

THE SCIENTIFIC BASIS OF FORMATIVE AND SUMMATIVE ASSESSMENT FOR SCHOOL PUPILS

Mamatova Fazilat Ixtiyorovna - Termiz State Pedagogical Institute E-mail:

[mamatovafazilat411@gmail.com](mailto:mamatovafazilat411@gmail.com) ORCID: 0009-0005-8140-924X

Jabborova Dilshoda Xolmamat qizi - Second-year student, Department of Technological Education Termiz State Pedagogical Institute

**Abstract**

Assessment is one of the most influential components of the educational process because it determines not only how pupils' learning outcomes are measured, but also how teaching decisions are made, how feedback is organized, and how students understand their own progress. In contemporary school education, formative and summative assessment are regarded as two complementary mechanisms rather than opposing practices. Formative assessment supports learning during the instructional process by identifying pupils' strengths, misconceptions, gaps, and developmental needs. The article concludes that an effective school assessment system should integrate formative and summative approaches in a balanced, transparent, and learner-centered manner.

**Keywords:** formative assessment, summative assessment, school pupils, feedback, validity, reliability, learning outcomes, educational measurement, self-regulated learning, assessment for learning.

**Introduction**

Assessment has traditionally been understood as a mechanism for checking whether pupils have mastered a particular body of knowledge. However, modern educational theory considers assessment not only as a tool for measuring learning, but also as a means of improving learning. This shift is especially important in school education, where pupils' cognitive, emotional, social, and motivational development is still actively forming. For this reason, assessment practices used with school pupils must be scientifically grounded, pedagogically purposeful, psychologically appropriate, and methodologically reliable.

The distinction between formative and summative assessment is central to contemporary pedagogy. Formative assessment is conducted during the learning process and helps teachers adjust instruction according to pupils' needs. Summative assessment is conducted after a unit, semester, academic year, or educational stage and provides a general judgment about achieved learning outcomes. Black and Wiliam's influential review demonstrated that classroom formative assessment can produce substantial learning gains when feedback is frequent, meaningful, and connected to instructional improvement.

The scientific relevance of this topic is determined by several factors. First, many school systems still overemphasize final marks and examinations while underusing assessment as a diagnostic and developmental tool. Second, teachers often confuse frequent testing with formative assessment, although a test becomes formative only when its results are used to improve teaching and learning. Third, summative assessment can become unfair or pedagogically weak if it lacks validity, reliability, transparency, and alignment with learning objectives. The *Standards for Educational and*

*Psychological Testing* emphasize that educational assessment must be supported by evidence related to validity, reliability, test administration, scoring, and interpretation.

Therefore, the purpose of this article is to analyze the scientific foundations of formative and summative assessment for school pupils and to identify the conditions under which these assessment types become pedagogically effective. The article argues that the strongest assessment model is not based on choosing either formative or summative assessment, but on integrating both into a coherent system. Formative assessment guides learning while it is still developing; summative assessment certifies what has been achieved. When both are properly designed, they support not only academic achievement but also pupils' responsibility, reflection, motivation, and readiness for lifelong learning.

### **Methodology**

This article uses a conceptual-analytical research method. The purpose is not to conduct a classroom experiment, but to synthesize existing scientific views on formative and summative assessment and apply them to the context of school pupils. The analysis is based on major theoretical works, international educational reports, assessment standards, and evidence-informed pedagogical recommendations.

The methodological structure of the article includes four stages. First, the concepts of formative and summative assessment are defined and compared. Second, their scientific foundations are examined through learning theory, feedback theory, measurement theory, and motivation theory. Third, their practical role in school education is analyzed. Fourth, a balanced model of assessment is proposed for effective classroom implementation.

The main analytical criteria used in this article are pedagogical purpose, timing, evidence type, feedback function, learner involvement, validity, reliability, and instructional impact. These criteria make it possible to distinguish between superficial and scientifically grounded assessment practice. For example, a teacher may give many tests during a semester, but this does not automatically mean that formative assessment is being used. If pupils receive only marks and no guidance, the practice remains summative in function, even if it happens frequently. Similarly, a final project may be summative, but it can also contain formative stages if pupils receive feedback during planning, drafting, revising, and presentation.

The article also applies a comparative approach. Formative and summative assessment are compared not as competing systems, but as complementary functions within one educational process. This approach is important because schools often make the mistake of treating formative assessment as "soft" and summative assessment as "serious." Scientifically, this is a false distinction. Formative assessment is serious because it directly influences learning while improvement is still possible. Summative assessment is serious because it affects grades, certification, and educational decisions. Both require professional competence from teachers.

### **Results and Discussion**

The analysis shows that formative and summative assessment differ in purpose, timing, function, and interpretation, but both are necessary for effective school education. Their main differences can be summarized as follows:

<b>Criterion</b>	<b>Formative Assessment</b>	<b>Summative Assessment</b>
Main purpose	To improve learning during the process	To judge learning after instruction

Timing	During lessons, units, or learning activities	At the end of a unit, term, year, or course
Main user	Teacher and pupil	Teacher, school, parents, administration, certification bodies
Feedback role	Immediate, diagnostic, developmental	Usually limited, evaluative, reporting-oriented
Typical forms	Questioning, observation, quizzes, drafts, peer assessment, self-assessment	Final tests, exams, term grades, standardized tests, final projects
Scientific requirement	Responsiveness, clarity, feedback quality	Validity, reliability, fairness, alignment
Main risk	Becomes meaningless if feedback is weak	Becomes unfair if validity or reliability is weak

The first major finding is that formative assessment is scientifically justified because it corresponds to how learning actually develops. Pupils rarely master complex concepts in one step. They misunderstand, revise, compare, practice, and gradually improve. Formative assessment captures this developmental nature of learning. It allows the teacher to identify misconceptions before they become stable errors. For example, in mathematics, a pupil may use the correct formula but misunderstand the logic behind it. A purely summative test may reveal only the final incorrect answer, whereas formative questioning can reveal the source of the misunderstanding.

The second finding is that formative assessment improves pupils' metacognitive awareness. When pupils understand learning objectives, success criteria, and feedback, they become more capable of monitoring their own progress. This is especially important for school pupils because self-regulation is not automatically developed; it must be taught through structured classroom practice. Self-assessment and peer assessment can help pupils compare their work with clear criteria, but they must be carefully guided. Without criteria, peer assessment may become subjective or socially uncomfortable. With criteria, it can become a powerful learning tool.

The third finding is that summative assessment remains necessary, but only when it is properly designed. Schools need summative assessment to report achievement, certify progress, compare results, and make educational decisions. However, summative assessment becomes problematic when it is reduced to memorization, when test items do not match learning objectives, or when grades are interpreted as fixed labels of pupil ability. A scientifically designed summative assessment should include a representative sample of curriculum content, appropriate cognitive difficulty, clear scoring criteria, and transparent interpretation.

The fourth finding concerns the relationship between formative and summative assessment. The strongest model is an integrated assessment system. In such a system, formative assessment prepares pupils for deeper learning, while summative assessment verifies whether learning outcomes have been achieved. For example, during a technology education course, pupils may first receive formative feedback while designing a practical project. The final product may then be assessed summatively using a rubric. This model is stronger than a single final test because it evaluates both process and outcome.

The fifth finding is that assessment has a direct effect on pupil motivation. Formative assessment can increase motivation when it shows pupils that improvement is possible. However, it can also reduce motivation if feedback is vague, humiliating, excessive, or focused only on mistakes.

Summative assessment can motivate pupils by clarifying standards and goals, but it can also create anxiety if used too frequently or unfairly. Research on formative and summative assessment has shown that assessment practices can influence motivation, learning attitudes, test anxiety, and self-regulation. Therefore, school assessment should be designed not only as a measurement tool but also as a psychological influence on pupils' learning behavior.

A major practical problem is that many teachers give marks instead of feedback. This is weak pedagogy. A mark tells the pupil the result, but it does not explain the route to improvement. For example, "3/5" is not formative unless the pupil understands why two points were lost and how to correct the work. Similarly, "excellent" is emotionally pleasant but instructionally poor if it does not identify what was done well. Good feedback should answer three questions: What is the learning goal? Where is the pupil now? What should the pupil do next?

Another problem is the misuse of summative tests. A final test is not scientifically strong simply because it is formal. If the questions assess only factual recall while the curriculum requires analysis, creativity, or problem-solving, the test has weak validity. If different teachers score the same answer differently, reliability is weak. If pupils are tested on material that was not taught or explained, fairness is weak. These problems damage trust in assessment and can distort teaching.

The proposed integrated model contains the following principles:

1. Learning objectives must be clear before assessment begins.
2. Formative assessment must be used regularly, but not mechanically.
3. Feedback must be specific, actionable, and connected to success criteria.
4. Pupils must be trained to use feedback, not merely receive it.
5. Summative assessment must align with curriculum standards.
6. Rubrics and scoring criteria must be transparent.
7. Final grades should be based on sufficient and relevant evidence.
8. Assessment should measure understanding, application, reasoning, and skills, not only memorization.
9. Teachers should analyze assessment data to improve instruction.
10. Schools should avoid assessment overload because excessive testing can reduce meaningful learning.

For school teachers, the practical implication is clear: assessment must become part of teaching, not an activity added after teaching. In each lesson, teachers should collect evidence of learning through questions, short written responses, observation, group work, oral explanation, practical tasks, or digital tools. However, the evidence must lead to action. If many pupils misunderstand a concept, the teacher should reteach it differently. If only a few pupils struggle, targeted support should be provided. If pupils already understand the content, enrichment tasks should be offered.

For pupils, formative assessment should develop responsibility. Pupils need to understand that mistakes are not simply failures; they are diagnostic signals. However, this idea must not be romanticized. Mistakes are useful only when they are analyzed and corrected. A classroom culture of formative assessment requires discipline, clarity, and intellectual honesty. Pupils should know what quality work looks like and should be expected to revise their work.

For school administrators, the implication is that assessment policy should not be limited to grade collection. Schools should support teachers with rubrics, moderation practices, feedback training, collaborative planning, and assessment literacy. If teachers are not trained in validity, reliability, and

feedback design, assessment quality will remain inconsistent. Summative results should also be analyzed at the school level to identify curriculum gaps, teaching weaknesses, and support needs. For parents, the implication is that grades should not be treated as the only indicator of learning. A pupil may receive a high grade through memorization but still have weak conceptual understanding. Another pupil may initially perform poorly but improve significantly through formative feedback. Therefore, schools should communicate both achievement and progress.

### Conclusion

Formative and summative assessment are scientifically grounded and pedagogically necessary components of school education. Formative assessment is justified by learning theory, feedback theory, and self-regulated learning because it supports pupils while learning is still developing. It helps teachers identify misconceptions, adapt instruction, and guide pupils toward improvement. Summative assessment is justified by educational measurement theory because schools need valid and reliable evidence of achieved learning outcomes.

The main conclusion is that formative and summative assessment should not be separated mechanically. A strong assessment system uses formative assessment to improve learning and summative assessment to evaluate learning. The weakness of many school assessment systems is not the existence of tests or grades, but the poor scientific design of assessment practices. If formative assessment lacks useful feedback, it becomes empty routine. If summative assessment lacks validity and reliability, it becomes unfair judgment.

For school pupils, assessment must be transparent, developmental, fair, and aligned with curriculum goals. Teachers should design assessment as a continuous evidence-based process in which feedback, criteria, self-reflection, and final evaluation are logically connected. Such an approach improves not only academic achievement but also pupils' motivation, responsibility, and ability to regulate their own learning. Therefore, the scientific basis of formative and summative assessment lies in their balanced integration into a coherent pedagogical system.

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