with a standard deviation of 0.78. This suggests that the curriculum instructors have an overall high ($\overline{X}$ =3.31 to 3.89) evaluation of the goals. In particular, the goal "The proportion of teachers with high titles, high academic qualifications, and young teachers to teachers is reasonable" received the highest rating ($\overline{X}$ =3.89), with a standard deviation of 0.55. This indicates a high level of evaluation for this specific goal.

Table 4.8 Mean and standard deviation of Goals comment on curriculum for students.

Goals	Mean	S.D.	Level
1. Level of course construction.	4.05	0.81	High
2. Planning and effectiveness of textbook construction.	3.71	0.54	High
3. Degree of updating of teaching materials.	4.28	0.69	High
4. Number of original textbooks selected.	4.24	0.73	High
Total Average	4.07	0.69	High

Based on the information from the table 4.8, the overall average value for the evaluation of the goals is 4.07, with a standard deviation of 0.69. This indicates that the curriculum instructors have a high ($\overline{X}$ =3.71 to 4.28) overall evaluation of the goals. Specifically, the evaluation for "Degree of updating of teaching materials" received the highest rating ($\overline{X}$ =4.28), with a standard deviation of 0.69. The level of evaluation for the goal is considered high.

Table 4.9 Mean and standard deviation of Goals comment on curriculum for graduate students

Goals	Mean	S.D.	Level
1. Reasonable design of the number of courses	3.91	0.77	High
2. The curriculum is closely linked to each other and has a certain logic	3.90	0.78	High
3. The curriculum is adapted to the development needs of enterprises	3.85	0.86	High
4. The curriculum provides students with solid theoretical knowledge and technical skills.	3.77	0.83	High
5. Overall, the school's talent training programme is reasonably designed	3.86	0.76	High
Total Average	3.86	0.8	High

Based on the information from the table 4.9, the overall average value for the evaluation of the goals is 3.86, with a standard deviation of 0.8, indicating that the curriculum instructors have a high ($\overline{X}$ =3.77 to 3.91) overall evaluation of the goals. Specifically, the evaluation for "Reasonable design of the number of courses" received the highest rating ($\overline{X}$ =3.91), with a standard deviation of 0.77. The level of evaluation for this particula goal is considered high.

Table 4.10 Mean and standard deviation of Goals comment on curriculum for graduate users.

Goals	Mean	S.D.	Level
1. Graduates' learning ability	4.00	0	High
2. Graduates' innovation ability	4.41	0.80	High
3. Graduates' interpersonal communication ability	4.00	0	High
4. Graduates' ability to work in a team	4.39	0.80	High
5. Graduates' organizational and coordination skills	3.80	0.40	High
6. Time management skills of graduates	4.20	0.97	High
7. Information perception skills of graduates	4.00	0	High
8. Analytical skills of graduates	4.42	0.80	High
9. Graduates' problem-solving skills	4.20	0.40	High
10. Graduate's ability to manage reserves	4.00	0.89	High
11. Execution skills of graduates	4.20	0.40	High
12. Graduates' ability to bear pressure	4.38	0.80	High
Total Average	4.17	0.52	High

Based on the information from the table 4.10, the overall average value for the evaluation of the goals is 4.17, with a standard deviation of 0.52, indicating that the curriculum instructors have a high ($\overline{X}$ =3.80 to 4.42) overall evaluation of the goals. Specifically, the evaluation for "Analytical skills of graduates" received the highest rating ($\overline{X}$ =4.42), with a standard deviation of 0.8. The level of evaluation for this particular goal is considered high.

4.3 The Results of Comment on Curriculum Objective

Table 4.11 Mean and standard deviation of Objective comment on curriculum for Curriculum instructors.

Objectives	Mean	S.D.	Level
1. Teachers are familiar with the training programme of the school's engineering and costing majors	4.50	0.50	High
2. The cultivation program of engineering and costing majors can achieve the cultivation objectives of the majors	4.00	0	High
3. The cultivation programme of engineering and costing majors has been well implemented	4.25	0.43	High
Total Average	4.25	0.31	High

Based on the information from the table 4.11, the overall average value for the evaluation of the objectives is 4.25, with a standard deviation of 0.31, indicating that the curriculum instructors have high ($\overline{X}$ =4.00 to 4.50) overall evaluation of the objectives. Specifically, the evaluation for "Teachers are familiar with the training programme of the school's engineering and costing majors" received the highest rating($\overline{X}$ =4.50), with a standard deviation of 0.5. The level of evaluation for this particular objective is considered high.

Table 4.12 Mean and standard deviation of Objective comment on curriculum for Instructor.

Objectives	Mean	S.D.	Level
1. A reasonable proportion of laboratory equipment is used in professional foundation and professional courses	3.89	0.45	High
2. Reasonable rate of experimental courses offered	4.00	0.86	High
3. A reasonable proportion of laboratory equipment is used in professional foundation and professional courses	3.89	0.45	High
4. Reasonable rate of experimental courses offered	4.00	0.86	High
5. The proportion of experimental high-tech equipment	3.42	0.87	Moderate
6. Proportion of design and comprehensive experiments offered	3.74	1.01	High
7. Laboratory opening rate	3.32	0.86	Moderate
6. The number of off-campus internship bases is high	3.89	0.85	High
7. Adequate internship sites on campus	4.26	0.78	High
Total Average	3.79	0.81	High

Based on the information from the table 4.12, the overall average value for the evaluation of the objectives is 3.79, with a standard deviation of 0.81, indicating that the curriculum instructors have high ($\overline{X}$ =3.42 to 4.26) overall evaluation of the objectives. Specifically, the evaluation for "Adequate internship sites on campus" received the highest rating ($\overline{X}$ =4.26), with a standard deviation of 0.78. The level of evaluation for this particular objective is considered high.

Table 4.13 Mean and standard deviation of Objective comment on curriculum for students.

Objectives	Mean	S.D.	Level
1. The implementation of the teaching etiquette rules by the teacher in charge of the class.	4.3	0.71	High
2. Whether the teacher is full of energy, dignified and loud in teaching.	4.28	0.718	High
3. How well do teachers do in rigorous teaching and teaching by example?	4.33	0.69	High
4. How well do teachers do in teaching and educating others?	4.32	0.69	High
5. Professional knowledge of the teacher	4.32	0.70	High
6. Teaching organization ability of the teacher	4.26	0.73	High
Total Average	4.30	0.69	High

Based on the information from the table 4.13, the overall average value for the evaluation of the objectives is 4.30, with a standard deviation of 0.69, indicating that the curriculum instructors have a high ($\overline{X}$ =4.26 to 4.33) overall evaluation of the objectives. Specifically, the evaluation for "Professional knowledge of the teacher" received the highest rating ($\overline{X}$ =4.34), with a standard deviation of 0.7. The level of evaluation for this particular objective is considered high.

Table 4.14 Mean and standard deviation of Objective comment on curriculum for graduate students.

Objectives	Mean	S.D.	Level
1. Satisfaction with the public courses of your major	3.88	0.78	High
2. Satisfaction with the compulsory courses of your major	3.97	0.73	High
3. Satisfaction with the elective courses of your major	3.87	0.79	High
4. Satisfaction with the academic activities of your programme	3.82	0.76	High
5. Satisfaction with the innovative competitions and activities of your programme	3.81	0.79	High
6. Satisfaction with the innovative activities in your programme	3.82	0.76	High
7. Satisfaction with thesis writing and defence in your major	3.92	0.76	High
Total Average	3.87	0.77	High

Based on the information from the table 4.14, the overall average value for the evaluation of the objectives is 3.87, with a standard deviation of 0.77, indicating that the curriculum instructors have a high ($\overline{X}$ =3.81 to 3.97) overall evaluation of the objectives. Specifically, the evaluation for "Satisfaction with the compulsory courses of your major" received the highest rating ($\overline{X}$ =3.97), with a standard deviation of 0.73. The level of evaluation for this particular objective is considered high.

Table 4.15 Mean and standard deviation of Objective comment on curriculum for graduate users.

Objectives	Mean	S.D.	Level
1. Graduates are qualified in terms of ability and knowledge structure	4.39	0.48	High
2. Graduates have a solid foundation in professional theory	4	0.63	High
3. Graduates have a certain understanding of the frontier knowledge of the profession	4.2	0.74	High
4. Graduates have mastered professional application skills	4.41	0.48	High
5. Graduates have a certain degree of social practice experience	4.2	0.40	High
6. Graduates have mastered humanities and social knowledge	3.8	0.74	High
7. Graduates have computer application skills	4.4	0.48	High
8. Graduates have a good command of foreign languages	3.6	0.80	High
9. Graduates have obtained practice qualification certificate	3.8	0.74	High
Total Average	4.09	0.61	High

Based on the information from the table 4.15, the overall average value for the evaluation of the objectives is 4.09, with a standard deviation of 0.61, indicating that the curriculum instructors have a high ($\overline{X}$ =3.60 to 4.41) overall evaluation of the objectives. Specifically, the evaluation for "Graduates have mastered professional application skills" received the highest rating ($\overline{X}$ =4.14), with a standard deviation of 0.48. The level of evaluation for this particular objective is considered high.

4.4 The Results of Comment on Curriculum Learning Experience

Table 4.16 Mean and standard deviation of Learning Experience comment on curriculum for curriculum instructors.

Learning Experience	Mean	S.D.	Level
1. The school's existing hardware (computers, photographic equipment, etc.) resources can meet the teaching needs	4	0	High
2. Can the existing software resources (practical training software, teaching resources library, etc.) meet the teaching needs?	4.16	0.43	High
Total Average	4.08	0.22	High

Based on the information from the table 4.16, the overall average value for the evaluation of the learning experience is 4.08, with a standard deviation of 0.22, indicating that the curriculum instructors have a high ($\overline{X}$ =4 to 4.16) overall evaluation of the objectives. Specifically, the evaluation for "Can the existing software resources" received the highest rating ($\overline{X}$ =4.16), with a standard deviation of 0.43. The level of evaluation for this particular objective is considered high.

Table 4.17 Mean and standard deviation of Learning Experience comment on curriculum for instructors.

Learning Experience	Mean	S.D.	Level
1. Number of research projects and funding for teachers	3.42	0.67	High
2. Teacher's scientific research achievement awards	3.78	0.83	High
3. Number of papers and monographs	3.68	0.65	High
4. The influence of teachers' papers	3.47	0.75	Moderate
Total Average	3.59	0.73	High

Based on the information from the table 4.17, the overall average value for the evaluation of the learning experience is 3.59, with a standard deviation of 0.73, indicating that the curriculum instructors have a high ($\overline{X}$ =3.42 to 3.78) overall evaluation of the objectives. Specifically, the evaluation for "Teacher's scientific research achievement awards" received the highest rating ($\overline{X}$ =3.78), with a standard deviation of 0.83. The level of evaluation for this particular objective is considered high.

Table 4.18 Mean and standard deviation of Learning Experience comment on curriculum for students.

Learning Experience	Mean	S.D.	Level
1. Do you think the teacher is proficient in teaching content, clear and logical?	4.31	0.72	High
2. Do you think the teacher in the classroom teaching can highlight the key points, solve the difficulties, teaching skilled, clear and thorough	4.23	0.76	High
3. How well do you think the teachers do in updating the teaching content, introducing new developments in the subject, and linking theory to practice?	4.25	0.77	High
4. How do you think the ratio of theoretical teaching to practical teaching time is?	4.12	0.93	High
5. Do you think the teacher can do a good job in class design and writing, clear organization, accurate and beautiful?	4.22	0.74	High
6. Do you think the teacher does a good job in using multimedia teaching?	4.32	0.67	High
7. Do you think the teachers teach students according to their abilities and pay attention to the guidance of learning methods?	4.24	0.7	High

Table 4.18 Mean and standard deviation of Learning Experience comment on curriculum for students. (Cont.)

Learning Experience	Mean	S.D.	Level
8. How do you think the learning atmosphere in the classroom	4.06	0.91	High
9. How do you think the teachers do in terms of teaching innovation?	4.18	0.81	High
10. How do you think the teacher's classroom teaching effect is?	4.23	0.76	High
Total Average	4.22	0.78	High

Based on the information from the table 4.18, the overall average value for the evaluation of the learning experience is 4.22, with a standard deviation of 0.78, indicating that the curriculum instructors have a high ($\overline{X}$ =4.06 to 4.32) overall evaluation of the objectives. Specifically, the evaluation for "Do you think the teacher does a good job in using multimedia teaching?" received the highest rating ($\overline{X}$ =4.32), with a standard deviation of 0.67. The level of evaluation for this particular objective is considered high.

Table 4.19 Mean and standard deviation of Learning Experience comment on curriculum for graduate students.

Learning Experience	Mean	S.D.	Level
1. Specialization	4.05	0.77	High
2. Improvement of the curriculum	4.04	0.78	High
3. Improving the quality of the teaching staff	4.04	0.78	High
4. Improvement of teaching management	4.06	0.75	High
5. Strengthening of school-enterprise cooperation	3.94	0.89	High
Total Average	4.03	0.77	High

Based on the information from the table 4.19, the overall average value for the evaluation of the learning experience is 4.03, with a standard deviation of 0.77, indicating

that the curriculum instructors have a high ($\overline{X}$ =3.94 to 4.06) overall evaluation of the objectives. Specifically, the evaluation for "Improvement of teaching management" received the highest rating ($\overline{X}$ =4.06), with a standard deviation of 0.75. The level of evaluation for this particular objective is considered high.

Table 4.20 Mean and standard deviation of Learning Experience comment on curriculum for graduate users.

Learning Experience	Mean	S.D.	Level
1. Do you think the training objectives of the major are in line with the development trend of globalization and engineering technology?	4.20	0.74	High
2. Do you think the training objectives of the major are in line with the development and changes of the country and society (region) in terms of the needs of personnel training?	3.60	0.48	High
3. You think the training objectives of this major meet the needs of industrial development and changes on the training of talents	4.20	0.74	High
4. Do you think the training objectives of the major meet the needs of the industry and enterprises (employers) for the training of talents?	3.80	0.40	High
5. Do you think the training objectives of this major are in line with the development and positioning objectives of the university?	4.22	0.74	High
6. You believe that the training objectives of this programme are in line with the resources available and the development needs of the programme	4.20	0.40	High
7. You think the training objectives of the major are reasonable	3.98	0.74	High
Total Average	4.00	0.61	High

Based on the information from the table 4.20, the overall average value for the evaluation of the learning experience indicating that the curriculum instructors have a high ($\overline{X}$ =3.60 to 4.30) overall evaluation of the objectives. Specifically, the evaluation for "Do you think the training objectives of this major are in line with the development and positioning objectives of the university?" received the highest rating ($\overline{X}$ =4.22), with a standard deviation of 0.74. The level of evaluation for this particular objective is considered high.

4.5 The Results of Comment on Curriculum Outcome

Table 4.21 Mean and standard deviation of Outcome comment on curriculum for curriculum instructors

Outcome	Mean	S.D.	Level
1. Teachers are clear about the management and assessment programme of the engineering and costing profession	4.00	0	High
2. Assessment standards for engineering costing majors are formulated with reference to regional industry talent demand standards	3.80	0.43	High
3. A professional assessment system involving multiple parties, including the school, industry and enterprises, has been constructed	4.05	0.50	High
4. The school provides timely feedback to the professional teachers on the results of the professional assessment	3.50	0.50	High
Total Average	3.84	0.36	High

Based on the information from the table 4.21, the overall average value for the evaluation of the outcomes is 3.84, with a standard deviation of 0.36, indicating that the curriculum instructors have a high ($\overline{X}$ =3.5 to 4.25) overall evaluation of the outcomes.

Specifically, the evaluation for "A professional assessment system involving multiple parties, including the school, industry, and enterprises, has been constructed" received the highest rating ($\overline{X}$ =4.05), with a standard deviation of 0.74. The level of evaluation for this particular outcome is considered high.

Table 4.22 Mean and standard deviation of Outcome comment on curriculum for **i**nstructor.

Outcome	Mean	S.D.	Level
1. Students' moral character	4.37	0.48	High
2. Students' Foreign Language Proficiency	3.84	0.74	High
3. Completion of students' graduation thesis (design)	4.00	0.46	High
4. Proportion of students enrolled in postgraduate programmes	3.79	0.83	High
5. Quality of students' major courses completion	4.26	0.44	High
6. Number of students' published papers and works	3.63	0.87	High
7. Students' participation in entrepreneurial practice and innovative activities	4.05	0.69	High
8. Number of students participating in competitions and awards	4.11	0.72	High
9. Quality of enrolled students	4.16	0.67	High
10. Number of students with above average scores	3.89	0.64	High
11. One-time employment rate of students	4.11	0.72	High
12. Overall employment rate of students	3.89	0.79	High
13. Satisfaction of employers with students	3.89	0.45	High
14. Evaluation of students by other schools	3.84	0.93	High
15. Students' social awareness and influence	3.47	0.60	Moderate
16. Students' academic status and level	3.52	0.88	High
17. Students' contribution to society	3.79	0.52	High
Total Average	3.92	0.67	High

Based on the information from the table 4.22, the overall average value for the evaluation of the outcomes is 3.92, with a standard deviation of 0.67, indicating that the curriculum instructors have a high ($\overline{X}$ =3.47 to 4.37) overall evaluation of the outcomes. Specifically, the evaluation for "Students' moral character" received the highest rating ($\overline{X}$ =4.37),with a standard deviation of 0.48. The level of evaluation for this particular outcome is considered high.

Table 4.23 Mean and standard deviation of Outcome comment on curriculum for students.

Outcome	Mean	S.D.	Level
1. I am clear about the goals to be achieved in teaching the course	4.10	0.85	High
2. Teaching can accomplish the teacher's expected goals and tasks	4.21	0.76	High
3. The teaching content is consistent with my major and combined with the reality	4.23	0.74	High
4. The teaching content is relatively new and I am interested in the teaching content	4.13	0.85	High
5. The level of difficulty of the teaching is suitable for me	4.09	0.83	High
6. The teacher's explanation is vivid and can mobilize my learning initiative	4.15	0.81	High
7. The teacher let us participate and exercise ourselves in the participation	4.17	0.83	High
8. I am satisfied with the organization of the teacher's teaching, and the students' enthusiasm and motivation to learn are very high	4.16	0.83	High
9. I am satisfied that the course has enabled me to master the knowledge required for my major	4.14	0.84	High

Table 4.23 Mean and standard deviation of Outcome comment on curriculum for students. (Cont.)

Outcome	Mean	S.D.	Level
10. I can feel that I have improved through the course	4.18	0.85	High
11. Have an urgent desire to further study the content related to this course	4.14	0.84	High
Total Average	4.15	0.82	High

Based on the information from the table 4.23, the overall average value for the evaluation of the outcomes is 4.15, with a standard deviation of 0.82, indicating that the curriculum instructors have a high ($\overline{X}$ =4.09 to 4.23) overall evaluation of the outcomes. Specifically, the evaluation for "The teaching content is consistent with my major and combined with the reality" received the highest rating ($\overline{X}$ =4.23), with a standard deviation of 0.74. The level of evaluation for this particular outcome is considered high.

Table 4.24 Mean and standard deviation of Outcome comment on curriculum for **g**raduates.

Outcome	Mean	S.D.	Level
1. Lack of distinctive professional features, high attention but lack of practical action	4.17	0.94	High
2. Unclear positioning	3.64	0.89	High
3. Lack of work experience	4.09	0.92	High
4. Insufficient employment guidance from the school	3.68	0.93	High
5. Not learning professional knowledge well	3.73	0.98	High
6. No good prospects for development	3.79	0.99	High
7. The salary is low and not up to your expectation	3.66	0.91	High
8. Your satisfaction with the employment work of the college	3.89	0.82	High
Total Average	3.83	0.92	High

Based on the information from the table 4.24, the overall average value for the evaluation of the outcomes is 3.83, with a standard deviation of 0.92, indicating that the curriculum instructors have a high ($\overline{X}$ =4.17 to 4.25) overall evaluation of the outcomes. Specifically, the evaluation for "Lack of distinctive professional features, high attention but lack of practical action" received the highest rating ($\overline{X}$ =4.17), with a standard deviation of 0.94. The level of evaluation for this particular outcome is considered high.

Table 4.25 Mean and standard deviation of Outcome comment on curriculum for graduate users.

Outcome	Mean	S.D.	Level
1. The cultivation requirements should be closer to the needs of enterprises	4.20	0.40	High
2. Strengthen students' practical training work	3.60	0.48	High
3. Strengthen the cultivation of students' professional basic knowledge and ability	4.00	0.89	High
4. Curriculum and teaching content should keep up with the times	3.80	0.40	High
5. Strengthen the cultivation of students' comprehensive quality	4.00	0	High
6. Strengthen the cultivation of students' loyalty to enterprises	4.20	0.74	High
7. Strengthen the cultivation of students' outlook on career selection	3.40	0.48	Moderate
8. Provide more opportunities for school-enterprise cooperation	4.00	0.89	High
9. Strengthen the development of students' English learning ability	4.60	0.48	High
10. Strengthen the cultivation of students' lifelong learning ability	4.00	0.63	High
Total Average	3.98	0.54	High

Based on the information from the table 4.25, the overall average value for the evaluation of the outcomes is 3.98, with a standard deviation of 0.54, indicating that the curriculum instructors have a high ($\overline{X}$ =3.40 to 4.60) overall evaluation of the outcomes. Specifically, the evaluation for "Strengthen the development of students' English learning ability" received the highest rating ($\overline{X}$ =4.6), with a standard deviation of 0.48. The level of evaluation for this particular outcome is considered high.

4.6 The Results of Comment on Curriculum Total of TYLER Model Table

Table 4.26 Mean and level of curriculum evaluation using TYLER model

TYLER model	course instructor		instructor		students		Undergraduate		Graduate users		Total	
	Mean	Level	Mean	Level	Mean	Level	Mean	Level	Mean	Level	Mean	Level
Goals	3.92	High	3.61	High	4.07	High	3.86	High	4.17	High	3.93	High
Objective	4.25	High	3.79	High	4.3	High	3.87	High	4.09	High	4.06	High
Learning Experience	4.08	High	3.59	High	4.22	High	4.03	High	4.00	High	4.00	High
Outcome	3.84	High	3.92	High	4.15	High	3.83	High	3.98	High	3.95	High
Total	4.02	High	3.81	High	4.2	High	3.93	High	4.05	High	4.01	High

The curriculum of the bachelor's degree program in installation engineering pricing at Sichuan University of Science and Engineering was evaluated using the Tyler model criteria. The overall level was high ($\overline{X}$ =4.01), with high levels observed in goals, objective, learning experience, and outcome ($\overline{X}$ =3.90, 4.15, 4.00, and 3.95, respectively). The maximum mean value was observed in the objective and total categories among students ($\overline{X}$ =4.30 and 4.20, respectively).

CHAPTER 5
CONCLUSION DISCUSSION AND RECOMMENDATION

This research study evaluated the curriculum of the bachelor's degree program in installation engineering pricing at Sichuan University of Science and Engineering. The evaluation was conducted using the Goal-based approach proposed by Tyler. The Tyler model comprised four components: Goals, Objectives, Learning Experience, and Outcome. It was employed to assess and analyze the installation engineering pricing courses. Questionnaires were utilized to systematically compare the strengths and weaknesses of these courses at the institute. The analysis involved descriptive statistical analysis, comparative mean analysis, and standard deviation analysis. The research sample was scientific and objective, consisting of five groups: four instructors, 19 curriculum instructors, 111 students, 161 graduate students, and 5 graduate users.

5.1 Conclusion of Research

5.2 Discussion

5.3 Research recommendations

5.1 Conclusion of Research

This study constructed an index system based on the Tyler model of course evaluation, dividing the evaluation of the installation engineering pricing course into four parts: Goals, Objectives, Learning Experience, and Outcome. The overall evaluation was at a high level ($\overline{X}$ =4.01), with high ratings for Goals, Objectives, Learning Experience, and Outcome ($\overline{X}$ =3.90, 4.15, 4.00, and 3.95, respectively).

The Goals evaluation was at a high level overall ($\overline{X}$ =3.90), with the group of graduate users having the highest mean value ($\overline{X}$ = 4.17). The Objectives evaluation was at a high level overall ($\overline{X}$ =4.15), with the group of students having the highest mean value ($\overline{X}$ =4.30). The Learning Experience evaluation was at a high level overall ($\overline{X}$ =4.00), with the group of students having the highest mean value ($\overline{X}$ =4.22). The Outcome evaluation was at a high level overall ($\overline{X}$ =3.95), with the group of students having the highest mean value ($\overline{X}$ =4.15).

5.2 Discussion

The installation engineering pricing course was evaluated using the Tyler model, and the following conclusions were drawn based on the survey sample:

5.2.1 In general, students and enterprises are satisfied with the cultivation objectives of the installation engineering pricing course and believe that the course structure is logically clear, theoretical foundation courses are comprehensive, professional courses are timely, skills training is targeted, and practical training courses are reasonable. However, students' time management ability and reserve management ability need improvement based on their self-evaluation and enterprise evaluation.

5.2.2 Overall, teachers, students, and enterprises are satisfied with the teaching objectives of the installation engineering pricing course, and feedback is provided on the achievement in each aspect.

5.2.3 The learning experience of the installation engineering pricing course has formed a good cycle to promote each other, but improvements are needed in some areas such as course resource construction, course teaching organization, and student motivation. Students rated teachers' teaching etiquette, attitude, and professional knowledge as satisfactory but rated teachers' teaching organization slightly lower. Teaching content, explanation of difficult points, class design, multimedia application, teaching according to the material, and teaching effect were rated as satisfactory, while theory and practice, classroom atmosphere, and teaching innovation were rated as average. The achievement of teaching objectives is evaluated as satisfactory.

5.2.4 In general, teachers and enterprises are satisfied with the cultivation effect of the installation engineering pricing course, which stimulates students' interest in learning, highlights the cultivation of innovation spirit and practical ability, enables independent inquiry and cooperative learning, and properly plays the teachers' leading position while fully reflecting the students' main position.

5.3 Research recommendations

5.4.1 Suggestions for applying the research results:

1) Students should strive to improve their professional knowledge, as the level of professional knowledge directly affects their understanding of the course content and enhances their interest in the subject.

2) The university should increase small class teaching for the installation engineering pricing course to meet the needs of teachers and students for teaching organizational forms and to promote the improvement of the teaching quality of the installation engineering pricing course.

3) The university should develop its own evaluation standards based on its own reality and improve the curriculum system by testing the teaching effect of the installation engineering pricing course.

5.4.2 Suggestions for further research:

1) The instrument development of the study only utilized questionnaires, but in the future, multiple research tools can be used, such as interviews and group discussions.

2) This study evaluated the Tyler mode installation engineering pricing curriculum, but in the future, the Tyler mode can also be used to assess another curriculum.

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APPENDICES

APPENDIX A

- List of Experts Reviewing Research Instruments

- Letter to Experts and Specialists for Research Tools Validation

List of Experts Reviewing Research Instruments

1. Asso. Prof. Dr Tiwat Maneechote
   Faculty of School of Creative Educational Management,
   Panyapiwat Institute of Management, Thailand.
2. Prof. Dr. Rewadi krahomvong
   Faculty of Education, Thaksin University, Thailand.
3. Dr. Sujin Nukaew
   Faculty of Education Nakhon Si Thammarat Rajabhat University,
   Thailand.

No. 0649.02/0210

Faculty of Technical Education
Rajamangala University of Technology
Thanyaburi
39 Moo 1, Rangsit-Nakhon Nayok Road,
Klong Hok, Khlong Luang, Pathum Thani
Postal Code 12110, Thailand

23 February 2023

Subject Invitation letter inviting experts to validate research instruments

Dear Asso. Prof. Dr Tiwat Maneechote

Due to Mrs.Li Jiang , a student who is taking up Master of Education Program in Curriculum Development and Instructional Innovation, Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), is currently processing a thesis for this semester entitled "Curriculum evaluation of bachelor degree of installation engineering pricing at sichuan university of science and engineering using criterion based on Tyler model."with Asst. Prof. Dr. Pranom Punsawai, a research advisor.

In relation to this, the researcher has a strong desire to be assisted with regard to the validation of the instruments required studies. The curriculum administration committee consider that you are the most qualified professional with knowledge and capabilities to provide such, the researcher has chosen and would like to ask approval from your good office to be the evaluator. I would like to invite you to be an expert to the validation research instruments for Mrs.Li Jiang for the benefit of further education. I am highly anticipating your kind approval regarding this matter.

Thank you for your kind consideration.

Sincerely Yours,

(Asst. Prof. Arnon Niyomphol)
Dean, Faculty of Technical Education

Department of Education
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Postal Code 12110, Thailand

23 February 2023

Subject Invitation letter inviting experts to validate research instruments

Dear Asso. Prof. Dr Rewadi krahomvong

Due to Mrs.Li Jiang , a student who is taking up Master of Education Program in Curriculum Development and Instructional Innovation, Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), is currently processing a thesis for this semester entitled "Curriculum evaluation of bachelor degree of installation engineering pricing at sichuan university of science and engineering using criterion based on Tyler model."with Asst. Prof. Dr. Pranom Punsawai, a research advisor.

In relation to this, the researcher has a strong desire to be assisted with regard to the validation of the instruments required studies. The curriculum administration committee consider that you are the most qualified professional with knowledge and capabilities to provide such, the researcher has chosen and would like to ask approval from your good office to be the evaluator. I would like to invite you to be an expert to the validation research instruments for Mrs.Li Jiang for the benefit of further education. I am highly anticipating your kind approval regarding this matter.

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Sincerely Yours,

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23 February 2023

Subject Invitation letter inviting experts to validate research instruments

Dear Dr. Sujin Nukaew

Due to Mrs.Li Jiang , a student who is taking up Master of Education Program in Curriculum Development and Instructional Innovation, Faculty of Technical Education, Rajamangala University of Technology Thanyaburi (RMUTT), is currently processing a thesis for this semester entitled "Curriculum evaluation of bachelor degree of installation engineering pricing at sichuan university of science and engineering using criterion based on Tyler model."with Asst. Prof. Dr. Pranom Punsawai, a research advisor.

In relation to this, the researcher has a strong desire to be assisted with regard to the validation of the instruments required studies. The curriculum administration committee consider that you are the most qualified professional with knowledge and capabilities to provide such, the researcher has chosen and would like to ask approval from your good office to be the evaluator. I would like to invite you to be an expert to the validation research instruments for Mrs.Li Jiang for the benefit of further education. I am highly anticipating your kind approval regarding this matter.

Thank you for your kind consideration.

Sincerely Yours,

(Asst. Prof. Arnon Niyomphol)
Dean, Faculty of Technical Education

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APPENDIX B

List of Questionnaire

Questionnaire of Curriculum Instructors

Curriculum evaluation of Bachelor degree of installation engineering pricing,

Sichuan University of Science and Engineering

Using criterion based on Tyler model

Part 1 General information of respondents

Statement: Please add the sign according to the status.

1. Gender

☐ Male ☐ Female

2. Your age.

☐ 24-30 years old ☐ 31-40 years old ☐ 40+ years old

3. Profession you are teaching

☐ installation engineering pricing ☐ Civil engineering

☐ Water Supply and Sewerage Engineering

Part 2 Comments were made on the installation engineering pricing curriculum at Sichuan University of Science and Engineering.

Please read the statements as required, taking into account the factual opinions from the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Afterward, mark a ✓ in the student comment level box using the 5 assessment criteria as follows:

Level 5 means the most appropriate level.

Level 4 means appropriate to a large extent.

Level 3 means moderately appropriate.

Level 2 means appropriate to a lesser extent.

Level 1 means the least appropriate.

No.	Assessment list	Suitability level				
		5	4	3	2	1
	Goals					
1	The school will conduct in-depth industry and enterprise research before setting professional training objectives					
2	The specialties offered by the school have good adaptability with the economic development of the region where they are located					
3	The school will adjust the professional settings and talent training programmes in a timely manner according to the feedback from enterprises and the needs of local economic development					
	Objectives					
1	Teachers are familiar with the training programme of the school's engineering and costing majors					
2	The cultivation program of engineering and costing majors can achieve the cultivation objectives of the majors					
3	The cultivation programme of engineering and costing majors has been well implemented					
	Learning Experience					
1	The school's existing hardware (computers, photographic equipment, etc.) resources can meet the teaching needs					

No.	Assessment list	Suitability level				
		5	4	3	2	1
2	Can the existing software resources (practical training software, teaching resources library, etc.) meet the teaching needs?					
	Outcome					
1	Teachers are clear about the management and assessment programme of the engineering and costing profession					
2	Assessment standards for installation engineering pricing majors are formulated with reference to regional industry talent demand standards					
3	A professional assessment system involving multiple parties, including the school, industry and enterprises, has been constructed					
4	The school provides timely feedback to the professional teachers on the results of the professional assessment					

<u>Part 3</u> Problems and Suggestions

Explanation: Please identify any additional problems and provide suggestions regarding the provision of the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Your insights will be valuable in developing and enhancing the installation engineering pricing curriculum in a more effective direction.

The problem condition.

1) encountered.....
2) Advantage.....
3) Suggestion.....

Questionnaire of Instructors

Curriculum evaluation of Bachelor degree of installation engineering pricing, Sichuan University of Science and Engineering

Using criterion based on Tyler model

Part 1 General information of respondents

Statement: Please add the sign according to the status.

1. Gender

☐ Male ☐ Female

2. Your age.

☐ 24-30 years old ☐ 31-40 years old ☐ 40+ years old

3. Profession you are teaching

☐ installation engineering pricing ☐ Civil engineering

☐ Water Supply and Sewerage Engineering

Part 2 Comments were made on the installation engineering pricing curriculum at Sichuan University of Science and Engineering.

Please read the statements as required, taking into account the factual opinions from the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Afterward, mark a ✓ in the student comment level box using the 5 assessment criteria as follows:

Level 5 means the most appropriate level.

Level 4 means appropriate to a large extent.

Level 3 means moderately appropriate.

Level 2 means appropriate to a lesser extent.

Level 1 means the least appropriate.

No.	Assessment list	Suitability level				
		5	4	3	2	1
	Goals					
1	The number of degree committees and special professors and doctoral supervisors account for a reasonable proportion of teachers					
2	The proportion of teachers with high titles, high academic qualifications and young teachers to teachers is reasonable					
3	A reasonable proportion of teachers are provincial key and provincial outstanding teachers					
4	The proportion of bilingual courses offered by teachers is reasonable					
5	The proportion of full professors participating in undergraduate teaching is reasonable					
	Objectives					
1	A reasonable proportion of laboratory equipment is used in professional foundation and professional courses					
2	Reasonable rate of experimental courses offered					
3	The proportion of experimental high-tech equipment					
4	Proportion of design and comprehensive experiments offered					
5	Laboratory opening rate					

No.	Assessment list	Suitability level				
		5	4	3	2	1
6	The number of off-campus internship bases is high					
7	Adequate internship sites on campus					
	Learning Experience					
1	Number of research projects and funding for teachers					
2	Teacher's scientific research achievement awards					
3	Number of papers and monographs					
4	The influence of teachers' papers					
	Outcome					
1	Students' moral character					
2	Students' Foreign Language Proficiency					
3	Completion of students' graduation thesis (design)					
4	Proportion of students enrolled in postgraduate programmes					
5	Quality of students' major courses completion					
6	Number of students' published papers and works					
7	Students' participation in entrepreneurial practice and innovative activities					
8	Number of students participating in competitions and awards					
9	Quality of enrolled students					
10	Number of students with above average scores					

No.	Assessment list	Suitability level				
		5	4	3	2	1
11	One-time employment rate of students					
12	Overall employment rate of students					
13	Satisfaction of employers with students					
14	Evaluation of students by other schools					
15	Students' social awareness and influence					
16	Students' academic status and level					
17	Students' contribution to society					

Part 3 Problems and Suggestions

Explanation: Please identify any additional problems and provide suggestions regarding the provision of the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Your insights will be valuable in developing and enhancing the installation engineering pricing curriculum in a more effective direction.

The problem condition

1) encountered.....

2) Advantage.....

3) Suggestion.....

Questionnaire of Students

Curriculum evaluation of Bachelor degree of installation engineering pricing,

Sichuan University of Science and Engineering

Using criterion based on Tyler model

Part 1 General information of respondents

Statement: Please add the sign according to the status.

1. Gender

☐ Male ☐ Female

2. The grade level being studied

☐ 2nd Grade ☐ 3rd Grade ☐ 4th Grade

3. Major of Studied

☐ installation engineering pricing ☐ Civil engineering

☐ Water Supply and Sewerage Engineering

Part 2 Comments were made on the installation engineering pricing curriculum at Sichuan University of Science and Engineering.

Please read the statements as required, taking into account the factual opinions from the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Afterward, mark a ✓ in the student comment level box using the 5 assessment criteria as follows:

Level 5 means the most appropriate level.

Level 4 means appropriate to a large extent.

Level 3 means moderately appropriate.

Level 2 means appropriate to a lesser extent.

Level 1 means the least appropriate.

No.	Assessment list	Suitability level				
		5	4	3	2	1
	Goals					
1	Level of course construction					
2	Planning and effectiveness of textbook construction					
3	Degree of updating of teaching materials					
4	Number of original textbooks selected					
	Objective					
1	The implementation of the teaching etiquette rules by the teacher in charge of the class.					
2	Whether the teacher is full of energy, dignified and loud in teaching.					
3	How well do teachers do in rigorous teaching and teaching by example?					
4	How well do teachers do in teaching and educating others?					
5	Professional knowledge of the teacher					
6	Teaching organization ability of the teacher					
	Learning Experience					
1	Do you think the teacher is proficient in teaching content, clear and logical?					
2	Do you think the teacher in the classroom teaching can highlight the key points, solve the difficulties, teaching skilled, clear and thorough					
3	How well do you think the teachers do in updating the teaching content, introducing new					

No.	Assessment list	Suitability level				
		5	4	3	2	1
	developments in the subject, and linking theory to practice?					
4	How do you think the ratio of theoretical teaching to practical teaching time is?					
5	Do you think the teacher can do a good job in class design and writing, clear organization, accurate and beautiful?					
6	Do you think the teacher does a good job in using multimedia teaching?					
7	Do you think the teachers teach students according to their abilities and pay attention to the guidance of learning methods?					
8	How do you think the learning atmosphere in the classroom					
9	How do you think the teachers do in terms of teaching innovation?					
10	How do you think the teacher's classroom teaching effect is?					
	Outcome					
1	I am clear about the goals to be achieved in teaching the course					
2	Teaching can accomplish the teacher's expected goals and tasks					
3	The teaching content is consistent with my major and combined with the reality					

No.	Assessment list	Suitability level				
		5	4	3	2	1
4	The teaching content is relatively new and I am interested in the teaching content					
5	The level of difficulty of the teaching is suitable for me					
6	The teacher's explanation is vivid and can mobilize my learning initiative					
7	The teacher let us participate and exercise ourselves in the participation					
8	I am satisfied with the organization of the teacher's teaching, and the students' enthusiasm and motivation to learn are very high					
9	I am satisfied that the course has enabled me to master the knowledge required for my major					
10	I can feel that I have improved through the course					
11	Have an urgent desire to further study the content related to this course					

Part 3 Problems and Suggestions

Explanation: Please identify any additional problems and provide suggestions regarding the provision of the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Your insights will be valuable in developing and enhancing the installation engineering pricing curriculum in a more effective direction.

The problem condition

1) encountered.....

2) Advantage.....

3) Suggestion.....

Questionnaire of Graduate Students

Curriculum evaluation of Bachelor degree of installation engineering pricing,

Sichuan University of Science and Engineering

Using criterion based on Tyler model

Part 1 General information of respondents

Statement: Please add the sign according to the status.

1. Gender

☐ Male ☐ Female

2. Your age.

☐ Under 25 years old ☐ 26-35 years old

☐ 36-45 years old ☐ Over 45 years old

3. Your graduation date.

☐ 2022 ☐ 2021 ☐ 2020 ☐ 2019 ☐ 2018

4. Nature of your organization.

☐ School ☐ State enterprise or institution

☐ Private enterprise

5. Did your current job correspond to your major when you were studying?

☐ They were related to some extent, and I could apply my professional knowledge

☐ They were not related at all

Part 2 Comments were made on the installation engineering pricing curriculum at Sichuan University of Science and Engineering.

Please read the statements as required, taking into account the factual opinions from the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Afterward, mark a ✓ in the student comment level box using the 5 assessment criteria as follows:

Level 5 means the most appropriate level.

Level 4 means appropriate to a large extent.

Level 3 means moderately appropriate.

Level 2 means appropriate to a lesser extent.

Level 1 means the least appropriate.

No.	Assessment list	Suitability level				
		5	4	3	2	1
	Goals					
1	Reasonable design of the number of courses					
2	The curriculum is closely linked to each other and has a certain logic					
3	The curriculum is adapted to the development needs of enterprises					
4	The curriculum provides students with solid theoretical knowledge and technical skills.					
5	Overall, the school's talent training programme is reasonably designed					
	Objectives					
1	Basic evaluation of the training of professional talents					
2	Satisfaction with the public courses of your major					
3	Satisfaction with the compulsory courses of your major					
4	Satisfaction with the elective courses of your major					

No.	Assessment list	Suitability level				
		5	4	3	2	1
5	Satisfaction with the academic activities of your programme					
6	Satisfaction with the innovative competitions and activities of your programme					
7	Satisfaction with the innovative activities in your programme					
8	Satisfaction with thesis writing and defence in your major					
	Learning Experience					
1	Specialization					
2	Improvement of the curriculum					
3	Improving the quality of the teaching staff					
4	Improvement of teaching management					
5	Strengthening of school-enterprise cooperation					
	Outcome					
1	Lack of distinctive professional features, high attention but lack of practical action					
2	Unclear positioning					
3	Lack of work experience					
4	Insufficient employment guidance from the school					
5	Not learning professional knowledge well					
6	No good prospects for development					

No.	Assessment list	Suitability level				
		5	4	3	2	1
7	The salary is low and not up to your expectation					
8	Your satisfaction with the employment work of the college					

Part 3 Problems and Suggestions

Explanation: Please identify any additional problems and provide suggestions regarding the provision of the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Your insights will be valuable in developing and enhancing the installation engineering pricing curriculum in a more effective direction.

The problem condition

1) encountered.....

2) Advantage.....

3) Suggestion.....

Questionnaire of Graduate Users

Curriculum evaluation of Bachelor degree of installation engineering pricing,

Sichuan University of Science and Engineering

Using criterion based on Tyler model

Part 1 General information of respondents

Statement: Please add the sign according to the status.

1、The nature of your unit

☐ State-owned enterprise ☐ Private enterprise

☐ Foreign enterprise

2、The industry of your unit

☐ Real estate ☐ Construction ☐ Geo-mining

3、The installation engineering pricing professionals hired by your unit in the past 5 years

☐ 3-5 people ☐ 6-10 people ☐ more than 10 people

4、The demand for installation engineering pricing professionals in your unit in the next 5 years or so

☐ 3-5 persons ☐ 6-10 persons ☐ 10 persons or more

Part 2 Comments were made on the installation engineering pricing curriculum at Sichuan University of Science and Engineering.

Please read the statements as required, taking into account the factual opinions from the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Afterward, mark a ✓ in the student comment level box using the 5 assessment criteria as follows:

Level 5 means the most appropriate level.

Level 4 means appropriate to a large extent.

Level 3 means moderately appropriate.

Level 2 means appropriate to a lesser extent.

Level 1 means the least appropriate.

No.	Assessment list	Suitability level				
		5	4	3	2	1
	Goals					
1	Graduates' learning ability					
2	Graduates' innovation ability					
3	Graduates' interpersonal communication ability					
4	Graduates' ability to work in a team					
5	Graduates' organizational and coordination skills					
6	Time management skills of graduates					
7	Information perception skills of graduates					
8	Analytical skills of graduates					
9	Graduates' problem-solving skills					
10	Graduate's ability to manage reserves					
11	Execution skills of graduates					
12	Graduates' ability to bear pressure					
	Objectives					
1	Graduates are qualified in terms of ability and knowledge structure					
2	Graduates have a solid foundation in professional theory					

No.	Assessment list	Suitability level				
		5	4	3	2	1
3	Graduates have a certain understanding of the frontier knowledge of the profession					
4	Graduates have mastered professional application skills					
5	Graduates have a certain degree of social practice experience					
6	Graduates have mastered humanities and social knowledge					
7	Graduates have computer application skills					
8	Graduates have a good command of foreign languages					
9	Graduates have obtained practice qualification certificate					
	Learning Experience					
1	Do you think the training objectives of the major are in line with the development trend of globalization and engineering technology?					
2	Do you think the training objectives of the major are in line with the development and changes of the country and society (region) in terms of the needs of personnel training?					
3	You think the training objectives of this major meet the needs of industrial development and changes on the training of talents					

No.	Assessment list	Suitability level				
		5	4	3	2	1
4	Do you think the training objectives of the major meet the needs of the industry and enterprises (employers) for the training of talents?					
5	Do you think the training objectives of this major are in line with the development and positioning objectives of the university?					
6	You believe that the training objectives of this programme are in line with the resources available and the development needs of the programme					
7	You think the training objectives of the major are reasonable					
	Outcome					
1	The cultivation requirements should be closer to the needs of enterprises					
2	Strengthen students' practical training work					
3	Strengthen the cultivation of students' professional basic knowledge and ability					
4	Curriculum and teaching content should keep up with the times					
5	Strengthen the cultivation of students' comprehensive quality					
6	Strengthen the cultivation of students' loyalty to enterprises					

No.	Assessment list	Suitability level				
		5	4	3	2	1
7	Strengthen the cultivation of students' outlook on career selection					
8	Provide more opportunities for school-enterprise cooperation					
9	Strengthen the development of students' English learning ability					
10	Strengthen the cultivation of students' lifelong learning ability					

Part 3 Problems and Suggestions

Explanation: Please identify any additional problems and provide suggestions regarding the provision of the installation engineering pricing curriculum at Sichuan University of Science and Engineering. Your insights will be valuable in developing and enhancing the installation engineering pricing curriculum in a more effective direction.

The problem condition

1) encountered.....

2) Advantage.....

3) Suggestion.....

APPENDIX C

List of Validity (IOC : Item Objective Congruence)

Validity (IOC : Item Objective Congruence) for Curriculum Instructors

No.	Assessment list	IOC	Result
	General information of respondents		
1	Gender ☐ Male ☐ Female	1	yes
2	Your age ☐24-30 years old ☐ 31-40 years old ☐ 40+ years old	1	yes
3	Profession you are teaching ☐ installation engineering pricing ☐ Civil engineering ☐ Water Supply and Sewerage Engineering	1	yes
	Goals		
1	The school will conduct in-depth industry and enterprise research before setting professional training objectives	1	yes
2	The specialties offered by the school have good adaptability with the economic development of the region where they are located	1	yes
3	The school will adjust the professional settings and talent training programmes in a timely manner according to the feedback from enterprises and the needs of local economic development	1	yes

No.	Assessment list	IOC	Result
	Objectives		
1	Teachers are familiar with the training programme of the school's engineering and costing majors	1	yes
2	The cultivation program of engineering and costing majors can achieve the cultivation objectives of the majors	1	yes
3	The cultivation programme of engineering and costing majors has been well implemented	0.66	yes
	Learning Experience		
1	The school's existing hardware (computers, photographic equipment, etc.) resources can meet the teaching needs	1	yes
2	Can the existing software resources (practical training software, teaching resources library, etc.) meet the teaching needs?	1	yes
	Outcome		
1	Teachers are clear about the management and assessment programme of the engineering and costing profession	1	yes
2	Assessment standards for installation engineering pricing majors are formulated with reference to regional industry talent demand standards	1	yes
3	A professional assessment system involving multiple parties, including the school, industry and enterprises, has been constructed	1	yes
4	The school provides timely feedback to the professional teachers on the results of the professional assessment	1	yes

Validity (IOC : Item Objective Congruence) for Instructors

No.	Assessment list	IOC	Result
	General information of respondents		
1	Gender ☐ Male ☐ Female	1	yes
2	Your age ☐24-30 years old ☐ 31-40 years old ☐ 40+ years old	1	yes
3	Profession you are teaching ☐ installation engineering pricing ☐ Civil engineering ☐ Water Supply and Sewerage Engineering	1	yes
	Goals		
1	The number of degree committees and special professors and doctoral supervisors account for a reasonable proportion of teachers	1	yes
2	The proportion of teachers with high titles, high academic qualifications and young teachers to teachers is reasonable	1	yes
3	A reasonable proportion of teachers are provincial key and provincial outstanding teachers	1	yes
4	The proportion of bilingual courses offered by teachers is reasonable	1	yes

No.	Assessment list	IOC	Result
5	The proportion of full professors participating in undergraduate teaching is reasonable	1	yes
	Objectives		
1	A reasonable proportion of laboratory equipment is used in professional foundation and professional courses	1	yes
2	Reasonable rate of experimental courses offered	1	yes
3	The proportion of experimental high-tech equipment	1	yes
4	Proportion of design and comprehensive experiments offered	1	yes
5	Laboratory opening rate	1	yes
6	The number of off-campus internship bases is high	1	yes
7	Adequate internship sites on campus	1	yes
	Learning Experience		
1	Number of research projects and funding for teachers	1	yes
2	Teacher's scientific research achievement awards	1	yes
3	Number of papers and monographs	1	yes
4	The influence of teachers' papers	1	yes
	Outcome		
1	Students' moral character	1	yes
2	Students' Foreign Language Proficiency	1	yes
3	Completion of students' graduation thesis (design)	1	yes
4	Proportion of students enrolled in postgraduate programmes	1	yes
5	Quality of students' major courses completion	1	yes

No.	Assessment list	IOC	Result
6	Number of students' published papers and works	0.66	yes
7	Students' participation in entrepreneurial practice and innovative activities	1	yes
8	Number of students participating in competitions and awards	1	yes
9	Quality of enrolled students	1	yes
10	Number of students with above average scores	1	yes
11	One-time employment rate of students	1	yes
12	Overall employment rate of students	1	yes
13	Satisfaction of employers with students	1	yes
14	Evaluation of students by other schools	1	yes
15	Students' social awareness and influence	1	yes
16	Students' academic status and level	1	yes
17	Students' contribution to society	1	yes

Validity (IOC : Item Objective Congruence) for Students

No.	Assessment list	IOC	Result
	General information of respondents	1	yes
1	1. Gender ☐ Male ☐ Female	1	yes
2	The grade level being studied ☐ 2nd Grade ☐ 3rd Grade ☐ 4th Grade	1	yes
3	Major of Studied ☐ installation engineering pricing ☐ Civil engineering ☐ Water Supply and Sewerage Engineering	1	yes
	Goals		
1	Level of course construction	1	yes
2	Planning and effectiveness of textbook construction	1	yes
3	Degree of updating of teaching materials	1	yes
4	Number of original textbooks selected	1	yes
	Objective		
1	The implementation of the teaching etiquette rules by the teacher in charge of the class.	1	yes
2	Whether the teacher is full of energy, dignified and loud in teaching.	1	yes
3	How well do teachers do in rigorous teaching and teaching by example?	1	yes

No.	Assessment list	IOC	Result
4	How well do teachers do in teaching and educating others?	1	yes
5	Professional knowledge of the teacher	1	yes
6	Teaching organization ability of the teacher	1	yes
	Learning Experience		
1	Do you think the teacher is proficient in teaching content, clear and logical?	1	yes
2	Do you think the teacher in the classroom teaching can highlight the key points, solve the difficulties, teaching skilled, clear and thorough	1	yes
3	How well do you think the teachers do in updating the teaching content, introducing new developments in the subject, and linking theory to practice?	1	yes
4	How do you think the ratio of theoretical teaching to practical teaching time is?	1	yes
5	Do you think the teacher can do a good job in class design and writing, clear organization, accurate and beautiful?	1	yes
6	Do you think the teacher does a good job in using multimedia teaching?	1	yes
7	Do you think the teachers teach students according to their abilities and pay attention to the guidance of learning methods?	1	yes
8	How do you think the learning atmosphere in the classroom	1	yes
9	How do you think the teachers do in terms of teaching innovation?	1	yes
10	How do you think the teacher's classroom teaching effect is?	1	yes

No.	Assessment list	IOC	Result
	Outcome		
1	I am clear about the goals to be achieved in teaching the course	1	yes
2	Teaching can accomplish the teacher's expected goals and tasks	1	yes
3	The teaching content is consistent with my major and combined with the reality	1	yes
4	The teaching content is relatively new and I am interested in the teaching content	1	yes
5	The level of difficulty of the teaching is suitable for me	0.66	yes
6	The teacher's explanation is vivid and can mobilize my learning initiative	1	yes
7	The teacher let us participate and exercise ourselves in the participation	1	yes
8	I am satisfied with the organization of the teacher's teaching, and the students' enthusiasm and motivation to learn are very high	1	yes
9	I am satisfied that the course has enabled me to master the knowledge required for my major	1	yes
10	I can feel that I have improved through the course	1	yes
11	Have an urgent desire to further study the content related to this course	1	yes

Validity (IOC : Item Objective Congruence) for Graduate Students

No.	Assessment list	IOC	Result
	General information of respondents		
1	Gender ☐ Male ☐ Female	1	yes
2	Your age ☐ Under 25 years old ☐ 26-35 years old ☐ 36-45 years old ☐ Over 45 years old	1	yes
3	Your graduation date. ☐ 2022 ☐ 2021 ☐ 2020 ☐ 2019 ☐ 2018	1	yes
4	Nature of your organization. ☐ School ☐ State enterprise or institution ☐ Private enterprise	1	yes
5	Did your current job correspond to your major when you were studying? ☐ They were related to some extent, and I could apply my professional knowledge ☐ They were not related at all	1	yes

No.	Assessment list	IOC	Result
	Goals		
1	Reasonable design of the number of courses	1	yes
2	The curriculum is closely linked to each other and has a certain logic	1	yes
3	The curriculum is adapted to the development needs of enterprises	1	yes
4	The curriculum provides students with solid theoretical knowledge and technical skills.	1	yes
5	Overall, the school's talent training programme is reasonably designed	1	yes
	Objectives		
1	Basic evaluation of the training of professional talents	1	yes
2	Satisfaction with the public courses of your major	1	yes
3	Satisfaction with the compulsory courses of your major	1	yes
4	Satisfaction with the elective courses of your major	1	yes
5	Satisfaction with the academic activities of your programme	1	yes
6	Satisfaction with the innovative competitions and activities of your programme	1	yes
7	Satisfaction with the innovative activities in your programme	1	yes
8	Satisfaction with thesis writing and defence in your major	1	yes
	Learning Experience		
1	Specialization	1	yes

No.	Assessment list	IOC	Result
2	Improvement of the curriculum	1	yes
3	Improving the quality of the teaching staff	1	yes
4	Improvement of teaching management	1	yes
5	Strengthening of school-enterprise cooperation	1	yes
	Outcome		
1	Lack of distinctive professional features, high attention but lack of practical action	1	yes
2	Unclear positioning	1	yes
3	Lack of work experience	1	yes
4	Insufficient employment guidance from the school	1	yes
5	Not learning professional knowledge well	1	yes
6	No good prospects for development	1	yes
7	The salary is low and not up to your expectation	1	yes
8	Your satisfaction with the employment work of the college	1	yes

Validity (IOC : Item Objective Congruence) for Graduate Users

No.	Assessment list	IOC	Result
	General information of respondents		
1	The nature of your unit ☐ State-owned enterprise ☐ Private enterprise ☐ Foreign enterprise	1	yes
2	The industry of your unit ☐ Real estate ☐ Construction ☐ Geo-mining	1	yes
3	The installation engineering pricing professionals hired by your unit in the past 5 years ☐ 3-5 people ☐ 6-10 people ☐ more than 10 people	1	yes
4	The demand for installation engineering pricing professionals in your unit in the next 5 years ☐ 3-5 persons ☐ 6-10 persons ☐ 10 persons or more	1	yes
	Goals		
1	Graduates' learning ability	1	yes
2	Graduates' innovation ability	1	yes
3	Graduates' interpersonal communication ability	1	yes
4	Graduates' ability to work in a team	1	yes

No.	Assessment list	IOC	Result
5	Graduates' organizational and coordination skills	1	yes
6	Time management skills of graduates	1	yes
7	Information perception skills of graduates	1	yes
8	Analytical skills of graduates	1	yes
9	Graduates' problem-solving skills	1	yes
10	Graduate's ability to manage reserves	1	yes
11	Execution skills of graduates	1	yes
12	Graduates' ability to bear pressure	1	yes
	Objectives		
1	Graduates are qualified in terms of ability and knowledge structure	1	yes
2	Graduates have a solid foundation in professional theory	1	yes
3	Graduates have a certain understanding of the frontier knowledge of the profession	1	yes
4	Graduates have mastered professional application skills	1	yes
5	Graduates have a certain degree of social practice experience	1	yes
6	Graduates have mastered humanities and social knowledge	1	yes
7	Graduates have computer application skills	1	yes
8	Graduates have a good command of foreign languages	1	yes
9	Graduates have obtained practice qualification certificate	1	yes

No.	Assessment list	IOC	Result
	Learning Experience		
1	Do you think the training objectives of the major are in line with the development trend of globalization and engineering technology?	1	yes
2	Do you think the training objectives of the major are in line with the development and changes of the country and society (region) in terms of the needs of personnel training?	1	yes
3	You think the training objectives of this major meet the needs of industrial development and changes on the training of talents	1	yes
4	Do you think the training objectives of the major meet the needs of the industry and enterprises (employers) for the training of talents?	1	yes
5	Do you think the training objectives of this major are in line with the development and positioning objectives of the university?	1	yes
6	You believe that the training objectives of this programme are in line with the resources available and the development needs of the programme	1	yes
7	You think the training objectives of the major are reasonable	1	yes
	Outcome		
1	The cultivation requirements should be closer to the needs of enterprises	1	yes
2	Strengthen students' practical training work	1	yes

No.	Assessment list	IOC	Result
3	Strengthen the cultivation of students' professional basic knowledge and ability	1	yes
4	Curriculum and teaching content should keep up with the times	1	yes
5	Strengthen the cultivation of students' comprehensive quality	1	yes
6	Strengthen the cultivation of students' loyalty to enterprises	1	yes
7	Strengthen the cultivation of students' outlook on career selection	1	yes
8	Provide more opportunities for school-enterprise cooperation	1	yes
9	Strengthen the development of students' English learning ability	1	yes
10	Strengthen the cultivation of students' lifelong learning ability	1	yes

Biography

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