

# Research on the Construction and Application of the Panorama of Teaching Skill Evaluation for Preservice Teachers

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**Abstract:** To address challenges in the teaching skill evaluation of preservice teachers, such as traditional models being unable to meet digital demands, and intelligent evaluation suffering from ambiguous indicators and insufficient interpretability, this study constructs a comprehensive panorama of teaching skill evaluation covering the entire process of pre-class, in-class, and post-class. Centered on in-class teaching skills, the panorama adopts a three-level hierarchical design, establishing a specific, observable, and interpretable underlying framework. It balances interdisciplinary commonalities with the characteristics of information technology, while highlighting emerging skills such as curriculum-based ideological and political education and AI application. As a standardized data framework for the intelligent evaluation of preservice teachers' teaching skills, the panorama integrates with interpretability methods to support the reverse tracing of evaluation results from atomic-level skills to segment effects, ensuring the fairness and credibility of the evaluation. This framework provides theoretical support and practical pathways for empowering evaluation with intelligent technologies and realizing result interpretability, and holds significant importance for improving the quality of teacher training.

**Keywords:** Teaching skills; Panorama; Interpretability; Intelligent evaluation

## 1. Introduction

As the reserve force of the future teaching workforce, preservice teachers' proficiency in teaching skills directly impacts the quality of basic education and the achievement of educational goals. Teaching skills not only serve as a crucial bridge for preservice teachers to transition from theoretical learning to practical teaching but also act as a key indicator to measure their possession of professional teacher literacy. A scientific and systematic evaluation of teaching skills can not only provide a basis for normal universities to optimize training programs, adjusting curriculum settings and practical training priorities, but also guide preservice teachers in their professional development, helping them make targeted improvements in simulated teaching, educational internships, and other scenarios. Therefore, the evaluation of preservice teachers' teaching skills, as a core proposition in teacher training, plays an irreplaceable foundational role in implementing the fundamental task of fostering virtue through education and advancing the deepening of basic education reforms.

With the accelerated digital transformation of education, the traditional teaching skill evaluation model, which relies on manual observation and subjective scoring, can no longer meet the large-scale and precision-oriented training needs of preservice teachers. The introduction of intelligent evaluation has thus become an inevitable trend [1]. However, intelligent evaluation faces multiple challenges in practice: the ambiguity of evaluation indicators leads to a lack of quantifiable underlying behavioral definitions in traditional skill classifications, making it difficult for AI models to identify accurately; the disconnection between technology and teaching logic causes some intelligent systems to focus solely on superficial behavioral data while ignoring the educational connotations of skills; and the credibility crisis of results caused by technical "black boxes" leaves preservice teachers skeptical of evaluation outcomes. These issues compel the evaluation system to break free from the single application of technology and shift toward a path of "framework first, technology adaptation" [2].

Integrating interpretability into intelligent evaluation is not only an inevitable choice to solve the dilemma of technical black boxes but also a core requirement to adapt to the development of future educational evaluation. With the application of machine learning, deep learning, and other technologies in evaluation, if the results output by models lack theoretical support, it is easy to trigger preservice

teachers' distrust in the evaluation. The integration of interpretability can provide a basis for evaluation results: by tracing the correlation chain between skills, preservice teachers can understand the specific causes of their skill shortcomings, thereby enhancing their initiative to improve. From the perspective of future educational development trends, interpretable intelligent evaluation is a prerequisite for achieving personalized training and precision empowerment. It not only meets the requirement of educational equity for evaluation transparency, avoiding the impact of technical biases on fairness, but also enables evaluation to evolve from simple scoring to in-depth diagnosis by connecting evaluation data with educational decision-making [3].

In summary, based on the fundamental demands of preservice teacher training, the practical bottlenecks of intelligent evaluation, and the core value of interpretability for future evaluation, it is inevitable to construct a systematic, accurate, and interpretable panorama of teaching skill evaluation. This panorama will provide solid support for the scientific evaluation and continuous development of preservice teachers' teaching skills.

## **2. Construction of the Panorama of Teaching Skill Evaluation for Preservice Teachers**

### ***2.1 Guiding Principles for Construction***

The construction of the panorama of teaching skill evaluation for preservice teachers is guided by the core principles of "whole-process integration, skill stratification, and balance between commonalities and individuality." It aims to break the limitation of traditional evaluation, which focuses on single in-class points, and regards pre-class teaching design, in-class teaching implementation, and post-class teaching reflection and extension as an organic whole. By integrating multi-dimensional skills such as teaching design, teaching behavior, and teaching improvement, the panorama avoids the fragmentation of skill evaluation and highlights the continuity and systematicness of teaching skills. Meanwhile, based on the logic of behavior-strategy-framework, teaching skills are decomposed into three observable and progressive levels of indicators: the underlying Atomic-level skills focus on specific behaviors; the middle-level General teaching skills emphasize cross-segment strategies; and the top-level Container-level teaching skills concentrate on segment frameworks. This forms a hierarchical supportive relationship from concrete to abstract and from operation to strategy, ensuring that the evaluation captures both details and the overall picture. On this basis, while retaining the general teaching skills applicable to various disciplines, the panorama emphasizes the specific needs of the information technology discipline by incorporating emerging skills such as digital tool application, computational thinking infiltration, and AI-assisted teaching into the evaluation system. It not only meets the requirements for cultivating preservice teachers' general abilities but also aligns with the special demands of the era for information technology teachers, providing a theoretical framework for the application of artificial intelligence technology in teaching skill evaluation [4].

Based on the natural sequence of teaching activities, the skill system of the panorama is divided into three segments: pre-class, in-class, and post-class, as shown in Figure 1:

1) Pre-class teaching skills: Focus on teaching design skills, serving as the blueprint planning for in-class teaching. They mainly include curriculum standard analysis, student situation analysis, teaching material analysis, teaching objective setting, teaching strategy selection, teaching activity design, and teaching resource integration. These skills lay the foundation for the implementation of in-class teaching.

2) In-class teaching skills: As the core research object, they are the concentrated embodiment of preservice teachers' teaching skills. Through the three-level hierarchical system of "Container-level skills (segment framework) – General teaching skills (cross-segment strategies) – Atomic-level skills (underlying behaviors)," they fully cover the skill performance of in-class segments such as introduction, new knowledge teaching, application, and summary.

3) Post-class teaching skills: Focus on teaching improvement and support, acting as the extension and optimization of in-class teaching. They include teaching research skills, post-class tutoring skills, and evaluation and feedback skills. These skills are key to improving teaching quality and serve as important support for preservice teachers' professional growth [5].

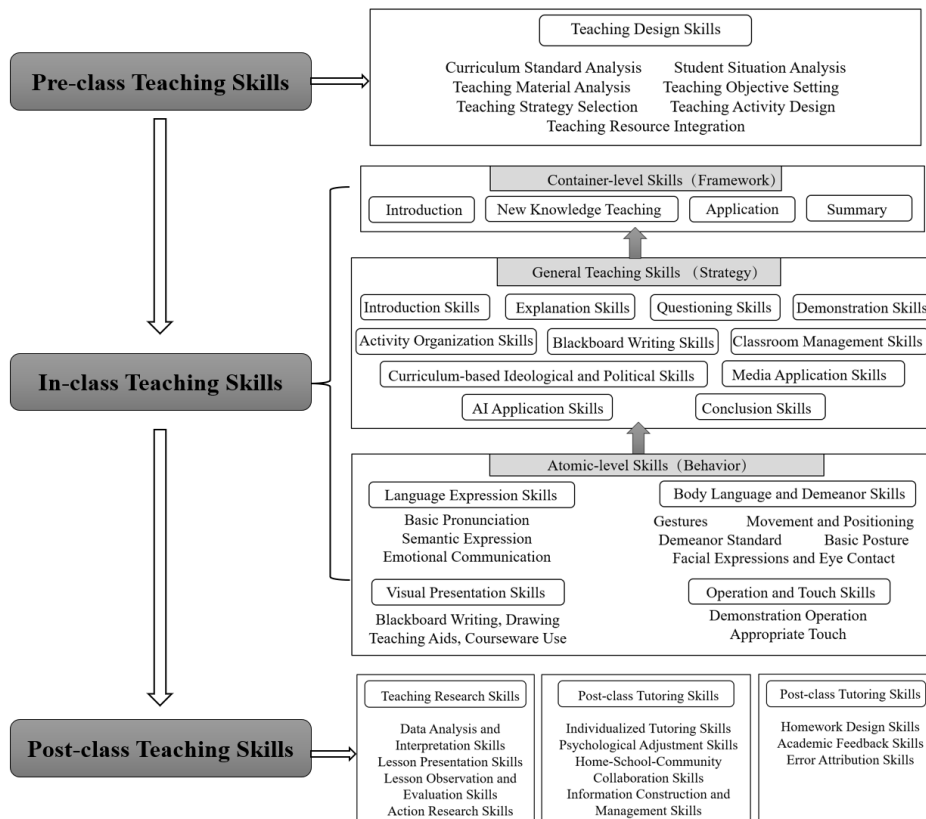


Figure 1: Panorama of Teaching Skill Evaluation for Preservice Teachers.

## 2.2 Three-level Hierarchical Design of In-class Teaching Skills

In-class teaching skills are not only the practical implementation of pre-class design but also the direct basis for post-class reflection. They are the most concentrated and direct embodiment of preservice teachers' teaching skills. Therefore, this study focuses on sorting out in-class teaching skills.

### 2.2.1 First-level Indicator: Container-level Skills

Container-level skills are segmental framework skills divided based on the in-class teaching process. Their core function is to provide a structured carrier for teaching activities, integrate, and drive the application of secondary General skills. These skills have clear segment objectives, time boundaries, and conceptual orientations, and can contain the specific application of other skills like a container.

Combined with the typical process of preservice teachers' simulated teaching, Container-level skills are divided into four categories:

1) Introduction Skills: Framework skills for the class initiation segment. Their core goal is to stimulate students' learning interest, clarify learning objectives, and lay the foundation for subsequent teaching through scenario creation, review of prior knowledge, problem-driven approaches, etc. Key elements include the relevance between scenarios and objectives, the connection between prior and new knowledge, and the focus of students' attention.

2) New Knowledge Teaching Skills: Framework skills for the core segment of the class. Their core goal is to systematically convey new knowledge and guide students to understand core concepts or master key skills. Key elements include the clarity of knowledge logic, the emphasis on key and difficult points, and the guidance of students' thinking.

3) Application Skills: Framework skills for the knowledge consolidation segment. Their core goal is to test students' mastery of new knowledge and promote knowledge transfer and application through exercises, tasks, discussions, etc. Key elements include the pertinence of exercise design and the depth of students' participation.

4) Summary Skills: Framework skills for the class conclusion segment. Their core goal is to sort out the knowledge context, strengthen core points, and connect subsequent learning. Key elements include

the completeness of the knowledge structure, the accuracy of key point review, and the guidance of students' reflection.

The advantage of dividing Container-level skills according to teaching segments lies in their strong systematicness and logic: they conform to the natural flow of teaching activities, clearly present the sequence and internal logic of the teaching process, and help preservice teachers grasp the overall picture of teaching activities; at the same time, each segment has relatively clear tasks and objectives, facilitating preservice teachers' operation and practice in simulated teaching. However, this division pays insufficient attention to cross-segment comprehensive skills or skills for responding to unexpected situations, which may lead to preservice teachers lacking flexibility and adaptability in actual teaching [6]. Therefore, it is necessary to make up for this limitation through Secondary indicators.

### 2.2.2 Secondary Indicator: General Teaching Skills

General teaching skills are cross-segment strategic skills refined based on in-class teaching events. Their core function is to provide flexibly adaptable teaching strategies for different Container-level skills. These skills are not limited to a single segment but can directly affect the achievement of segment objectives, and they possess universality, situationality, and coordination.

1) Universality: General teaching skills are not confined to a specific teaching segment but run through the four stages of introduction, new knowledge teaching, application, and summary. For example, Explanation Skills are used for scenario interpretation in the introduction segment, concept analysis in the new knowledge teaching segment, exercise guidance in the application segment, and logic sorting in the summary segment. However, not all General skills are required in every stage: some segments may not need Blackboard Writing Skills, and some may rely more on Media Application Skills than Language Expression Skills.

2) Situationality: The functional positioning, manifestation, and implementation focus of the same skill may vary completely across different Container-level skills. Taking Media Application Skills as an example: in the introduction segment, their function is scenario creation; in the new knowledge teaching segment, it is the presentation of intuitive materials; and in the application segment, it is interactive support.

3) Coordination: A single General teaching skill can hardly support complex teaching segments independently; it needs to work in coordination with other skills through skill combinations, and the combination methods are dynamically adjusted according to the objectives of Container-level skills. For example, the core goal of the new knowledge teaching segment is to promote knowledge understanding, which usually requires a basic combination of "Explanation Skills + Questioning Skills + Demonstration Skills"; if abstract concepts are involved, Media Application Skills need to be added.

Combined with the core events of in-class teaching, General teaching skills are specifically divided into 11 categories. The core functions of each category are shown in Table 1:

Table 1: General Teaching Skills and Their Core Functions

General Teaching Skills	Description of Core Functions
Introduction Skills	Stimulate learning interest and guide students into the learning state through scenario creation, problem-driven approaches, story-telling, etc
Explanation Skills	Explain knowledge concepts, logical relationships, or demonstrate principles using precise language to ensure students understand core content
Questioning Skills	Guide students' thinking and test learning outcomes through questions of different levels (recall, understanding, application, creation)
Demonstration Skills	Present knowledge through intuitive methods such as physical operations, tool demonstrations, and process simulations
Activity Organization Skills	Design activity forms such as group discussions, collaborative tasks, and inquiry-based practice to guide students' in-depth participation
Blackboard Writing Skills	Present knowledge structures on the blackboard using visual forms such as text, symbols, and charts
Classroom Management Skills	Ensure the orderly and efficient conduct of teaching activities through attention regulation, rhythm control, and discipline maintenance
Curriculum-based Ideological and Political Skills	Explore value elements in knowledge carriers and naturally integrate value guidance into the teaching process
Media Application Skills	Select and use digital tools such as courseware, virtual teaching aids, and simulation software to overcome teaching difficulties and enrich teaching forms
AI Application Skills	Use AI tools such as intelligent assessment and personalized recommendation to optimize teaching
Conclusion Skills	Complete the class conclusion through knowledge summary, homework assignment, and extended learning to strengthen learning effects and connect subsequent learning

### 2.2.3 Third-Level Indicator: Atomic-level Teaching Skills

Atomic-level teaching skills are observable and indivisible underlying behavioral elements in in-class teaching, and they are the smallest units that constitute secondary General teaching skills. These skills have clear explicit characteristics and can be recorded and evaluated through quantitative indicators such as frequency, duration, and intensity, providing anchor points for the precise assessment of teaching skills. With the development of artificial intelligence technology, the extraction, correlation, and analysis of explicit behavioral data of Atomic-level skills are gradually realizing automation and intelligence. In the future, real-time tracking and evaluation of these skills can be achieved through system design, laying a data foundation for intelligent teaching evaluation [7]. Based on the core carriers of in-class behaviors, Atomic-level skills are specifically divided into four categories. Their detailed indicators and connotations are shown in Table 2:

Table 2: Detailed Indicators and Core Connotations of Atomic-level Teaching Skills

Atomic-level Teaching Skills	Detailed Indicators	Core Connotations
Language Expression Skills	Basic Pronunciation	Standard pronunciation, moderate volume, adaptive speaking speed
	Semantic Expression	Clear instructions, accurate terminology, coherent logic
	Emotional Communication	Friendly tone, emphasis on key points, appeal
Body Language and Demeanor Skills	Gestures	Indicative gestures, emphatic gestures, interactive gestures
	Movement and Positioning	Coverage range, interaction distance
	Demeanor Standards	Appropriate and neat clothing
	Basic Posture	Straight standing posture, upright sitting posture
	Facial Expressions and Eye Contact	Adaptability of expressions to content scenarios, eye contact coverage, response to eye contact
Visual Presentation Skills	Blackboard Writing, Drawing	Neat handwriting, reasonable layout, marking of key points
	Teaching Aids, Courseware Use	Display angle, clarity, smooth operation
Operation and Touch Skills	Demonstration Operation	Standardization, safety, and proficiency in experiment/tool operation
	Appropriate Touch	Encouraging touch in line with educational ethics; avoiding excessive or inappropriate touch

### 2.3 Detailed Explanation

In the process of constructing the panorama, it is necessary to maintain the logical rigor of classification and respond to the actual needs of teaching practice. Due to overlapping connotations or era-specific characteristics, some skills require clear definition of their independence and correlation to avoid ambiguous classification or logical redundancy. The specific explanations are as follows:

#### 2.3.1 Boundary Differentiation between AI Application Skills, Media Application Skills, and Demonstration Skills

The core of Demonstration Skills lies in concrete operation demonstrations, focusing on conveying information through teachers' direct operations or physical presentations, and emphasizing the imitability of behavioral processes. Its essence is human operation demonstration, with technical tools serving only as auxiliary carriers; the core of Media Application Skills is the adaptation and integration of digital tools, focusing on optimizing information transmission through technical carriers such as courseware, virtual teaching aids, and simulation software, and emphasizing the matching degree between tool selection and teaching objectives. Its essence is technology serving teaching, which does not rely on teachers' direct operation demonstrations but achieves teaching effects through preset digital resources; the core of AI Application Skills is the active participation of intelligent tools. Different from the passive presentation of traditional media, AI tools, such as intelligent assessment systems and personalized recommendation algorithms can generate feedback based on real-time data, emphasizing dynamic human-machine interaction. Its essence is technology acting as a "teaching partner" with independent analysis and adaptation capabilities, thus requiring independent classification to reflect the advanced form of digital

teaching.

Although the three all involve the use and display of teaching tools, there are differences in their core connotations and functional positioning. Independent classification can make the training objectives of each skill more precise.

### ***2.3.2 Positioning of Observation Skills: As a Common Sub-dimension of General Skills***

Observation Skills refer to teachers' ability to capture signals such as students' expressions, movements, and feedback, and adjust teaching behaviors in real time, which runs through the entire teaching activity.

From the perspective of hierarchy, Observation Skills are not purely underlying behaviors and do not conform to the definition of Atomic-level skills as smallest and indivisible units, so they should not be classified into Atomic-level skills; from the perspective of segments, Observation Skills run through the entire in-class process and cannot be classified into a single Container-level skill; from the perspective of function, Observation Skills serve as implicit support for General teaching skills rather than independent strategic skills. Therefore, Observation Skills should not be treated as independent indicators, but as a common sub-dimension of various General teaching skills. In the description of skills such as Explanation, Questioning, and Classroom Management, clear requirements for real-time adjustment based on observation should be included, enabling them to be integrated into the skill system without fragmentation.

### ***2.3.3 Necessity of Classifying Blackboard Writing Skills and Curriculum-based Ideological and Political Skills as Independent Skills***

"Blackboard Writing and Drawing" in Atomic-level skills focuses on the standardization of writing and presentation; in contrast, Blackboard Writing Skills, as Secondary indicator General skills, take the strategic nature of blackboard design as their core, embodying advanced capabilities in dynamic generation and thinking guidance. Distinct from simple operational behaviors, they require independent classification.

Curriculum-based Ideological and Political Skills represent the organic integration of value guidance and knowledge impartment. They require teachers to proactively explore ideological and political elements in disciplines and infiltrate them through multiple channels such as language, activities, and media, rather than being passive behaviors attached to Explanation or Interaction. Classified as an independent skill, they not only reflect the educational orientation of fostering virtue through education but also clarify the strategic requirements for how to infiltrate, making them an essential supplement to the teaching skill system in the new era.

## **3. Application of the Panorama and Its Integration with Interpretability**

### ***3.1 Basic Role: Standardized Input and Foundation of Interpretability***

The panorama provides a standardized data annotation framework for intelligent evaluation. The clear definition of its three-level skill system ensures unified standards for the collection of teaching behavior data, guaranteeing the consistency of input data. From a theoretical perspective, this structured framework itself constitutes the foundation of interpretability: the observability of Atomic-level skills provides clear anchor points for feature selection in machine learning models, while the hierarchical relationship between General skills and Container-level skills offers a natural path for the logical decomposition of model output results, avoiding the "evaluation black box" caused by ambiguous indicators.

### ***3.2 Integration with Interpretability: Method Adaptation and Two-way Verification***

The integration of the panorama with interpretability methods in machine learning and deep learning can enhance the credibility of evaluation results through the two-way logic of technical interpretation and framework verification.

#### ***3.2.1 Application Logic of Interpretability Methods***

For white-box models such as decision trees and linear regression, feature importance ranking can be directly linked to the skill hierarchy of the panorama to clarify the influence weight of underlying Atomic-level skills on General skills; for deep learning black-box models, interpretability methods such

as LIME (Local Interpretable Model-agnostic Explanations) and SHAP (SHapley Additive exPlanations) can be used to generate feature contribution explanations. The key behaviors identified by the model are compared with the skill correlation settings of the panorama to verify the evaluation logic [8].

### **3.2.2 Highlighting of Core Advantages**

1) Detecting Bias and Ensuring Fairness: The two-way verification mechanism can effectively identify evaluation biases. When technical interpretation results are inconsistent with the theoretical settings of the panorama, it can not only check whether the model has learned non-teaching-related features but also correct potential logical omissions in the panorama, ensuring that the evaluation is not disturbed by subjective biases and remains fair to all preservice teachers.

2) Enhancing Trust and Strengthening Acceptance: Through the panorama, interpretability builds a bridge between technical results and teaching cognition. It converts abstract features identified by AI into descriptions of teaching behaviors that preservice teachers can understand. This transforms evaluation results from numbers divorced from teaching practice into specific feedback consistent with daily teaching experience, allowing preservice teachers to clearly perceive the connection between evaluation basis and their own teaching behaviors. This fosters psychological recognition of the evaluation's rationality and improves acceptance of results and willingness to improve.

3) Precision Empowerment and Promoting Development: Based on the result tracing of interpretability, combined with the hierarchical relationship of the panorama, an improvement path can be provided for preservice teachers, starting with addressing shortcomings in Atomic-level skills, gradually optimizing the coordination of General skills, and ultimately enhancing the segment effect of Container-level skills. This makes the improvement direction clearer and practice more targeted, truly realizing the empowering value of evaluation for professional development [9].

## **4. Conclusions**

The panorama of teaching skill evaluation for preservice teachers constructed in this study fills the era-specific gap in traditional evaluation systems. By incorporating skills such as Curriculum-based Ideological and Political Skills and AI Application Skills into the evaluation framework, it breaks through the neglect of information-based teaching and value guidance in traditional indicators, enabling the evaluation system to respond to the requirements of educational reform in the new era. It also establishes a hierarchical framework with both systematicness and operability: the hierarchical design of teaching skills not only reflects the systematicness of teaching skills through whole-process integration but also ensures the operability of evaluation through observable Atomic-level skills, providing a logically clear and practically feasible theoretical framework for the intelligent evaluation of preservice teachers' teaching skills. Additionally, it strengthens the transparency of educational logic in intelligent evaluation: the hierarchical correlation of the panorama offers a natural path for the interpretability of intelligent evaluation, allowing the output results of technical models to be traced back to specific teaching behaviors and fundamentally enhancing the educational rationality and credibility of intelligent evaluation.

Based on the existing research results, future exploration can be deepened in multiple aspects: although the current panorama includes general skills across disciplines, it is highly targeted at the information technology discipline. In the future, by adjusting discipline-specific indicators, an evaluation paradigm of "commonality + individuality" applicable to multiple disciplines can be constructed; at the same time, combined with the characteristics of basic education in different regions, regionally adaptive panorama variants can be developed. Based on the indicator system of the panorama, further training and testing of machine learning models can be conducted: by collecting large-scale teaching practice data of preservice teachers, the accuracy of the model's feature extraction for Atomic-level skills and General skills can be optimized; combined with interpretability methods such as LIME and SHAP, the consistency between technical interpretation and panorama logic can be verified, forming an intelligent evaluation tool with both precision and interpretability.

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