

Formative assessment

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Formative assessment is a range of formal and informal assessment procedures employed by teachers during the learning process in order to modify teaching and learning activities to improve student attainment.^[1] It typically involves qualitative feedback (rather than scores) for both student and teacher that focuses on the details of content and performance.^[2] It is commonly contrasted with Summative assessment, which seeks to monitor educational outcomes, often for purposes of external accountability^[3].

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Definition

Noting in a widely cited review that the term formative assessment "does not have a tightly defined and widely accepted meaning", Black and Wiliam operate an umbrella definition of "all those activities undertaken by teachers, and/or by students, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged."^[4] Along similar lines, Cowie and Bell^[5] define formative assessment as "the process used by teachers and students to recognise and respond to student learning in order to enhance that learning, during the learning". Nicol and Macfarlane-Dick, who emphasise the role students can play in producing formative assessments state that "formative assessment aids learning by generating feedback information that is of benefit to students and to teachers. Feedback on performance, in class or on assignments, enables students to restructure their understanding/skills and build more powerful ideas and capabilities."^[6]

Formative assessment is typically contrasted with summative assessment. The former supports teachers and students in decision-making during educational and learning processes, while the latter occurs at the end of a learning unit and determines if the content being taught was retained. Ainsworth p. 23 (2006)^[7]

Formative assessment is not distinguished by the format of assessment, but by how the information is used. The same test may act as either formative or summative. However, some methods of assessment are better suited to one or the other purpose.^[8]

Origin of the term

Michael Scriven coined the terms formative and summative evaluation in 1967, and emphasized their differences both in terms of the goals of the information they seek and how the information is used.^[9] For Scriven, formative evaluation gathered information to assess the effectiveness of a curriculum and guide school system choices as to which curriculum to adopt and how to improve it.^[8] Benjamin Bloom took up the term in 1968 in the book *Learning for Mastery* to consider formative assessment as a tool for improving the teaching-learning process for students.^[10] His subsequent 1971 book *Handbook of Formative and Summative Evaluation*, written with Thomas Hasting and George Madaus, showed how formative assessments could be linked to instructional units in a variety of content areas.^[11] It is this approach that reflects the generally accepted meaning of the term today.^[12] For both Scriven and Bloom, an assessment, whatever its other uses, is only formative if it is used to alter subsequent educational decisions.^[8] Subsequently, however, Black and Wiliam have suggested this definition is too restrictive, since formative assessments may be used to provide evidence that the intended course of action was indeed appropriate. They propose that:

Practice in a classroom is formative to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited^[13]

Rationale and practice

There are several purposes to formative assessment:

- to provide feedback for teachers to modify subsequent learning activities and experiences,^[2]
- to identify and remediate group or individual deficiencies,^[2]
- to move focus away from achieving grades and onto learning processes, in order to increase self efficacy and reduce the negative impact of extrinsic motivation,^[3]
- to improve students' metacognitive awareness of how they learn.^[3]

Feedback is the central function of formative assessment. It typically involves a focus on the detailed content of what is being learnt,^[2] rather than simply a test score or other measurement of how far a student is falling short of the expected standard.^[6] Nicol and Macfarlane-Dick, synthesising from the literature, list seven principles of good feedback practice:

1. It clarifies what good performance is (goals, criteria, expected standards);
2. It facilitates the development of self-assessment in learning;
3. It provides high quality information to students about their learning;
4. It encourages teacher and peer dialogue around learning;
5. It encourages positive motivational beliefs and self-esteem;
6. It provides opportunities to close the gap between current and desired performance;
7. It provides information to teachers that can be used to help shape teaching.^{[14][6]}

Examples of formative assessment

The time between formative assessment and adjustments to learning can be a matter of seconds or a matter of

months.^[8] Some examples of formative assessment are:

- A language teacher asks students to choose the best thesis statement from a selection; if all choose correctly she moves on; if only some do she may initiate a class discussion; if most answer incorrectly then she may review the work on thesis statements^[8]
- A teacher asks her students to write down, in a brainstorm activity, all they know about how hot-air balloons work so that she can discover what students already knew about the area of science she is intending to teach ^[5]
- A science supervisor looks at the previous year's student test results to help plan teacher workshops in the summer vacation to address areas of weakness in student performance^[8]

Evidence

Meta-analysis of studies into formative assessment have indicated significant learning gains where formative assessment is used, across all content areas, knowledge and skill types, and levels of education.^[4] Marzano states:

"Recall the finding from Black and Wiliam's (1998) synthesis of more than 250 studies that formative assessments, as opposed to summative ones, produce the more powerful effect on student learning. In his review of the research, Terrance Crooks (1988) reports that effects sizes for summative assessments are consistently lower than effect sizes for formative assessments. In short, it is formative assessment that has a strong research base supporting its impact on learning."
(Marzano, 2006, p. 9)^[15].

Researchers have concluded that standards-based assessments are an effective way to “prescribe instruction and to ensure that no child is left behind” (Marzano, 2006 p. 13)^[15].

The strongest evidence of improved learning gains comes from short-cycle (over seconds or minutes within a single lesson) formative assessment, and medium to long-term assessment where assessment is used to change the teacher's regular classroom practice^[8].

Formative Assessment in K–12

Formative assessment is more valuable for day-to-day teaching when it is used to adapt the teaching to meet students' needs. Formative assessment helps teachers to monitor their students' progress and to modify the instruction accordingly. It also helps students to monitor their own progress as they get feedback from their peers and the teacher. Students also find opportunity to revise and refine their thinking by means of formative assessment. Formative assessment is also called as educative assessment and classroom assessment.

Methods of Formative Assessment: There are many ways to integrate formative assessment into K-12 classrooms. Although the key concepts of formative assessment such as constant feedback, modifying the instruction, and information about students' progress do not vary among different disciplines or levels, the methods or strategies may differ. For example, researchers developed generative activities (Stroup et al., 2004)^[16] and model-eliciting activities (Lesh et al., 2000)^[17] that can be used as formative assessment tools in mathematics and science classrooms. Others developed strategies computer-supported collaborative learning environments (Wang et al., 2004b)^[18]. More information about implication of formative assessment in specific areas is given below.

Purpose of Formative Assessment: The following are examples of application of formative assessment to content areas:

Formative Assessment in Math Education:

In math education, it is really important for teachers to see how their students approach the problems and how much mathematical knowledge and at what level students use when solving the problems. That is, knowing how students think in the process of learning or problem solving makes it possible for teachers to help their students overcome conceptual difficulties and, in turn, improve learning. In that sense, formative assessment is diagnostic. To employ formative assessment in the classrooms, a teacher has to make sure that each student participates in the learning process by expressing their ideas; there is a trustful environment -in which students can provide each other with feedback; s/he (the teacher) provides students with feedback; and the instruction is modified according to students' needs. In math classes, thought revealing activities such as model-eliciting activities (MEAs) and generative activities provide good opportunities for covering these aspects of formative assessment.

Formative assessment in Second/ Foreign Language Education:

As an ongoing assessment it focuses on the process, it helps teachers to check the current status of their students' language ability, that is, they can know what the students know and what the students do not know. It also gives chances to students to participate in modifying or replanning the upcoming classes (Bachman & Palmer, 1996)^[19]. Participation in their learning grows students' motivation to learn the target language. It also raises students' awareness on their target languages, which results in resetting their own goals. In consequence, it helps students to achieve their goals successfully as well as teachers be the facilitators to foster students' target language ability.

In classroom, short quizzes, reflectional journals, or portfolios could be used as a formative assessment (Cohen, 1994)^[20].

Formative Assessment in Elementary Education:

In primary schools is used to inform the next steps of learning. Teacher and students both use Formative Assessments as a tool to make decisions based on data. Formative assessment occurs when teachers feed information back to students in ways that enable the student to learn better, or when students can engage in a similar, self- reflective process. The evidence shows that high quality formative assessment does have a powerful impact on student learning. Black and Wiliam (1998) report that studies of formative assessment show an effect size on Standardized Tests of between 0.4 and 0.7, larger than most known educational interventions. (The effect size is the ratio of the average improvement in test scores in the innovation to the range of scores of typical groups of pupils on the same tests; Black and Wiliam recognize that standardized tests are very limited measures of learning.) Formative assessment is particularly effective for students who have not done well in school, thus narrowing the gap between low and high achievers while raising overall achievement. Research examined by Black and Wiliam supports the conclusion that summative assessments tend to have a negative effect on student learning.

Example of Formative Assessment in an Elementary Classroom

Activities that can be used as Formative Assessment Tools in Mathematics and Science Classrooms

Model-eliciting Activities (MEAs):

Model-eliciting activities are based on real-life situations where students, working in small groups, present a

mathematical model as a solution to a client's need (Zawojewski & Carmona, 2001)^[21]. The problem design enable students to evaluate their solutions according to the needs of a client identified in the problem situation and sustain themselves in productive, progressively effective cycles of conceptualizing and problem solving. Model-eliciting activities (MEAs) are ideally structured to help students build their real-world sense of problem solving towards increasingly powerful mathematical constructs. What is especially useful for mathematics educators and researchers is the capacity of MEAs to make students' thinking visible through their models and modeling cycles. Teachers do not prompt the use of particular mathematical concepts or their representational counterparts when presenting the problems. Instead, they choose activities that maximize the potential for students to develop the concepts that are the focal point in the curriculum by building on their early and intuitive ideas. The mathematical models emerge from the students' interactions with the problem situation and learning is assessed via these emergent behaviors.

Generative Activities:

In a generative activity, students are asked to come up with outcomes that are mathematically same. Students can arrive at the responses or build responses from this sameness in a wide range of ways. The sameness gives coherence to the task and allows it to be an "organizational unit for performing a specific function." (Stroup et al., 2004)

Other activities can also be used as the means of formative assessment as long as they ensure the participation of every student, make students' thoughts visible to each other and to the teacher, promote feedback to revise and refine thinking. In addition, as a complementary to all of these is to modify and adapt instruction through the information gathered by those activities.

Formative Assessment in Computer Supported Learning

Many academics are seeking to diversify assessment tasks, broaden the range of skills assessed and provide students with more timely and informative feedback on their progress. Others are wishing to meet student expectations for more flexible delivery and to generate efficiencies in assessment that can ease academic staff workloads. The move to on-line and computer based assessment is a natural outcome of the increasing use of information and communication technologies to enhance learning. As more students seek flexibility in their courses, it seems inevitable there will be growing expectations for flexible assessment as well.

Formative Assessment in UK education

In the UK education system, formative assessment (or assessment for learning) has been a key aspect of the agenda for personalised learning. The Working Group on 14–19 Reform led by Sir Mike Tomlinson, recommended that assessment of learners be refocused to be more teacher-led and less reliant on external assessment, putting learners at the heart of the assessment process.^[22]

The UK government has stated^[23] that personalised learning depends on teachers knowing the strengths and weaknesses of individual learners, and that a key means of achieving this is through formative assessment, involving high quality feedback to learners included within every teaching session.^[24]

The Assessment Reform Group has set out 10 principles for formative assessment.^[25] These are that assessment for learning should:

- be part of effective planning of teaching and learning
- focus on how students learn
- be recognised as central to classroom practice

- be regarded as a key professional skill for teachers
- be sensitive and constructive because any assessment has an emotional impact
- take account of the importance of learner motivation
- promote commitment to learning goals and a shared understanding of the criteria by which they are assessed
- enable learners to receive constructive guidance about how to improve
- develop learners' capacity for self-assessment so that they can become reflective and self-managing
- recognise the full range of achievements of all learners

Benefits of Formative Assessments for Teachers (Boston, 2002)

[26]

- Teachers are able to determine what standards students already know and to what degree.
- Teachers can decide what minor modifications or major changes in instruction they need to make so that all students can succeed in upcoming instruction and on subsequent assessments.
- Teachers can create appropriate lessons and activities for groups of learners or individual students.
- Teachers can inform students about their current progress in order to help them set goals for improvement.
- In 2008, Katy Bainbridge began work on Align Assess Achieve, a method of teaching formative assessment (<http://www.qualityinstruction.org>) to administrators and teachers.

Benefits of Formative Assessments for Students

[27] [28]

- Students are more motivated to learn.
- Students take responsibility for their own learning.
- Students can become users of assessment alongside the teacher.
- Students learn valuable lifelong skills such as self-evaluation, self-assessment, and goal setting.
- Student achievement can improve from 21-41 percentile points.

See also

- E-assessment
- Educational assessment
- Computer Aided Assessment
- Problem set

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External links

- The Concept of Formative Assessment. ERIC Digest. (<http://www.ericdigests.org/2003-3/concept.htm>)
- Qualifications and Curriculum Authority: assessment (http://www.qca.org.uk/qca_13581.aspx)
- Qualifications and Curriculum Authority: assessment for learning documents (http://www.qca.org.uk/qca_13440.aspx)
- Assessment for Learning (Learning and Skills Development Agency, now the Learning and Skills Network) (PDF) (<https://www.lseducation.org.uk/user/order.aspx?code=041723&src=XOWEB>)
- Learning and Skills Network website (<http://www.lseducation.org.uk/>)
- Assessment Reform Group website (<http://www.assessment-reform-group.org/>)
- The EvaluationWiki (<http://www.evaluationwiki.org>) - The mission of EvaluationWiki is to make freely available a compendium of up-to-date information and resources to everyone involved in the science and practice of evaluation. The EvaluationWiki is presented by the non-profit Evaluation Resource Institute.
- Formative-Assessment.com - Comprehensive Site on Formative Assessment (<http://www.formative-assessment.com>)

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