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# Components and Indicators of Instructional Design Competence for Thai Pre-Service Teachers

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## Abstract

This study aims to investigate and validate the components and indicators of instructional design competence for Thai pre-service teachers. The research began with a synthesis of relevant concepts and theories through a comprehensive literature review and expert interviews, followed by the development of a questionnaire for data collection. The instrument was then administered to 471 pre-service teachers. The findings revealed that the instructional design competence of pre-service teachers comprises 3 dimensions: knowledge, ability, and personal attributes. The knowledge and ability dimensions are further subdivided into six common components: curriculum analysis, learner analysis, determination of learning objectives, design of learning activities, selection of instructional media and resources, and measurement and evaluation of learning outcomes. In contrast, the personal attributes dimension includes traits such as curiosity and a willingness to learn, teamwork, systematic thinking, creativity, and moral ethics. Furthermore, confirmatory factor analysis (CFA) using LISREL software demonstrated that the developed model exhibits acceptable goodness-of-fit indices (e.g.,  $X^2/df = 1.582$ ,  $NFI = 0.984$ ,  $RMSEA = 0.035$ ,  $CFI = 0.994$ ). The standardized factor loadings indicated that the Ability dimension had the highest weight (0.989), followed by the knowledge dimension (0.976) and the personal attributes dimension (0.890). Among the sub-components, the design of learning activities and the measurement and evaluation of learning outcomes in the knowledge and ability dimensions, as well as systematic thinking in the personal attributes dimension, showed the highest loadings.

**Keywords:** Thai Society and Culture Learning Innovation, Global Literacy, Cross-Cultural Families, Secondary Students, Global Society

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## 1. Introduction

Contemporary society is characterized by uncertainty and rapid change in both social and technological dimensions, which has generated a demand for an education system capable of effectively addressing 21st-century skills. The Thailand 4.0 vision—emphasizing innovation in the production and development of human capital (Siribhanpitak et al., 2018)—and the perspective of Dolprasit (2021), which underscores the necessity for instructional practices that foster digital literacy, cultural competence, creativity, and critical thinking (Bernhardt, 2015), national policies and strategies, including the National Education Plan (Office of the Education Council Secretary, 2017), have prioritized the preparation of human resources, particularly in the realm of learning management. It is posited that teachers should transform their roles from traditional instructors to designer teachers (Fakkao & Singharach, 2020), a change that must begin with enhancing the quality of pre-service teachers from the outset of the teacher production process (Chaichaowarat, 2017). If the input factors are of high quality—meaning pre-service teachers are competent, virtuous, and dedicated—then the resulting output will also be of superior quality (Napaphong & Inkaew, 2018). This demonstrates that improving educational quality with a focus on learner achievement must start with the selection and development of pre-service teachers equipped with diverse competencies to meet the challenges of an increasingly competitive and borderless global environment.

The development of quality pre-service teachers—capable of delivering instruction that meets high standards and specialized expertise essential for a high-level profession—has been prioritized by the regulatory bodies involved in teacher production. According to Section 49 of the Teachers and Educational Personnel Council Act (2003), professional standards for entering the teaching profession require individuals to possess comprehensive knowledge and practical experience in learning management. This includes the creation of lesson plans, the design of instructional strategies that are appropriate for the developmental stages of learners, the selection and development of educational media and resources to enhance learning, the organization of learning activities, and the evaluation of student performance. The success of the teaching and learning process fundamentally depends on the quality of instructional design (Jermtaisong, 2011). A critical factor for educators is the ability to design instruction and plan teaching effectively, as this is considered the most vital element in education (Arends, 1997). Consequently, the Teachers Council has established Professional Standard No. 4, which mandates that teachers develop lesson plans that are practically implementable—that is, plans that can be selected, modified, or created, along with teaching logs or other preparatory documents that enable the organization of learning activities leading students to achieve the desired learning objectives (Office of the Teachers Council, 2006). This requirement aligns with Khaemmanee's (2016) assertion that effective teaching demands that professional educators possess high-level instructional design competence—a competence central to the teaching profession. Therefore, teacher preparation institutions should emphasize and promote among pre-service teachers the critical importance of designing instructional strategies that stimulate learners to realize their full potential through creative, innovative, engaging, and challenging activities, thereby fostering active learning (Wongyai & Phatphon, 2019).

Nevertheless, despite the establishment of professional teaching standards for instructional design and the inclusion of courses within teacher education programs aimed at cultivating pre-service teachers' instructional design competence through practical teaching experiences, these measures have not sufficiently enabled pre-service teachers to design effective instruction. For instance, Pornviriyasakul (2011) found that during their teaching practicum, pre-service teachers encountered difficulties in instructional design, lesson plan writing, devising engaging learning activities, and sequencing instructional steps. This finding is consistent with Chaowakiratipong (2017), who reported that pre-service teachers struggle with various aspects of lesson planning, including inconsistent detailing of components, inappropriate selection of teaching methods relative to the content, incorrect sequencing of activities according to the chosen instructional model, unsuitable selection of instructional media and resources, and misaligned assessment strategies relative to learning objectives. Similarly, Kerdnate & Phueadchantheuk (2020) observed that pre-service teachers are unable to design and write lesson plans correctly, leading to a lack of a coherent framework for effective instruction. These issues are further corroborated by qualitative data obtained during interviews and analyses of lesson plan assignments from second-year pre-service teachers at the Faculty of Education, Phetchabun Rajabhat University, during the first semester of the 2023 academic year, which revealed that many pre-service teachers experienced significant difficulties in designing engaging learning activities and writing lesson plans—primarily due to a fear of failure and reluctance to adopt innovative instructional methods, techniques, or learning innovations. As a result, they tend to rely solely on models provided by instructors and often resort to copying from online sources, textbooks, and various research documents, thereby inhibiting the development of original instructional designs. These findings underscore that instructional design competence is a critical skill that must be developed among teachers and educational personnel. Given that designing instruction appropriate to learners' developmental stages is an essential competency for teachers (Teachers and Educational Personnel Development Institute, 2005, as cited in Chaichaowarat, 2017), it is imperative to enhance the instructional design competence of pre-service teachers to foster the development of professional educators in the future (Sinlarat, 2017).

The investigation and validation of the components of instructional design competence for pre-service teachers is essential in an era marked by rapid technological and social change. In today's dynamic context, teacher education must continually adapt, particularly as educational systems worldwide face the challenges of the 21st century, which demand a multifaceted set of skills—such as critical thinking, problem-solving, sound decision-making, and the integration of technology into teaching. These competencies are crucial for preparing pre-service teachers to become professionals who can effectively apply instructional design skills in lesson preparation, thereby meeting the evolving needs of society and the economy (Siribhanpitak

et al., 2018; Fakkao & Singharach, 2020). Empirical validation of these components—using techniques such as Confirmatory Factor Analysis (CFA)—is vital for ensuring the accuracy and reliability of the developed model. Such validation provides evidence that the delineated dimensions of knowledge, ability, and personal attributes accurately reflect the reality of pre-service teachers and offer a framework for enhancing teaching methods and training programs in response to the continuous evolution of educational environments (Chaichaowarat, 2017; Fakkao & Singharach, 2020).

Therefore, this research aims to investigate and validate the components of instructional design competency, a critical competency for the professional development of pre-service teachers in the 21<sup>st</sup> century. Furthermore, the identified components of instructional design competency will serve as a crucial guideline to assist teacher preparation institutions in designing methodologies or curricula for the development of professional teachers who possess the knowledge, skills, and personal attributes necessary for effective teaching and learning management in the 21<sup>st</sup> century.

## 2. Methodology

### 2.1. Research Design

This research employs a mixed methods approach, specifically integrating quantitative and qualitative research methodologies. This methodological triangulation allows for a comprehensive and nuanced understanding of the research phenomenon, leveraging the strengths of both quantitative and qualitative paradigms.

### 2.2. Research Instruments

The instruments utilized for data collection in this study include:

- 1) Expert Interview: A single semi-structured interview instrument was developed and validated to assess the components and indicators of instructional design competence for pre-service teachers
- 2) Questionnaire Instrument: A single questionnaire was developed to assess the components and indicators of instructional design competence for pre-service teachers.

### 2.3. Sample and Data Collection

#### 2.3.1. Sample

The sample includes: 1) Instructional Design Experts: A total of 15 experts were selected using purposive sampling. The selection criteria required that each expert hold a doctoral degree in curriculum and instruction occupy a position of assistant professor or higher, and possess at least three years of teaching experience in instructional design for pre-service teachers. And 2) Pre-service Teachers: The study targeted 471 pre-service teachers in their third and fourth academic years from the Faculty of Education at Phetchabun Rajabhat University, during the second semester of the 2024 academic year. Participants were selected using purposive sampling by including the entire cohort, by the sample size criteria proposed by Comrey & Lee (1992), which recommend a minimum sample size of 300 for robust component analysis.

#### 2.3.2. Data Collection

Stage 1: Development of a Preliminary Conceptual Framework

The researcher reviewed relevant concepts and theories pertaining to the instructional design competence of pre-service teachers using documents and related research. This review was conducted to establish a conceptual framework that includes:

1) Knowledge and Understanding of Instructional Design: This dimension comprises (a) curriculum analysis, (b) learner analysis, (c) determination of learning objectives, (d) content specification, (e) design of learning activities, (f) selection of media or learning resources, and (g) measurement and evaluation of learning outcomes.

2) Ability in Instructional Design: This involves planning instruction through the development of lesson plans that appropriately, comprehensively, and coherently specify the necessary components, namely (a) curriculum analysis, (b) learner analysis, (c) determination of learning objectives, (d) content specification, (e) design of learning activities, (f) selection of media or learning resources, and (g) measurement and evaluation of learning outcomes.

3) Personal Attributes of Pre-service Teachers in Instructional Design: This dimension refers to the desirable behavioral traits that facilitate effective instructional design, including a strong inclination to learn, teamwork, systematic thinking, and creativity.

The researcher then conducted interviews with experts in instructional design to gather insights on the components and indicators of instructional design competence for pre-service teachers, focusing on the three aspects: (1) knowledge of instructional design, (2) ability in instructional design, and (3) personal attributes relevant to instructional design, as outlined in section 1.1

Stage 2: Definition of Components and Indicators

In this stage, the researcher synthesized and summarized the information obtained from the theoretical review and expert interviews. The resulting insights were then used to formulate the questionnaire items designed to assess the components and indicators of instructional design competence.

Stage 3: Validation of Components and Indicators

Finally, the researcher administered the questionnaire to a target sample of 471 pre-service teachers. The collected data were analyzed using Confirmatory Factor Analysis (CFA) to validate and finalize the components of instructional design competence for pre-service teachers.

### 2.3.3. Analyzing of Data

- 1) Analyze the expert opinions regarding the components and indicators of instructional design competence for pre-service teachers, derived from interviews, through content analysis, summarization, and interpretation.
- 2) Analyze the respondents' demographic data by calculating the mean and standard deviation.
- 3) Analyze the components of instructional design competence for pre-service teachers using Confirmatory Factor Analysis (CFA) with LISREL 8.72 software.

## 3. Results

Findings on the Components and Indicators of Instructional Design Competence for Pre-Service Teachers: The researcher developed an initial conceptual framework by reviewing relevant concepts and theories from literature and related studies, and by conducting interviews with experts in instructional design. This process focused on three dimensions of instructional design competence: (1) Knowledge of instructional design, (2) Ability in instructional design, and (3) Personal attributes related to instructional design for pre-service teachers. Based on this synthesis, the components and indicators of instructional design competence were defined, as summarized in Table 1.

**Table 1. Components and Indicators of Instructional Design Competence**

Competence	Components	Indicators
1. Knowledge of instructional design	1.1 Curriculum Analysis	1.1.1 Explain the principles underlying the analysis of course structure for instructional design
		1.1.2 Explain the consistency of the components in the analysis of course structure for instructional design
	1.2 Learner Analysis	1.2.1 Explain the principles underlying learner analysis
		1.2.2 Explain the methods for analyzing learners
		1.2.3 Explain the results of the learner analysis
	1.3 Determination of Learning Objectives	1.3.1 Identify learning objectives that align with the standards and curriculum indicators
	1.4 Design of Learning Activities	1.3.2 Clearly specify the expected behavioral levels across knowledge, skills/process, and the desired attributes accurately
		1.3.3 Accurately specify the criteria or levels of learner performance
		1.4.1 Explain the instructional models, methods, techniques, or innovations that align with the learning objectives
		1.4.2 Explain the instructional models, methods, techniques, or innovations that are aligned with the content
	1.5 Selection of Instructional Media and Resources	1.4.3 Explain the instructional models, methods, techniques, or innovations that correspond with the characteristics of learners, including their age, interests, and aptitudes
		1.4.4 Explain the instructional models, methods, techniques, or innovations that align with the classroom context, such as class size and resource availability
		1.5.1 Identify instructional media or learning resources that align with the learning objectives
		1.5.2 Identify instructional media or learning resources that align with the content
		1.5.3 Identify instructional media or learning resources that align with the learning activities
		1.5.4 Identify instructional media or learning resources that are appropriate for the learners' age
	1.6 Measurement and Evaluation of Learning Outcomes	1.5.5 Identify instructional media or learning resources that are engaging and contemporary
		1.5.6 Identify instructional media or learning resources that are aligned with the classroom context, such as class size and resource availability
		1.6.1 Identify the methods, instruments, and criteria for assessing and evaluating learning outcomes that align with the learning objectives
		1.6.2 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes that align with the content

		1.6.3 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes under authentic conditions 1.6.4 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes that are appropriate for the learners' age
2. Ability	2.1 Curriculum Analysis	2.1.1 Specify the complete set of components for analyzing the course structure for instructional design 2.1.2 Analyze the course structure for instructional design accurately
		2.2.1 Accurately specify the methods for analyzing learners 2.2.2 Analyze the learners accurately 2.2.3 Accurately summarize the results of the learner analysis
	2.2 Learner Analysis	2.2.1 Accurately specify the methods for analyzing learners 2.2.2 Analyze the learners accurately 2.2.3 Accurately summarize the results of the learner analysis
		2.2.1 Accurately specify the methods for analyzing learners 2.2.2 Analyze the learners accurately 2.2.3 Accurately summarize the results of the learner analysis
	2.3 Determination of Learning Objectives	2.3.1 Write learning objectives that align with the standards and curriculum indicators 2.3.2 Accurately define the expected behavioral levels across the domains of knowledge, skills/process, and desired attributes 2.3.3 Accurately specify the criteria or levels of learner performance
	2.4 Design of Learning Activities	2.4.1 Select instructional models, methods, techniques, or innovations that align with the learning objectives 2.4.2 Select instructional models, methods, techniques, or innovations that are aligned with the content 2.4.3 Select instructional models, methods, techniques, or innovations that are aligned with the characteristics of learners, including their age, aptitudes, and interests 2.4.4 Design innovative learning activities that align with the learning objectives, content, and the characteristics of the learners 2.4.5 Select instructional models, methods, techniques, or innovations that foster learner enjoyment in the learning process 2.4.6 Select instructional models, methods, techniques, or innovations that align with the classroom context, such as class size and resource availability
	2.5 Selection of Instructional Media and Resources	2.5.1 Identify instructional media or learning resources that align with the learning objectives 2.5.2 Identify instructional media or learning resources that align with the content 2.5.3 Identify instructional media or learning resources that are appropriate for the learners' age
		2.5.4 Identify instructional media or learning resources that are engaging and contemporary 2.5.5 Identify instructional media or learning resources that align with the classroom context, such as class size and resource availability
		2.5.6 Identify instructional media or learning resources that align with the classroom context, such as class size and resource availability
	2.6 Measurement and Evaluation of Learning Outcomes	2.6.1 Identify the methods, instruments, and criteria for assessing and evaluating learning outcomes that align with the learning objectives 2.6.2 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes that align with the content 2.6.3 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes under authentic conditions
		2.6.4 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes that align with the content 2.6.5 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes under authentic conditions
		2.6.6 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes that align with the content 2.6.7 Identify the methods, instruments, and criteria for measuring and evaluating learning outcomes under authentic conditions
3. Personal Attributes	3.1 Curiosity and a Passion for Learning	3.1.1 Demonstrate behaviors that reflect dedication in instructional design 3.1.2 Exhibit behaviors that demonstrate enthusiasm and a keen interest in instructional design. 3.1.3 Demonstrate self-directed behaviors in acquiring knowledge for instructional design
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	3.2 Teamwork	3.2.1 Exhibit behaviors that demonstrate personal responsibility in the design of instruction
		3.2.2 Exhibit behaviors that demonstrate effective leadership and followership in instructional design
		3.2.3 Exhibit behaviors that demonstrate effective collaboration with others in instructional design
		3.2.4 Exhibit behaviors that demonstrate open-mindedness and a willingness to consider and listen to group feedback in instructional design
	3.3 Systematic Thinking	3.3.1 Exhibit behaviors that demonstrate effective planning in instructional design
		3.3.2 Exhibit behaviors that demonstrate a systematic approach in instructional design
		3.3.3 Exhibit behaviors that demonstrate the use of appropriate reasoning in decision-making for instructional design
		3.3.4 Evaluate the instructional design and implement improvements accordingly
	3.4 Creativity	3.4.1 Exhibit behaviors that demonstrate out-of-the-box thinking and the initiative to implement innovative ideas in instructional design
		3.4.2 Exhibit behaviors that demonstrate openness to diverse perspectives in instructional design
		3.4.3 Exhibit behaviors that demonstrate flexibility and a willingness to embrace change in instructional design
	3.5 Ethical Values and Integrity	3.5.1 Exhibit behaviors that demonstrate honesty, such as refraining from plagiarism and avoiding the use of others' work in instructional design
		3.5.2 Exhibit behaviors that demonstrate respect and regard for learners in instructional design
		3.5.3 Exhibit behaviors that demonstrate compassion and a willingness to assist learners in instructional design

Findings of the Validation of the Components and Indicators of Instructional Design Competence for Pre-Service Teachers. The researcher validated the components and indicators of instructional design competence for pre-service teachers by administering a questionnaire to 471 pre-service teachers. The collected data were then analyzed using Confirmatory Factor Analysis (CFA) to examine the components of instructional design competence. The results are presented in Figure 2, Table 3, and Table 4, respectively.

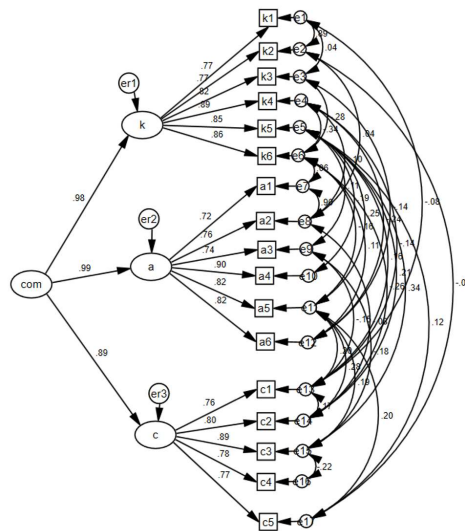


Figure 1. Second-order Confirmatory Factor Analysis of Instructional Design Competence

**Table 2. Goodness-of-Fit Indices of the Second-Order Confirmatory Factor Analysis of Instructional Design Competence**

Index values	Criteria for evaluation	Statistical values	Evaluation results
$X^2/df$	< 5 Acceptable	1.582	Passed
NFI	$\geq 0.80$ Acceptable	0.984	Passed
RMSEA	< 0.10 Acceptable	0.035	Passed
CFI	$\geq 0.85$ Good	0.994	Passed
IFI	$\geq 0.85$ Good	0.994	Passed
TLI	$\geq 0.85$ Good	0.990	Passed
RMR	$\leq 0.05$ Good	0.006	Passed

From Table 2, it was found that the chi-square value ( $X^2$ ) is 132.901 with degrees of freedom (df) equal to 84. The statistical indices, including the chi-square/df ratio, NFI, RMSEA, CFI, IFI, TLI, and RMR, all meet the acceptable criteria. These results indicate that the second-order confirmatory factor model of instructional design competence is consistent with the empirical data.

**Table 3. Standardized Factor Loadings of the Confirmatory Factor Analysis of Instructional Design Competence**

Variable	Internal components	Component weightings
Instructional Design Competence (COM)	Knowledge and Understanding of Instructional Design (K)	0.976
	Ability in Instructional Design (A)	0.989
	Personal Attributes of Pre-service Teachers in Instructional Design (C)	0.890
Knowledge and Understanding of Instructional Design (K)	Curriculum Analysis (K1)	0.772
	Learner Analysis (K2)	0.768
	Determination of Learning Objectives (K3)	0.817
	Design of Learning Activities (K4)	0.892
	Selection of Instructional Media and Resources (K5)	0.850
	Measurement and Evaluation of Learning Outcomes (K6)	0.863
Ability in Instructional Design (A)	Curriculum Analysis (A1)	0.716
	Learner Analysis (A2)	0.759
	Determination of Learning Objectives (A3)	0.739
	Design of Learning Activities (A4)	0.901
	Selection of Instructional Media and Resources (A5)	0.820
	Measurement and Evaluation of Learning Outcomes (A6)	0.821
Personal Attributes of Pre-service Teachers in Instructional Design (C)	Curiosity and a Passion for Learning (C1)	0.765
	Teamwork (C2)	0.803
	Systematic Thinking (C3)	0.892
	Creativity (C4)	0.781
	Ethical values and integrity (C5)	0.771

From Figure 1 and Table 3, it was found that the first-order confirmatory factor analysis of the instructional design competence model for pre-service teachers, which included 17 variables, yielded standardized factor loadings ranging from 0.716 to 0.901, all statistically significant at the .01 level. In the Knowledge and Understanding dimension (K), the variable with the highest loading was the determination of learning activities (K4) at 0.892, followed by the measurement and evaluation of learning outcomes (K6) at 0.863. In the Ability in Instructional Design dimension (A), the highest loading was observed for the design of learning activities (A4) at 0.901, followed by the measurement and evaluation of learning outcomes (A6) at 0.821. In the Personal Attributes dimension (C), the variable with the highest loading was systematic thinking (C3) at 0.892, followed by teamwork (C2) at 0.803.

Additionally, the second-order confirmatory factor analysis revealed that the Ability in Instructional Design (A) dimension had the highest standardized factor loading at 0.989, followed by the Knowledge and Understanding of Instructional Design (K) dimension with a standardized factor loading of 0.976.

#### 4. Discussion

The study of the components of instructional design competence for pre-service teachers reveals that the instructional design competence of pre-service teachers comprises three main dimensions: Knowledge, Ability, and Personal Attributes. The first two dimensions (Knowledge and Ability) are further subdivided into six common components: curriculum analysis, learner analysis, determination of learning objectives, design of learning activities, selection of instructional media and resources, and measurement and evaluation of learning outcomes. These findings are consistent with Shulman's (1986) emphasis on the importance of Pedagogical Content Knowledge (PCK), which asserts that teachers must possess both subject matter knowledge

and the ability to apply that knowledge effectively in real-world situations. Furthermore, the TPACK framework by Mishra and Koehler (2006) underscores the integration of content knowledge, pedagogical strategies, and technology to enhance effective instructional design. Consequently, this research confirms that the development of competence in these two dimensions requires the systematic integration of both knowledge and skills.

For the personal attributes of pre-service teachers—including a passion for learning, teamwork, systematic thinking, creativity, and ethical values—the research findings indicate that high-quality instructional design relies not only on knowledge and planning ability but also on individual characteristics that foster analytical thinking and creative problem-solving. This aligns with the findings of Chai, Koh, and Tsai (2013), who reported that developing teacher competence in the modern era requires an integration of academic knowledge with personal attributes. Furthermore, Beauchamp and Thomas (2009) emphasize that the development of personal characteristics and ethical values significantly influences the formation of teacher identity and long-term effectiveness. Consequently, this research underscores that the development of instructional design competence should be an integrated process encompassing knowledge, ability, and personal attributes, enabling teachers to effectively meet the challenges of contemporary education.

Findings from the Validation of the Components and Indicators of Instructional Design Competence for Pre-Service Teachers. It was found that the instructional design competence model for pre-service teachers developed in this study is consistent with the empirical data. All fit indices were within acceptable limits, demonstrating the validity and reliability of the competence structure, which is measured across three main dimensions: Ability in Instructional Design (A) with the highest standardized loading (0.989), Knowledge and Understanding of Instructional Design (K) with a standardized loading of 0.976, and Personal Attributes of Pre-Service Teachers in Instructional Design (C) with a standardized loading of 0.890. Moreover, several sub-components exhibited high standardized loadings; for example, within the Knowledge and Ability dimensions, the design of learning activities (K4, A4) and the measurement and evaluation of learning outcomes (K6, A6) were particularly influential, while within the Personal Attributes dimension, systematic thinking (C3) and teamwork (C2) showed high loadings.

These results underscore that effective instructional design depends on an integrated approach combining knowledge, practical skills, and personal attributes. Such an approach facilitates systematic problem-solving and collaborative work in complex learning environments. These findings align with Shulman's (1986) emphasis on the development of pedagogical content knowledge, which integrates subject matter expertise with pedagogical methods, and with the TPACK framework proposed by Mishra and Koehler (2006), which highlights the importance of integrating content knowledge, pedagogy, and technology in the instructional design process. Additionally, constructivist theory—which advocates that learners construct knowledge through direct experience and collaborative engagement—further reinforces the need for designing learning activities and assessments that are responsive to learners' needs. Consequently, the development of instructional design competence should emphasize hands-on practice and the cultivation of personal attributes that promote systematic thinking and effective teamwork, which are essential for enhancing the potential of pre-service teachers in an era of rapid educational change.

Nevertheless, the research found that the components of instructional design competence consist of Knowledge (K), Ability (A), and Personal Attributes (C), with each dimension exhibiting different standardized factor loadings. This finding is consistent with the study by Chai, Koh, and Tsai (2013), which reported that the Ability dimension in instructional design had the highest loading, indicating that the practical application of knowledge in real-world situations is critically important for developing pre-service teachers' competence. Similarly, Leong and Khong (2012) found that instructional design competence should encompass the development of subject matter knowledge, expertise in utilizing diverse teaching techniques, and skills in assessing learning outcomes—abilities that form the essential foundation for enhancing pre-service teachers' competence in all aspects of instructional design. Moreover, Tsai and Kuo (2013) revealed that the determination of learning activities is a key component in developing teacher competence, as it is closely linked to the integration of contemporary teaching theories and tools in the design of effective classrooms.

## 5. Conclusion

This instructional design competency model serves as a conceptual framework for enhancing pre-service teacher education curricula. It achieves this by integrating content pertaining to knowledge components (e.g., curriculum analysis and learner analysis), design capabilities—specifically, the creation of innovative learning activities—and personal attributes such as systems thinking and teamwork into the curriculum development process. Furthermore, the identified components of instructional design competency will serve as a crucial guideline to assist teacher preparation institutions in designing methodologies or curricula for the development of professional teachers who possess the knowledge, skills, and personal attributes necessary for effective teaching and learning management in the 21st century.

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