

Developing Pedagogical Vision through Pedagogical Observation: A Conceptual Framework for Pre-Service Biology Teacher Education

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Abstract. Contemporary teacher education increasingly emphasizes the development of future teachers' ability to perceive, interpret, and make informed pedagogical decisions in authentic classroom situations. Thus, pedagogical vision has become an essential component of professional teacher preparation. Although contemporary educational research has generated substantial knowledge on teacher noticing, reflective practice, classroom observation, and professional vision, researchers predominantly examine these concepts as separate theoretical perspectives and provide only limited explanation of how they interact during pre-service teacher education. Building upon contemporary research on classroom observation, this study theoretically substantiates the role of pedagogical observation in shaping pedagogical vision among pre-service biology teachers and develops a conceptual framework explaining the mechanisms underlying this process. To achieve this aim, the study applies systematic literature analysis, comparative analysis of contemporary pedagogical concepts, abstraction, theoretical synthesis, and conceptual modelling. As a result, the study integrates teacher noticing, reflective practice, classroom observation, and professional vision into a coherent conceptual framework that conceptualizes pedagogical observation as a professional environment in which professional noticing, reflective interpretation, and pedagogical analysis interact. Consequently, the framework demonstrates that existing observation instruments can support not only the evaluation of educational quality but also the deliberate development of pedagogical vision and professional thinking among future teachers. The proposed framework therefore provides a theoretical foundation for developing methodologies that organize pedagogical observation and supports future empirical research on the formation of pedagogical vision in pre-service biology teacher education.

Keywords: pedagogical vision; teacher noticing; reflective practice; classroom observation; pedagogical observation; pre-service biology teachers; teacher education; conceptual framework.

JEL Classification: I21, I28

Formulas: 0; fig. 1; tabl. 0; bibl. 17

Introduction. Contemporary teacher education is undergoing a significant transformation. Whereas traditional approaches primarily emphasized the acquisition of professional knowledge, instructional skills, and the reproduction of established teaching practices, current educational research increasingly focuses on developing future teachers' capacity to perceive, interpret, and make sense of complex classroom situations. Within this context, the expected outcome of teacher preparation extends beyond methodological competence to include the development of pedagogical vision, which enables teachers to make informed and context-sensitive instructional decisions in authentic educational settings.

This challenge has stimulated the emergence of several influential theoretical perspectives in international educational research, including *teacher noticing*, *reflective practice*, *classroom observation*, and *professional vision*. Each of these concepts explains a particular dimension of teacher professional development, ranging from the ability to recognize pedagogically significant events and critically reflect on professional experience to analysing classroom situations and developing a holistic understanding of teaching practice. However, these perspectives have largely evolved as independent conceptual traditions, making it difficult to explain how their underlying processes interact during the professional preparation of future teachers.

The issue is particularly relevant in the preparation of pre-service biology teachers. Contemporary biology teachers are expected not only to possess strong disciplinary knowledge and effective instructional strategies but also to analyse students' learning processes, identify conceptual difficulties, evaluate the effectiveness of pedagogical decisions, and adapt instruction to diverse educational contexts. Ongoing educational reforms, including the implementation of the New Ukrainian School, further reinforce the need to develop pedagogical vision as an essential component of future teachers' professional competence.

Against this background, there is a growing need to reconsider pedagogical observation not simply as a component of teaching practice or a technique for lesson analysis, but as a professional environment in which *teacher noticing*, *reflective practice*, and *pedagogical analysis* become integrated into a coherent process of professional learning. From this perspective, pedagogical observation serves not only as a means of examining classroom practice but also as a mechanism through which pedagogical vision gradually develops. To address this theoretical challenge, the present study proposes a conceptual framework explaining how pedagogical observation contributes to the formation of pedagogical vision among pre-service biology teachers through the integration of teacher noticing, reflective practice, and pedagogical analysis.

Literature Review. Contemporary research on initial teacher education increasingly focuses on developing future teachers' capacity to perceive,

interpret, and make sense of classroom situations from a professional perspective. Within the international educational discourse, explanations of this process have gradually evolved through several interconnected theoretical strands, each elucidating a distinct dimension of teacher professional learning and development.

One of the foundational and most influential theoretical approaches explaining how teachers learn to recognize pedagogically significant classroom events is the concept of *teacher noticing*. Within this framework, professional perception is conceptualized not as an innate ability but as a competence cultivated through initial teacher education and professional practice (Sherin & van Es, 2009; Jacobs et al., 2010).

Initially, the concept of *teacher noticing* primarily emphasized teachers' ability to selectively attend to pedagogically significant classroom events. Subsequent research substantially broadened its scope, demonstrating that professional noticing involves not only identifying relevant events but also analysing, interpreting, and making pedagogically appropriate instructional decisions (Sherin, 2001; Barnhart & van Es, 2015; van Es & Sherin, 2025).

Recent studies further illustrate the evolution of the *teacher noticing* framework. Whereas earlier research primarily conceptualized noticing as an individual cognitive capability, contemporary scholarship increasingly emphasizes its sociocultural, practice-based, and context-dependent nature, highlighting its close relationship with teachers' professional experience and ongoing professional learning (van Es & Sherin, 2025; *Mathematics Teacher Noticing Frameworks*, 2026; *Toward Theoretical Synergies in Mathematics Teacher Noticing*, 2026).

Despite its substantial contribution to understanding how teachers perceive and interpret pedagogically significant classroom events, the concept of *teacher noticing* remains primarily concerned with the processes of attending to and interpreting instructional situations. This limitation has encouraged the development of broader theoretical perspectives aimed at explaining teachers' holistic professional perception of classroom practice, most notably through the concept of *professional vision*.

The continued development of research on teacher professional learning has demonstrated that professional noticing alone is insufficient for making well-founded pedagogical decisions. Recognizing pedagogically significant classroom events must be accompanied by critical reflection, enabling teachers not only to interpret what they observe but also to evaluate its educational significance and implications for their professional practice. This understanding has directed increasing scholarly attention toward the concept of *reflective practice*.

Originally introduced by Donald Schön, the concept of *reflective practice* conceptualizes reflection as an integral dimension of professional activity through which teachers critically examine their own experiences, construct professional understanding, and make informed pedagogical

decisions (Schön, 1983). Unlike approaches that primarily emphasize the perception and interpretation of classroom events, reflective practice is concerned with critically re-evaluating experience as a basis for continuous professional improvement.

Subsequent research has considerably broadened the classical understanding of reflection. Contemporary scholars describe it as a core mechanism of professional development that supports the analysis of pedagogical experience, critical evaluation of one's own teaching, the refinement of professional judgment, and an ongoing readiness to improve educational practice (Loughran, 2002; Zeichner & Liu, 2010; Li, 2025). In this perspective, reflection becomes not merely a response to experience but an essential process through which professional knowledge is continuously reconstructed.

Reflection assumes particular importance in initial teacher education. During teaching practice, it enables pre-service teachers to move beyond simply recognizing pedagogically significant classroom events toward their systematic professional analysis. Through reflective engagement, future teachers integrate theoretical knowledge with authentic classroom experience, gradually developing the capacity to justify and refine their pedagogical decisions (Loughran, 2002; Machost et al., 2024; Li, 2025).

Despite its fundamental contribution to teacher professional development, reflection is still predominantly conceptualized as a process of interpreting experience that has already been acquired. Considerably less attention has been devoted to understanding how such experience is initially generated and what forms of professional preparation provide the conditions necessary for meaningful reflective analysis. Among these, contemporary research increasingly identifies *classroom observation* as a particularly powerful context for developing the professional experience upon which reflective practice is built.

Classroom Observation as a Means of Pre-service Teacher Professional Development

The concepts discussed above explain how pre-service teachers learn to recognize pedagogically significant classroom events and critically reflect on their professional experiences. However, they do not fully explain the conditions under which these competencies develop or the forms of professional preparation through which they are cultivated. Within contemporary teacher education research, *classroom observation* is increasingly recognized as one of the principal contexts in which this professional learning takes place.

In the international literature, *classroom observation* is no longer viewed merely as an opportunity for pre-service teachers to observe experienced practitioners. Rather, it is increasingly conceptualized as a purposeful means of professional learning that creates conditions for developing pedagogical reasoning, reflective thinking, and the ability to

analyse authentic classroom situations. Moving beyond its traditional role as an instrument of supervision or evaluation, systematic classroom observation provides the scaffolding through which pre-service teachers develop professional noticing, interpret pedagogically significant classroom events, and progressively learn to justify their instructional decisions (Salazar, 2018; Halim et al., 2018; Siddiqua, 2019).

Subsequent research has considerably expanded the educational role of *classroom observation*. Whereas earlier studies primarily associated observation with the acquisition of practical teaching skills during school placement (Chiromo, 1997), contemporary scholarship conceptualizes it as a multi-layered process of professional development that promotes critical thinking, reflective practice, professional identity formation, and the capacity to analyse one's own teaching (Salazar, 2018; Hockly, 2018). Increasingly, observation is combined with video-based analysis, collaborative dialogue, and structured reflection, significantly enhancing its educational potential.

Contemporary research further demonstrates that the professional effectiveness of *classroom observation* depends not on the number of lessons observed but on the quality of the observation process itself. The most effective models are characterized by clearly defined observation goals, systematic documentation of pedagogically significant events, post-observation analysis, constructive feedback, and guided reflective discussion. Such structured approaches create favourable conditions for the purposeful professional development of pre-service teachers (Grytsyk & Smolina, 2024; Reños & Pontillas, 2024).

Taken together, these findings suggest that *classroom observation* has gradually evolved from a means of familiarizing future teachers with classroom practice into a professional learning environment in which *teacher noticing*, *reflective practice*, and pedagogical analysis become integrated. It is within this environment that the conditions for the emergence of a coherent professional vision are established.

Despite the widespread recognition of *classroom observation* as a key component of initial teacher education, most studies continue to focus on the organization of observation, its procedural stages, or the development of specific professional competencies. Considerably less attention has been devoted to explaining how the outcomes of classroom observation become integrated into the coherent development of teachers' professional vision and subsequently inform pedagogical decision-making. This issue, we argue, opens new opportunities for reconsidering *classroom observation* within the broader conceptual framework of professional vision.

The reviewed literature demonstrates that the concepts of *teacher noticing*, *reflective practice*, *classroom observation*, and *professional vision* illuminate different yet complementary dimensions of teacher professional learning. However, these concepts have largely been investigated as separate

theoretical perspectives or instructional approaches. Their integration into a coherent mechanism explaining the development of pedagogical vision among pre-service biology teachers remains insufficiently explored and requires further theoretical elaboration.

Aims. The aim of this study is to theoretically substantiate the role of classroom observation in the formation of pedagogical vision among pre-service biology teachers and to develop a conceptual framework explaining the mechanisms through which this process evolves by integrating contemporary pedagogical concepts.

Methodology. This study adopts a theoretical research methodology based on systematic literature analysis, comparative analysis of contemporary pedagogical concepts, theoretical generalization, abstraction, conceptual synthesis, and theoretical modelling.

The theoretical framework is based on contemporary international research on teacher noticing, reflective practice, classroom observation, and professional vision, which are examined as interconnected dimensions of pre-service teacher professional development.

The integration of these theoretical perspectives made it possible to theoretically substantiate the role of classroom observation in the formation of pedagogical vision among pre-service biology teachers and to develop a conceptual framework explaining the relationships among the key pedagogical concepts underlying this process.

This is a conceptual study aimed at providing a theoretical explanation of the mechanisms through which pedagogical vision develops in pre-service biology teachers.

Results. The theoretical synthesis of contemporary pedagogical concepts enabled the integration of previous research findings into a coherent conceptual framework (Figure 1) explaining the dynamic role of pedagogical observation in the formation of pedagogical vision among pre-service biology teachers. Unlike existing approaches, which primarily examine *teacher noticing*, *reflective practice*, *classroom observation*, and *professional vision* as relatively independent theoretical perspectives, the proposed framework integrates these concepts into a unified process of professional development.

Within the proposed framework, pedagogical observation is understood not merely as an instructional method or a means of evaluating professional performance, but as an active professional environment in which the key cognitive and reflective processes of teacher development interact. Structured pedagogical observation creates the conditions necessary for the development of teacher noticing, reflective practice, and pedagogical analysis of authentic classroom situations.

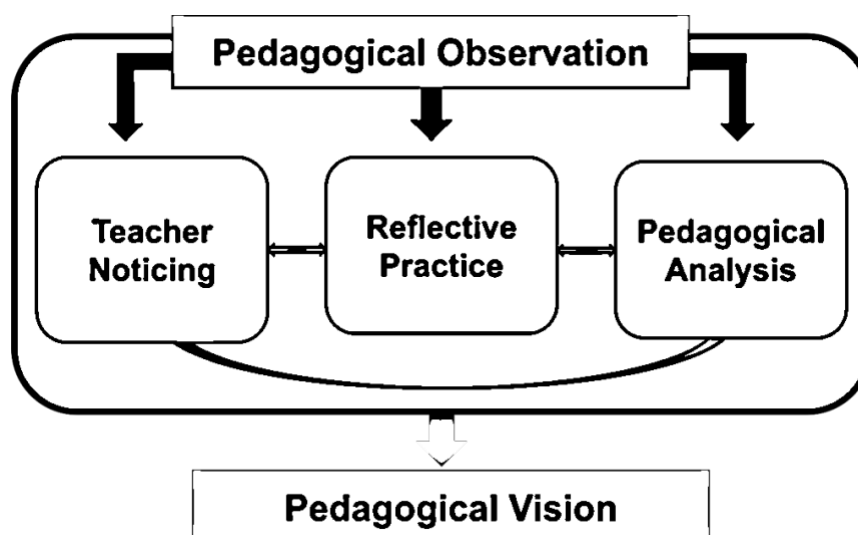


Figure 1. Conceptual framework illustrating how pedagogical observation contributes to the formation of pedagogical vision among pre-service biology teachers

Sources: developed by authors

Teacher noticing constitutes the first component of the framework. It enables pre-service teachers to recognize pedagogically significant classroom events, identify professionally relevant information, and focus attention on students' learning processes and classroom interactions. In the proposed framework, professional noticing serves as the starting point for subsequent pedagogical reasoning by determining which classroom events become the object of further professional reflection and analysis.

The second interconnected component is reflective practice. Reflection extends beyond the description of observed events by supporting their critical interpretation, connecting classroom experiences with professional knowledge, and evaluating possible pedagogical responses. In this way, reflective practice transforms pedagogical observation into a process of professional meaning-making.

Pedagogical analysis represents the integrative component of the proposed framework. It combines information obtained through pedagogical observation with professional knowledge, previous experience, and instructional goals, enabling future teachers to move from interpreting isolated classroom events toward a coherent professional understanding of educational situations.

Teacher noticing, reflective practice, and pedagogical analysis should not be interpreted as consecutive stages of professional development. Instead, they function as interdependent processes that continuously influence and refine one another, creating a cyclical process of professional meaning-making. Their integration within the pedagogical observation environment establishes the conditions necessary for the emergence of

pedagogical vision, conceptualized in the proposed framework as the integrative outcome of pedagogical observation.

Taken together, the proposed conceptual framework demonstrates that pedagogical observation performs a substantially broader role than is traditionally attributed to it in pre-service teacher education. Rather than functioning solely as a means of familiarizing future teachers with classroom practice or evaluating professional performance, pedagogical observation serves as an active professional environment in which pedagogical vision is progressively developed.

Discussion. The proposed conceptual framework provides a theoretical basis for interpreting pedagogical observation not merely as an instructional method or a tool for lesson analysis, but as an active professional environment in which *teacher noticing*, *reflective practice*, and *pedagogical analysis* dynamically interact. The integration of these interconnected processes creates the conditions necessary for the development of pedagogical vision, thereby extending the traditional understanding of the role of pedagogical observation in pre-service teacher education.

Contemporary research generally treats *teacher noticing*, *reflective practice*, *classroom observation*, and *professional vision* as distinct theoretical perspectives, each explaining a particular dimension of teacher professional development. The conceptual framework proposed in this study brings these perspectives together into a coherent developmental process. As a result, pedagogical observation is reconceptualized not only as a means of professional learning but also as a mechanism that links professional noticing, reflective interpretation, and pedagogical analysis of classroom situations.

Importantly, the proposed conceptual perspective does not challenge existing approaches to classroom observation but rather complements and extends them from the standpoint of pre-service teacher education. In Ukraine, a comprehensive regulatory framework for lesson observation has been established by the State Service for Quality of Education within the institutional school audit system. These observation instruments provide a detailed set of criteria for analysing instructional quality, teacher–student interaction, the integration of educational technologies, inclusive practices, and formative assessment. Consequently, they establish a solid normative baseline for evaluating educational quality while remaining fully consistent with the principles of the New Ukrainian School reform.

From the perspective of teacher education, however, the educational potential of these observation instruments extends well beyond their original regulatory purpose. In their primary function, they serve as a structured algorithm for systematically observing and documenting indicators of educational quality during institutional audits. When incorporated into university-based teacher education, particularly during teaching practice, the same observation framework can support the development of pedagogical

vision through the cultivation of *teacher noticing*, reflective interpretation of pedagogical situations, and pedagogical analysis. In this context, observation criteria become not the final objective of the process but rather the cognitive starting point for developing future teachers' professional thinking. It is precisely this theoretical reframing of the role of pedagogical observation that is reflected in the conceptual framework proposed in this study.

The proposed approach also opens new possibilities for organizing the teaching practice of pre-service biology teachers. Pedagogical observation may be employed not only to familiarize students with the work of experienced teachers but also to deliberately foster pedagogical vision through structured observation, reflective discussion, pedagogical analysis, and collaborative interpretation of authentic classroom situations.

Finally, the proposed conceptual framework establishes a theoretical foundation for future empirical research on the formation of pedagogical vision among pre-service teachers. Future studies should focus on developing a methodology for organizing pedagogical observation, identifying indicators of pedagogical vision, and experimentally examining the effectiveness of the proposed conceptual approach within biology teacher education.

Conclusions. This theoretical study integrates the contemporary concepts of teacher noticing, reflective practice, classroom observation, and professional vision into a coherent framework explaining the formation of pedagogical vision among pre-service biology teachers. The developed framework conceptualizes pedagogical observation as a professional environment in which professional noticing, reflective interpretation, and pedagogical analysis interact. The integration of these interconnected processes creates the conditions necessary for the development of pedagogical vision as an essential component of pre-service teacher education.

The theoretical reframing of pedagogical observation broadens its traditional role within teacher education. The framework demonstrates that existing observation instruments can be employed not only to evaluate the quality of educational practice but also to deliberately foster pedagogical vision, professional thinking, and the capacity to conduct well-founded pedagogical analyses of classroom situations.

The proposed approach provides a theoretical foundation for future research on the professional preparation of biology teachers. The next stage of this research should focus on developing a methodology for organizing pedagogical observation, identifying indicators of pedagogical vision, and empirically examining the effectiveness of the proposed approach. Advancing these research directions will contribute to both the theoretical understanding and the practical implementation of pedagogical vision development in pre-service biology teacher education.

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