Diagnostics in the Teacher's Hands: How to See the Invisible

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Annotation

In this article I show that the diagnostics of mental mechanisms is not an "additional workload" for the teacher, but his main professional instrument. Drawing on the CCFP model presented in previous issues of the series, on the principles of dynamic and formative diagnostics, as well as on current research of 2024-2026 in the field of pedagogical education, I substantiate that without diagnostics the teacher works blindly - he does not know from which level to begin, does not see progress, and cannot correct his strategy. I propose a system of diagnostic instruments for each of the eleven mental mechanisms, placing the accent on the priority of the diagnostics of the core, show how diagnostics becomes an integral part of the lesson, and not a separate event, and describe how exactly the future teacher must master the diagnostic competence in the pedagogical university. I pay special attention to the fact that diagnostics in the CCFP model is not "measurement," but "looking into": the ability to see the invisible, to recognize growth where traditional assessment sees only "right" or "wrong."

Keywords: diagnostics, mental mechanisms, core and support, dynamic diagnostics, formative assessment, pedagogical observation, portfolio, reflection, teacher preparation.

Introduction: Why the Teacher Must Be Able to Diagnose

In the previous article [6] I substantiated that mental mechanisms must become the core of the teacher's professional competence. But to know the mechanisms is only half the job. The second, no less important half is to be able to diagnose them. Why is this so important? Because without diagnostics there is no management of development. A teacher who does not know at which level each student is for each mechanism cannot determine where to begin; cannot choose adequate methods and tasks; cannot see whether his strategy works; cannot correct his approach if something goes wrong. It is like a doctor who tries to treat without making a diagnosis: he can act by intuition, but real treatment begins only when he sees what exactly is happening with the organism. So too the teacher: without diagnostics he works blindly, relying on general conceptions, and not on precise knowledge of where the student is and where he must move.

Traditional assessment does not see thinking. It sees only the result - a right or wrong answer. But it does not see the process - how the student arrived at this answer, what reasoning he built, what mistakes he made and how he corrected them. Moreover, diagnostics is not an "addition" to the lesson, but a part of it. As I already showed in the articles on the principle of dual purpose [2], diagnostics must be embedded in learning itself, and not be a separate event. Research confirms: "the ability to effectively assess learning situations is a critical component of teachers' professional competencies, especially in the diagnostics of learning difficulties and the potential of students in heterogeneous classes" [7]. Moreover, research shows that "teacher education programs should systematically integrate reflective pedagogical projects, formative assessment rubrics and culturally relevant learning tasks into their curricula" [7]. A 2025 study also emphasizes: "there is a growing consensus that students should learn 21st-century competencies" [12]. But this consensus must extend also to assessment: we must assess not knowledge, but competence. Not the static, but the dynamics. Not the result, but the process. That is precisely why I insist: diagnostics is the first and main competence of the "architect of thinking." Without it all the other competencies lose their meaning.

Why Traditional Assessment Does Not See Thinking

Before speaking of the new diagnostics, I must clearly say why the old assessment system is not simply ineffective, but harmful. It assesses the static, and not the dynamics. Traditional assessment is a cross-section at a particular moment in time. It shows what the student knows "here and now." But it does not show how he has changed compared with the previous time, how he is progressing, what his rates of development are. It assesses facts, and not thinking. Traditional assessment measures knowledge of facts and the ability to apply algorithms. It does not see the process of thinking - how the student arrived at the answer, what reasoning he built, what mistakes he made and how he corrected them. It creates a fear of error. Traditional assessment punishes for mistakes. This creates a fear of error that suppresses creativity, experimentation, and risk. And without risk there is no development. It orients toward the "correct answer." Traditional assessment presupposes that there is one correct answer to every question. But in real life most problems do not have a single correct solution. An orientation toward the "correct answer" forms conformist thinking, and not critical thinking. It does not take individual trajectories into account. Traditional assessment uses uniform criteria for all students. But every child is unique, each has his own pace of development and his own strengths. An assessment that does not take individuality into account is unjust and demotivating. As a 2025 study notes, "critical thinking is a fundamental higher-order thinking skill in mathematics education," but "inadequate assessment instruments create problems" [10]. Teachers report that "the use of rubrics and materials facilitates assessment, while critical thinking is regarded as a skill that develops over time" [10]. It is precisely this "develops over time" that is the key. Traditional assessment does not see time. It sees only a point. And diagnostics in the CCFP model sees the trajectory. It is like the difference between a photograph and a film: the photograph captures a moment, but only the film shows movement, development, and life.

Principles of Diagnostics: From Measurement to Looking Into

On the basis of all that has been said, I formulate five key principles of diagnostics in the CCFP model [2]. The first is the principle of dynamic diagnostics. Diagnostics must measure not a static level, but progress. Not "what the student knows now," but "how he has changed compared with the previous time." Not "right or wrong," but "how he has advanced in the development of a skill." Research confirms the effectiveness of the dynamic approach. In dynamic assessment "the teacher does not simply give simple feedback like 'That is right,' but provides elaborated feedback like 'Why did you say that?' or 'How did you know the answer?'" Such an approach "diagnoses the actual performance of students and the levels of their future potential" [9]. The second principle is embeddedness. Diagnostics must be embedded in the lesson, and not be a separate event. Not "first we teach, then we check," but "we teach and diagnose simultaneously." Every task is at once both learning and diagnostics. Every answer of the student is not only a result, but also diagnostic material. The third principle is the multiplicity of instruments. Diagnostics must use a multitude of instruments for the triangulation of conclusions. Not one test, but a complex of methods: observation, portfolio, self-assessment, mutual assessment, analysis of activity products, and diagnostic tasks. The fourth principle is the formative character. Diagnostics must be an instrument of development, and not only of ascertainment. Not "make a diagnosis and forget," but "give feedback that helps one move further." Research shows that "formative assessment" effectively improves critical thinking skills [9]. The fifth principle is individualization. Diagnostics must take into account the individual trajectory of each student. Not to compare students with each other, but to compare the student with himself. Not "how he looks against the background of others," but "how he grows compared with himself."

What and How to Diagnose: The Eleven Mechanisms

Now I will turn to the most important thing: what exactly the teacher must diagnose and how. It is critically important to emphasize: in the CCFP model priority in diagnostics is given to the mechanisms of the core. If the core is not formed in the student, the diagnostics of the supporting level is meaningless - it will show only the presence or absence of "instruments" that no one has to use. For each of the eleven mental mechanisms [1] I propose concrete diagnostic questions and indicators. The construction of cause-and-effect relationships (MM-1, core): what is diagnosed is the ability to build logical chains, to explain "why," to see multiple causes, to distinguish cause and effect, correlation and causality. How to diagnose? Through the analysis of oral and written explanations, tasks on building a sequence, and the search for causes. Indicators of progress: initial level - names one cause, does not see connections; intermediate - names several causes, builds a simple chain; high - sees multiple causes, distinguishes types of connections. Emotional intelligence (MM-3, core): what is diagnosed is the precision of naming emotions,

the ability to explain their causes, to relate the experiences of characters to one's own experience, and the richness of the emotional vocabulary. Instruments: "Diary of Emotions," analysis of the emotional content of texts, and observation. Indicators: initial - 3-4 basic emotions, does not explain causes; intermediate - 7-10 emotions, can explain causes; high - rich vocabulary, deep understanding, developed empathy. Socratic dialogue (MM-5, core): what is diagnosed is the quality of the student's questions (superficial or deep, closed or open), the ability to reformulate and clarify, and to conduct a dialogue, and not a monologue. Observation of participation in discussions, analysis of questions about a text, and reflective reports. Critical thinking (MM-6, core): what is diagnosed is the ability to find errors in reasoning, to adduce counterexamples, to evaluate the reliability of information, to distinguish facts from interpretations, and to identify hidden assumptions. Tasks on finding errors, evaluating sources, and analyzing argumentation. Indicators: initial - does not notice errors, accepts on faith; intermediate - notices obvious errors, evaluates simple sources; high - actively seeks errors, evaluates complex sources, identifies hidden assumptions. Spatial imagination (MM-10, core): what is diagnosed is the precision of visualization, the ability to mentally rotate objects, to move between 2D and 3D, and to see sections and projections. Tasks on the mental rotation of figures, visualization, and work with 3D models. Forecasting and strategic thinking (MM-11, core): what is diagnosed is the precision and well-groundedness of forecasts, the ability to see alternative scenarios, and to plan a strategy. The POE (Predict-Observe-Explain) method, tasks on strategic planning, and analysis of strategies in games. Eloquence and conciseness (MM-2, support): what is diagnosed is the clarity and precision of formulations, the structuredness of speech, persuasiveness, and conciseness. Analysis of oral presentations (including video recordings), written works, and observation of participation in dialogues. Indicators: initial - short simple sentences, speech unstructured; intermediate - structured, there are arguments, but not always persuasive; high - clear, structured, persuasive, adapted to the audience. Long-term memory (MM-4, support): what is diagnosed is the volume of memorized information, the speed and quality of reproduction, the use of mnemonics, and structuredness. Tasks on memorization and reproduction, analysis of the structuring of information (schemes, maps), and observation of the use of devices. Constructive argument (MM-7, support): what is diagnosed is the logic and well-groundedness of arguments, the ability to listen and reformulate the opponent's position, emotional control, and readiness to acknowledge different interpretations. Observation of participation in debates, analysis of argumentation, and self-assessment. Non-verbal communication and charisma (MM-8, support): what is diagnosed is the ability to "read" body language, to consciously use gestures, facial expressions, and intonation, bodily expressiveness, and contact with the audience. Video recordings of performances, observation of non-verbal communication, and self-assessment. Information search and analysis (MM-9, support): what is diagnosed is the ability to formulate queries, to evaluate sources, to analyze and structure information, and to interpret data. Tasks on information search, analysis of work with sources, and interpretation of data (graphs, tables). Research confirms the importance of such an approach. As a 2025 study notes, "the design of instruction conducive to critical thinking is a most important competence for future teachers" [11]. And "the ability to assess learning situations is a critical component of teachers' professional competencies" [7].

Instruments of Diagnostics: From Observation to Portfolio

Now I will turn to the concrete instruments that the future teacher must master. These instruments are not simply "methods." They are ways of interacting with that "rich cognitive niche" (Issue 3, Art. 13) that the teacher creates in the classroom. The first and most basic instrument is pedagogical observation. A teacher who knows how to observe sees what others do not notice: how the student approaches a task, what strategies he uses, where he stumbles, and how he reacts to difficulties. To master this instrument one needs the ability to focus on concrete mechanisms (not "observe in general," but "observe the manifestations of MM-6"), to record observations (notes, video, audio), to analyze them and draw conclusions. Research shows that "video vignettes" can be an effective instrument for developing the diagnostic skills of future teachers: students watch video recordings of lessons and learn to see what happens at the level of the students' thinking [7]. The second instrument is the analysis of activity products. Any product created by the student is diagnostic material. An essay, a solution of a task, a drawing, a project, a presentation - all of this carries information about the level of development of mental mechanisms. One must be able to "read" activity products (not only to evaluate correctness, but also to see the process), to single out diagnostic signs, and to compare products over time. The third instrument is diagnostic tasks. These are specially designed tasks that reveal the level of development of concrete mechanisms. For example, for MM-1: "Explain why this happened" (and not "what happened"); for MM-6: "Find the error in this reasoning" (and not "solve the task"); for MM-11: "What will happen if...?" (and not "what is?"). One must be able to design tasks that "provoke" the manifestation of concrete

mechanisms, and to analyze the answers. The fourth instrument is reflective reports. This is an instrument that works in both directions: the student reflects on his thinking, and the teacher receives diagnostic material. Questions: "How did you arrive at this answer?", "What was the most difficult?", "What would you do differently next time?", "What question arose in you?". One must be able to formulate reflective questions and analyze the answers. The fifth instrument is the portfolio. This is a collection of works and reflective records that shows the trajectory of the student's development over time. The portfolio should contain the student's works, reflective records, diagnostic data, and feedback from the teacher and classmates. One must be able to organize and keep a portfolio, to analyze it as a whole (to see the dynamics), and to use it for feedback and planning. Research confirms the effectiveness of the portfolio as a diagnostic instrument: "portfolio assessment" allows one to see the trajectory of development, and not only a static result [12]. The sixth instrument is mutual assessment and self-assessment. These are instruments that develop not only the teacher's diagnostic culture, but also the reflective abilities of students. One must be able to develop criteria for self-assessment and mutual assessment, to organize the process, and to analyze the results.

Diagnostics as Part of the Lesson

One of the key principles of diagnostics in the CCFP model is that it must be embedded in the lesson, and not be a separate event. What does this mean in practice? Every task is diagnostics. The teacher does not simply give a task so that the student completes it. He gives a task in order to see how the student thinks. Therefore it is important that the tasks be "open" - requiring not one correct answer, but reasoning, explanation, and argumentation. Every answer is diagnostic material. The teacher does not simply mark "right" or "wrong." He analyzes how the student arrived at the answer, what strategies he used, and where he stumbled. Every lesson is a diagnostic session. The teacher does not wait for a test in order to understand what is happening. He diagnoses constantly - through observation, through analysis, through dialogue. How does this look in different subjects? In a Russian language lesson the teacher does not simply check orthography, but analyzes how the student builds argumentation in an essay (MM-1, MM-2, MM-6). In a mathematics lesson the teacher does not simply look at the answer, but analyzes how the student builds a logical chain (MM-1), how he checks the solution (MM-6), and how he chooses a strategy (MM-11). In a history lesson the teacher does not simply check knowledge of dates, but analyzes how the student explains the causes of events (MM-1), how he evaluates sources (MM-6), and how he participates in debates (MM-7). In a physical education lesson the teacher does not simply evaluate physical results, but analyzes how the student makes strategic decisions in the game (MM-11), how he uses non-verbal communication (MM-8), and how he manages emotions (MM-3). Research confirms: "critical thinking is regarded as a skill that develops over time" [10]. This means that diagnostics must be procedural - it must record not a point, but a trajectory.

The Role of Artificial Intelligence in Diagnostics

I must also speak of the role of AI, because it is inevitable. Artificial intelligence can become a powerful instrument of diagnostics - but only if it is used as an assistant to the teacher, and not as his replacement. What can AI do? Collect and accumulate data - automatically record answers, works, and reflective records. Analyze dynamics - compare current answers with previous ones and identify progress or regression. Visualize data - present development in an intelligible form (graphs, diagrams, "heat maps"). Propose recommendations - on the basis of data, propose individual development trajectories. Research confirms the potential of AI in diagnostics: scales are being developed for assessing the ability of teachers to use AI for the development of critical thinking [13], and the use of generative AI for formative feedback is being investigated [14]. What can and should AI not do? Replace live communication - AI cannot replace the teacher in dialogue, in empathy, in understanding the uniqueness of each child. Make final decisions - AI can provide data and recommendations, but the final decisions about the student's development trajectory remain with the teacher and the student himself. Assess what cannot be formalized - emotional intelligence, creativity, and charisma - these qualities are poorly amenable to formal assessment and require human judgment. What is needed for the preparation of teachers? To be able to work with digital platforms for the collection and analysis of diagnostic data. To be able to interpret the data provided by AI. To be able to make decisions on the basis of these data, preserving human expertise. A 2025 study emphasizes: "the successful development of critical and creative thinking abilities requires a balanced approach combining structured support systems, innovative pedagogical strategies and technological infrastructure" [12]. AI is part of this infrastructure, but not its replacement. It is merely one of the instruments in the hands of the "architect of thinking," who is capable of breaking epistemological recursion (Issue 3, Art. 1) and of seeing in the data not simply numbers, but the living trajectory of the development of the subject.

How to Prepare Future Teachers for Diagnostics

How then to prepare the future teacher for this complex work? I see several stages. The first is the theoretical module: students must understand how diagnostics differs from traditional assessment, what the principles of dynamic, formative, and embedded diagnostics are, what the eleven mental mechanisms are (and how they are divided into core and support), and what diagnostic instruments exist and what each of them is for. The second is the practical module: diagnostics on oneself. Before diagnosing students, students must diagnose themselves: undergo diagnostics of their own mental mechanisms, analyze the results, draw up a development plan, and track the dynamics. Research confirms: "the dispositional aspects of psychological literacy, especially critical thinking, may be more strongly connected with teachers' professional self-perceptions than knowledge alone" [15]. One cannot teach what is not in oneself. The third is the practical module: diagnostics in learning situations. Students must train to diagnose in a safe environment: analyze video recordings of lessons (video vignettes) [7], analyze student works, participate in role-playing games where one student plays the student and another the teacher-diagnostician, and develop diagnostic tasks for different mechanisms. The fourth is the practical module: diagnostics in the school. During pedagogical practice students must really diagnose: observe students, record the manifestations of mechanisms, analyze activity products, conduct diagnostic tasks, keep a portfolio of diagnostic observations, and receive feedback from the mentor. The fifth is the reflective module: analysis of one's own diagnostic practice. Students must reflect on their diagnostic activity: what did I see? what did I not see? which instruments worked and which did not? how can I improve my diagnostics? what did I learn about myself as a diagnostician? A 2025 study emphasizes: "teacher education programs should systematically integrate reflective pedagogical projects, formative assessment rubrics and culturally relevant learning tasks into their curricula" [7]. Diagnostics is not a skill that can be mastered once and for all. It is a practice that requires constant reflection and improvement.

The Teacher's Diagnostic Culture: From Instruments to Position

I want to end this article with what is perhaps the most important. Diagnostics is not simply a set of instruments. It is a culture, a position, a way of seeing. Diagnostic culture is the ability to see the invisible. A teacher with a diagnostic culture sees not only the result, but also the process. Not only "right" or "wrong," but also "how," and "why," and "what next." It is the ability to wait and observe. Diagnostics is not a hurried "putting a grade." It is a patient looking into, the ability not to interfere before the time, to give the student the opportunity to manifest himself. It is the ability to be surprised. A teacher with a diagnostic culture does not cease to be surprised at how differently students think. He sees in every answer not an "error," but a "window" into a unique way of thinking. It is the ability to learn from students. Diagnostics is not only "I assess you." It is "I learn to see the world through your eyes." Every diagnostic act is an opportunity for the teacher to learn something new about thinking, about development, and about himself. Research confirms: "critical thinking is fundamental to the academic success of students and helps prepare them for solving real problems" [10]. But in order to develop critical thinking in students, the teacher must himself possess a diagnostic culture - the ability to see how this thinking is formed, where it stumbles, and where it moves.

Conclusion: Diagnostics as Looking Into

I want to end this article with words that may seem unexpected in the context of pedagogical diagnostics. Diagnostics in the CCFP model is not "measurement." It is looking into. Looking into the unique way of thinking of each student. Looking into the trajectory of development, which is never straight. Looking into what is hidden behind the right or wrong answer. Looking into one's own blind spots, into one's own inability to see what is obvious to the student. Diagnostics is not a technology. It is the art of seeing. And this art cannot be mastered in one semester. It can only be practiced - day after day, lesson after lesson, year after year. That is precisely why preparation for diagnostics is not a "module" in the program of the pedagogical university. It is a cross-cutting line of the entire preparation. Every course, every practice, and every reflective session must be permeated by the diagnostic gaze. It is precisely such preparation that I propose. Not "a teacher who knows how to use diagnostic instruments." But an "architect of thinking" for whom diagnostics is a way of seeing the world, a way of being in dialogue with the student, and a way of growing together with him. In the next article I will show how exactly the subject preparation in the pedagogical university must be restructured - from the "knowledge of the subject" to the "subject as a means of developing thinking" [3].

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