

The Role of Forecasting Skills in Competency-Based Education for Master's Students

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This conceptual review examines the role of forecasting skills in competency-based education for master's students preparing for professional careers in pedagogy. It synthesises pedagogical, psychological, and methodological scholarship on competence, forecasting, and prognostic activity in order to clarify the structure and educational significance of prognostic competence. The review indicates that prognostic competence extends beyond the acquisition of theoretical knowledge. It integrates diagnostic analysis, anticipation of alternative outcomes, pedagogical modelling, evidence-informed decision-making, and reflective regulation of professional action. The article proposes that these capacities should be developed across the master's curriculum rather than confined to a single course. Problem-based learning, scenario analysis, research projects, practicum-based forecasting tasks, and structured reflection are identified as particularly suitable pedagogical mechanisms. The analysis also distinguishes exploratory, programmatic, project, and organisational forecasts and relates them to expert, factographic, statistical, and extrapolative methods. It is concluded that the systematic development of forecasting skills can strengthen master's students' analytical thinking, research competence, professional judgement, and readiness to manage uncertainty in educational practice.

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Introduction

Contemporary education operates in conditions of rapid technological change, shifting labour-market expectations, and growing pressure on educational institutions to demonstrate the relevance of graduate learning. In this environment, the preparation of future educators

can no longer be organised solely around the transmission of subject knowledge. Competency-based education instead emphasises what learners can understand, apply, evaluate, and produce in authentic professional situations. Professional competence is therefore treated as an integrated combination of knowledge, practical skills,

attitudes, values, and the capacity to act responsibly in context (Allahverdiyeva, 2023; Burganova et al., 2016).

This shift is especially important at the master's level. Master's students are expected not only to apply established methods but also to interpret complex situations, conduct research, design interventions, and justify professional decisions. Recent studies link competence development with career preparedness, perceived employability, leadership capacity, and the ability to use knowledge in uncertain environments (George & Paul, 2024; Martsenyuk et al., 2025). Research competence and digital competence have likewise been associated with stronger academic and professional performance, although their effects depend on students' ability to integrate knowledge with purposeful action (Allahverdiyeva, 2023; Rodafinos et al., 2024; Sutiadiningsih et al., 2025).

One competence that brings these expectations together is prognostic competence: the capacity to anticipate plausible developments, assess alternative outcomes, and use such assessments to guide present decisions. Teaching is intrinsically future-oriented. Educators formulate objectives, anticipate learner difficulties, select instructional strategies, evaluate probable consequences, and revise plans in response to emerging evidence. Forecasting is therefore not an additional administrative task imposed on pedagogical work; it is embedded in lesson planning, curriculum design, assessment, learner support, research, and educational management (Allahverdiyeva, 2026).

The importance of prognostic competence is nevertheless not always made explicit in teacher-education programmes. Curriculum documents may refer to analysis, planning, evaluation, innovation, and research without identifying the forecasting processes that connect these capacities. As a result, students may acquire separate techniques without developing a coherent method for reasoning from current evidence to possible future conditions. Zahir (2025) similarly argues that prediction-related competence deserves focused attention in the preparation of future educators at the master's level.

This article addresses that conceptual gap by examining the role of forecasting skills in competency-based master's education. Its objectives are to clarify the relationship between competence and forecasting, synthesise the principal components of prognostic competence, classify relevant forecasting types and methods, and identify pedagogical approaches through which these skills can be developed systematically in future educators.

2. Methodology

The article employs a conceptual and narrative review methodology. Rather than testing an intervention or reporting original empirical data, it analyses and synthesises theoretical positions represented in pedagogical, psychological, and methodological scholarship. The source base includes foundational discussions of professional competence and pedagogical forecasting as well as recent studies of competence development among students in higher education.

The analysis proceeded through three interpretive stages. First, definitions of competence, forecast, forecasting, anticipation, and prognostic competence were compared to identify their common conceptual elements. Second, classifications of prognostic skills and forecasting methods were examined to determine the principal functional components of prognostic competence. Third, these components were related to the learning outcomes and pedagogical practices associated with competency-based master's education. Particular attention was given to the work of Makarova (2012), Regush (1985), Sevastyuk (2000), Zakharov (2010), and other scholars who explicitly connect forecasting with professional pedagogical preparation.

Because the reviewed literature originates from several academic traditions and languages, terminology varies across sources. In this article, forecasting refers to the cognitive and methodological process of constructing reasoned assumptions about possible future states or outcomes. Prognostic competence refers to the integrated professional capacity to perform that process appropriately and to use its results in

planning, decision-making, implementation, and evaluation.

3. Conceptual Foundations of Prognostic Competence

3.1 Competence as integrated professional capacity

Competence is commonly distinguished from the possession of isolated knowledge or skills. Dneprov (2002) describes it as readiness to mobilise available knowledge, skills, and methods of action in response to theoretical and practical tasks. Zimnyaya (2000) similarly presents competence as an integrative capacity that becomes visible through effective performance. From this perspective, competence is not a static store of information. It is demonstrated when an individual selects and coordinates relevant resources in a specific professional situation.

This interpretation is particularly suitable for teacher education because pedagogical situations are rarely fully predictable or technically uniform. Teachers must combine subject knowledge, psychological understanding, ethical judgement, communication, classroom management, and reflective evaluation. Markova (1990) identifies professional knowledge, pedagogical skills, psychological orientations, and personal qualities as interdependent elements of teachers' professional competence. Prognostic competence should therefore be understood as a cross-cutting capacity that organises these elements around future-oriented judgement.

3.2 Forecasting as disciplined anticipation

A forecast is a reasoned proposition about a possible future condition, the pathways through which it may emerge, and the time frame of its development. It does not claim to remove uncertainty or provide a guaranteed description of the future. Rather, forecasting offers a scientific and practical basis for evaluating alternatives before decisions are made. Bestuzhev-Lada (1982) emphasises that the principal function of forecasting is to strengthen the justification of plans and programmes, while Nikitina (2012) defines a forecast in relation to possible future states and alternative routes to their realisation.

Babaoglu (2012) draws a useful distinction between forecasting and planning. Forecasting considers how events may develop; planning specifies how decision makers intend them to develop. The two processes are interdependent because credible planning requires an assessment of probable conditions, risks, and consequences. In pedagogical practice, this distinction can be observed whenever a teacher anticipates learner responses before selecting a method, or when programme designers estimate the effects of curricular change before implementation.

Forecasting is closely related to anticipation. Regush (1985) treats it as goal-directed cognitive activity through which information about forthcoming events is constructed. Tarasova (2014) likewise understands prognostic activity as an anticipatory representation of the future based on the scientific interpretation of past and present conditions. Tsalko (2016) places emphasis on the acquisition and organisation of prognostic information. Taken together, these positions suggest that forecasting involves evidence collection, interpretation of trends, formulation of alternatives, estimation of probability, and conscious use of the resulting judgement.

4. Structure and Development of Prognostic Competence

4.1 Diagnostic and analytical capacity

Forecasting begins with diagnosis. A future-oriented judgement is credible only when it is grounded in an accurate understanding of the current situation and the factors that produced it. For future educators, this means collecting and interpreting information about learners, groups, learning environments, curriculum requirements, and available resources. Khubieva (2003) includes the collection of diagnostic information about individual students and groups among the fundamental components of prognostic activity. Diagnostic capacity also requires the ability to distinguish stable patterns from temporary events and relevant indicators from background information. At the master's level, students should be able to combine qualitative observations, assessment evidence, research findings, and contextual knowledge. The

objective is not to generate a mechanically precise prediction, but to construct an evidence-informed account of what may occur under specified conditions.

4.2 Anticipation and modelling of alternatives

The second component is the ability to generate and compare alternative developmental scenarios. Khubieva (2003) associates prognostic competence with formulating hypotheses about individual and group development, anticipating results, and designing individual development programmes. Sevastyuk (2000) adds the abilities to represent the possible development of the forecasting object, formulate pedagogical hypotheses, extrapolate pedagogical knowledge, and use modelling methods.

Scenario construction is particularly valuable in pedagogy because educational outcomes emerge from interactions among multiple factors. A master's student might, for example, compare the likely effects of direct instruction, collaborative learning, and problem-based learning for a particular group. Each scenario would specify assumptions, expected learner responses, probable difficulties, evidence to be monitored, and conditions under which the strategy should be revised. Such exercises transform forecasting from intuition into transparent professional reasoning (Allahverdiyeva, 2026).

4.3 Decision-making and pedagogical design

Prognostic competence is incomplete unless forecasts inform action. The educator must translate anticipated outcomes into objectives, instructional choices, intervention plans, and criteria for evaluation. Davkush (2018) therefore defines teachers' prognostic competence as an integrative quality that combines professional knowledge, personal characteristics, value orientations, practical skills, motivation, and a value-based attitude toward prognostic activity. Zakharov (2010) describes the formation of prognostic competence as a purposeful process involving knowledge of forecasting, mastery of prognostic actions, and acquisition of generalised methods for producing forecasts. Makarova (2012) similarly argues for contextual,

competency-based, systemic, person-centred, and activity-based approaches. These perspectives indicate that students should repeatedly move through a complete cycle: analyse the situation, formulate alternatives, select an action, justify the selection, implement it, and evaluate the result.

4.4 Reflection and regulation

Forecasts are provisional and must be revised when new evidence appears. Reflective regulation is therefore a central component of prognostic competence. Students need to compare anticipated and actual outcomes, identify incorrect assumptions, revise models, and explain how their decision-making should change. This process supports calibration: the gradual improvement of judgement through systematic attention to the accuracy and limitations of previous forecasts.

Reflection also has an ethical dimension. Forecasts about learners can become harmful if they are treated as fixed labels rather than revisable hypotheses. Competency-based teacher education should therefore require students to distinguish evidence-based anticipation from stereotyping, communicate uncertainty responsibly, and preserve learners' opportunities for development. Prognostic competence is strongest when it combines analytical rigour with professional humility.

5. Types and Methods of Educational Forecasting

Bestuzhev-Lada's (1982) typology distinguishes four useful forms of forecasting. An exploratory forecast asks what is likely to happen if current trends continue. A programmatic forecast identifies what is required to achieve a desired outcome. A project forecast develops a concrete representation of a future condition under specified assumptions. An organisational forecast determines which present decisions are needed to move a system toward its intended state. These forms are complementary: exploratory analysis clarifies the baseline, programmatic and project forecasts specify alternatives, and organisational forecasting links the preferred alternative to action.

Forecasts may also be classified by time horizon and degree of reliability. Short-term forecasts can guide immediate teaching decisions, whereas medium- and long-term forecasts are more relevant to programme development, institutional planning, and professional growth. Reliability should be expressed in terms of evidence and probability rather than certainty. A responsible forecast makes its assumptions visible and indicates the conditions under which its conclusion may no longer hold.

The literature identifies expert, factographic, statistical, and extrapolative methods. Expert methods synthesise the judgements of qualified specialists and may be individual or collective, anonymous or open, and single-stage or multistage. Factographic methods rely on documented information about the present condition and developmental history of the object. Statistical methods identify regularities in quantitative data, while extrapolation projects patterns observed in past and present data into future periods.

Digital tools have expanded opportunities to combine these approaches. Recent work demonstrates how prior academic performance and competence indicators can be used to forecast educational outcomes (Melnykov et al., 2024). Such models can support professional judgement, but they should not replace it. Educational data are context-dependent, and statistical accuracy does not by itself establish pedagogical appropriateness. Master's students therefore need both methodological literacy and the capacity to interpret model outputs critically.

6. Implications for Competency-Based Master's Education

The development of prognostic competence should be distributed across the master's programme rather than assigned exclusively to one discipline. Research-methods courses can develop evidence interpretation and hypothesis formation; pedagogy courses can develop scenario analysis and instructional design; practicum experiences can connect forecasts with authentic learner responses; and thesis work can strengthen long-term planning, methodological justification, and reflective evaluation. This

integrated approach also aligns forecasting with the development of research competence described by Allahverdiyeva (2023).

Problem-based learning is particularly appropriate because it presents students with incomplete information and requires them to justify decisions under uncertainty. A well-designed task may ask students to diagnose a pedagogical problem, generate several plausible developments, estimate risks, select an intervention, and identify evidence that would confirm or challenge the forecast. Assessment should reward the quality of reasoning, not simply whether one predicted outcome eventually occurs.

Scenario analysis can complement problem-based learning. Students can construct optimistic, probable, and adverse scenarios for such issues as learner engagement, technology adoption, curriculum reform, or inclusive education. They can then compare the consequences of different decisions across scenarios. This practice helps students understand that a robust pedagogical decision is not necessarily the one that performs best under a single assumption, but the one that remains defensible across several plausible conditions.

Research projects provide another important mechanism. Master's students can analyse historical and current data, identify patterns, formulate forecasts, and compare them with later evidence. Digital competence is relevant here because educational forecasting increasingly involves data collection, visualisation, and interpretation. However, digital tools become educationally valuable only when they are integrated with professional purpose, critical evaluation, and ethical judgement (Rodafinos et al., 2024; Sutiadiningsih et al., 2025).

Finally, assessment of prognostic competence should use authentic and developmental evidence. Suitable tasks include written scenarios, annotated lesson plans, research proposals, risk analyses, practicum journals, and oral defences of professional decisions. Rubrics can evaluate the quality of diagnosis, use of evidence, plausibility of alternatives, transparency of assumptions, justification of decisions, and responsiveness to new information. Such assessment is consistent

with competency-based education because it evaluates integrated performance rather than isolated recall.

7. Discussion

The literature reviewed in this article supports a view of prognostic competence as an organising capacity within teachers' broader professional competence. It connects analysis with planning, research with practice, and present evidence with future-oriented action. This helps explain why forecasting is relevant across instruction, assessment, learner development, curriculum design, and educational leadership rather than being confined to strategic planning.

A central implication is that forecasting skills should not be taught as formulas detached from pedagogical context. Their development depends on repeated engagement with authentic problems, explicit comparison of alternatives, and feedback on the reasoning process. The activity-based and contextual principles proposed by Makarova (2012) are therefore especially important. Students learn to forecast by performing and examining prognostic actions, not simply by memorising definitions.

The analysis also highlights the need for calibration and ethical safeguards. Forecasts can create false confidence when uncertainty is hidden, and predictions about learners can reinforce bias when categories are treated as fixed. Master's-level preparation should require students to state limitations, consider alternative explanations, monitor unintended effects, and revise decisions when evidence changes. These practices distinguish professional forecasting from unsupported speculation.

Although contemporary scholarship increasingly recognises the importance of competence development, systematic research on pedagogical prognostic competence remains limited. Future empirical studies should develop valid assessment instruments, examine the effects of scenario-based and practicum-based interventions, and investigate how forecasting

competence transfers across educational contexts. Longitudinal research would be especially useful for determining whether improvements observed during master's study influence later professional decision-making.

8. Conclusion

Forecasting skills are a necessary component of competency-based education for master's students in pedagogy because professional educational activity is inherently future-oriented. Educators must diagnose current conditions, anticipate possible developments, compare alternatives, design appropriate actions, and revise their judgements in light of new evidence. Prognostic competence integrates these processes into a coherent professional capacity. The review identifies four closely related dimensions: diagnostic and analytical capacity, anticipation and modelling, decision-making and pedagogical design, and reflective regulation. These dimensions

can be developed through problem-based learning, scenario analysis, research projects, practicum tasks, and authentic assessment. Their integration across the curriculum is more likely to produce durable competence than isolated theoretical instruction.

Accordingly, the development of prognostic competence should be treated as a priority in the preparation of future educators at the master's level. When grounded in evidence, expressed with appropriate uncertainty, and linked to reflective action, forecasting can strengthen analytical thinking, research capability, professional judgement, and the quality of pedagogical decision-making.

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