Technology to Support Next-Generation Classroom Formative Assessment for Learning

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Technology has the potential to play a powerful role in formative assessment practices that support the kind of learning favored by next-generation standards and bolstered by cognitive science research—learning that focuses on integrated, conceptual knowledge and problem-solving skills. Classroom-based assessments that are used in formative ways have been shown to significantly benefit student learning through providing feedback on the status of students' conceptual knowledge and problem-solving practices and by informing decisions about subsequent instructional support (Black & Wiliam, 1998). In recognition of the powerful role classroom assessments can play in state assessment systems, the Council of Chief State School Officers (CCSSO) state collaborative on formative assessment for students and teachers (FAST SCASS) developed a definition of formative assessment based on the research literature: "Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes" (FAST SCASS, 2008, p. 1).

Building on the FAST SCASS definition, this paper focuses on the ways that technologies can support effective formative assessment strategies and resources for planning, implementing, and adjusting classroom instruction. The technologies discussed in this paper include networked communities and a range of digital tools and artifacts. The paper does not address technology's role in two kinds of assessment that are commonly misconstrued as being examples of formative assessment: assessments used as formative evaluations of curriculum to inform subsequent revisions, and classroom-based "testlets" that sample items across a year's instruction in order to practice for an annual state test.

The paper begins by describing and summarizing the cognitive research base that supports a shift toward what we term "cognitively principled assessment." The paper then describes how technologies can support effective formative assessment practices that embody this shift, and summarizes research and development on technology-based resources intended for use in such formative assessment practices. The examples in this paper were selected based on the author's knowledge of the field from decades of experience

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in research, development, and evaluation projects related to technology-based student learning environments and assessments. The paper also presents a vignette to illustrate some of the ways teachers can take advantage of technology to plan, implement, and refine their formative assessment strategies.

Cognitively principled assessment design

Research on learning and on assessment should inform the development of assessments to measure learning progress and inform instructional decisions. For example, research on the development of expertise, as summarized in publications such as the National Research Council (NRC) report, *How People Learn*, indicates that experts build large, organized, interconnected knowledge structures and problem-solving strategies in a domain (Bransford, Brown, & Cocking, 2000). For the domain of science, national standards documents such as the *Framework for Science Education* and the *Next Generation Science Standards* recommend that science educators focus on fewer, more integrated, core disciplinary ideas. Such a focus on deeper learning will avoid previous standards' more shallow coverage of a large number of topics and will allow more time to engage in scientific investigations and argumentation (National Research Council, 2011, 2012). These current standards call for assessments of integrated knowledge and extended reasoning and problem solving, in contrast to the disconnected facts and procedures so prevalent in traditional assessments.

The NRC report, *Knowing What Students Know*, brings together decades of research in cognition, measurement, and psychometrics to make recommendations for learning-based assessments (Pellegrino, Chudowsky, & Glaser, 2001). The learning research and national frameworks and standards provide the cognitive component of cognitively principled assessment design.

Evidence-centered assessment design forms the measurement component of cognitively principled assessment design. Evidence-centered assessment design involves linking the learning to be assessed (a *student model*), to a *task model* that specifies features of the tasks and questions that would elicit the evidence of learning, then to an *evidence model* that specifies the types of student responses and scores that would indicate levels of proficiency (Messick, 1994; Mislevy, Almond, & Lukas, 2003; Pellegrino et al., 2001).

Cognitively principled assessment design, therefore, combines specification of the core disciplinary principles and problem-solving strategies that are the goals of instruction and assessment with the systematic design of assessments that link the learning targets with the assessment tasks and questions and the ways student responses will be scored and reported as evidence of achievement. National standards lay out the broad disciplinary core ideas and processes deemed by the professions to be goals of K–12 education (National Research Council, 2011, 2012; Common Core State Standards Initiative, 2010a, 2010b). Once the cognitive student models for learning targets have been specified, task models for activities and questions allowing observations of the learning, and evidence models for appraising the learning can complete the assessment design. Application of such a systematic process of cognitively principled assessment design can help ensure the quality and validity of formative assessments developed by programs and teachers.

Effective formative assessment

Formative assessment practices include not only a variety of informal strategies teachers may use "on the fly," but also formal, structured assessment tasks and methods that are systematically designed to help teachers probe and promote student thinking and reasoning. The cognitively principled design processes described above can guide development or selection of assessments to embed in instruction. Such cognitively principled assessment designs are greatly needed to counter the uneven technical quality of classroom assessments developed by teachers or assessments included with published curriculum materials (Wilson & Sloane, 2000; Mislevy & Haertel, 2006).

Formative assessment strategies are, by definition, planned by teachers prior to instruction. Research has found that the following features are components of effective formative assessment: (1) *specification of and alignment* with valued content standards that range from core principles and practices to basic knowledge and skills; (2) *monitoring* of progressive development; (3) realistic, *challenging problems* and items that elicit students' understanding and make their understanding visible; (4) *feedback* on student learning *during instruction* that identifies areas in need of improvement; and (5) guidance for teachers to *modify* instruction to meet student needs (Herman et al., 2005). Drawing on such research, the attributes of effective formative assessment strategies proposed by the FAST SCASS (2008) include:

1. Learning progressions—Assessments are designed to show where students are located on explicit pathways of increasing knowledge and skills (Heritage, 2008).

2. Learning goals—Goals and criteria for success are clear and communicated to students.

3. Embedded assessment—*During* instruction, evidence is gathered on learning progress and action is taken.

4. Specific feedback—Feedback based on assessment evidence describes to students where they are going, where their learning currently falls (on a progression), and what they can do to move ahead and close the gap.

5. Collaboration—Teachers and students work together to monitor learning and modify instruction.

6. Self and peer assessment—Students are actively engaged in assessment themselves.

Within the framework of cognitively principled assessment design, specification of the learning progressions and goals for instruction would be the first step, drawn from standards based on cognitive learning research. Assessment targets would further specify the knowledge and processes to be measured during instruction. Then, embedded assessments and feedback would be planned to elicit evidence of the learning during instruction. These embedded assessments could be activities and questions planned by the teacher or selected from existing resources. Feedback and further action in the form of immediate coaching or subsequent adjusted instruction could be provided by both the teacher and by interactive technologies. The planned assessments would also include activities that engaged students in self-assessment and collaboration with other students and the teacher.

Technology supports for alignment of embedded assessments with standards and targets

Development of cognitively principled assessments to embed in instruction places a heavy demand on teachers. Planning for embedding assessments during instruction and for providing feedback and differentiated follow-up requires not only time, but also pedagogical content knowledge and assessment expertise. Technology can support teachers' ability to build effective formative assessment features into their classroom practice. Technology-based resources can help teachers

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overcome many of the design and practical limitations of implementing classroom-based formative assessment practices because technology can make available cognitively principled assessment tasks to embed in curricula so that teachers do not have to rely on developing such tasks themselves. Moreover, technology can help to align, design, deliver, score, and interpret assessments within rich task environments that measure deep understandings in a feasible and cost-effective manner (Quellmalz & Haertel, 2004).

Online alignment and search tools

For teachers to plan assessments that will be embedded in their instruction and will focus on specific intended outcomes aligned with district, state, and national standards, the formative assessment process needs to begin with alignment of unit and lesson goals with those standards. Technology can facilitate such alignment activities by offering online databases that link curriculum, district, state, and national standards. Curriculum programs may provide "cross walks" of their curriculum-specific instructional activities to standards. The caveat for such publisher-provided alignment and search tools is that they may not be framed within the larger picture of the core disciplinary ideas or learning progressions. Curriculum alignments should be screened to ensure that they do not emphasize simple facts and procedures at the expense of challenging reasoning and problem solving. For example, teachers should be looking for assessments that gauge whether students can determine the flow of energy and matter through an ecosystem, rather than if students can just identify a producer and consumer.

Online alignment tools can provide training for judging the alignment of existing assessment tasks and items with standards. Such alignment tools could support efforts by groups of teachers to align standards, curricula, and assessments. Both Common Core state assessment consortia describe plans for helping teachers to align assessments with the Common Core standards (see, for example, http://parcconline.org/non-summative-assessments and http://www.smarterbalanced.org/k-12-education/teachers/).

However, teachers need to plan to embed assessment questions, tasks, and items that align not just with broad standards but with a progression of more specific learning targets that build in complexity within lessons and across a unit. To date, there are few research-based learning progressions at the lesson and unit level for teachers to access for unit planning (Trumbull & Lash, 2013, pp. 6–7).

More commonly, standards become queries for searching for assessments that have been aligned by others to those standards. For example, the Performance Assessment Links in Science (PALS) and Performance Assessment Links in Math (PALM) relational databases, funded by the National Science Foundation, offer tools to support searching online databases of science or math performance assessments aligned with national and state standards or curriculum units (SRI International, 2002, 2005).

Assessment collections

A key resource that technology can make available to teachers is access to pools of assessment tasks and items that teachers can embed within lessons and units. The resources can vary widely in their quality, such as whether they come with documentation of their basis in learning and assessment research for diagnosing deep content understanding and problem solving or with documentation of their technical quality. Curriculum and test publishers may provide sets of diagnostic assessments online or off-line that fit in their curriculum materials or are keyed to standards to be assessed on the annual state test. Some states, such as North Carolina, are using item bank software (for more information, see http://www.ixl.com/standards/north-carolina/). Publishers have created an array of computer-based test products for low-stakes assessments that incorporate banks of items, largely in the multiple-choice format. These item banks can be custom linked to a state's standards. Teachers can search the item banks to assemble tests and quizzes customized to their curriculum and state standards.

To date, these products tend to offer easy-to-administer, easy-to-score multiple-choice questions and some constructed-response ones. Teachers may be able to select individual tasks or sets of tasks and items that may be downloadable to print or be technology-delivered. Some embedded assessments also offer differentiated follow-up instructional activities. Few collections have any documentation of their technical quality and tend toward testing simple concepts and skills. An exception is the science item bank developed by the American Association for the Advancement of Science (1993). Sets of items represent progressive sequences of conceptual development, along with prerequisite knowledge. Data on the psychometric technical quality of the items are included (American Association for the Advancement of Science, n.d.). The Council of Chief State School Officers has developed a bank of conventional science items and performance assessments along with technical quality data for them (CCSSO, 2012). The PALS and PALM performance assessment collections post technical quality data provided by the assessment developers (SRI International, 2002, 2005).

Formative assessments designed by teachers

Software to help teachers develop assessment items has been created by multiple agencies. These software programs contain item templates and may have ancillary resources associated with them, such as libraries of mathematical and scientific notations, graphics, maps, and other supports that are not available with generic word processing tools. North Carolina and other states provide templates for teachers to use in constructing tests with traditional item formats (for example, see http://www.ixl.com/standards/north-carolina/math). Such templates can support the generation of individual items, such as multiple-choice items with a closed format, or more elaborate assessment tasks that involve a student completing several sequenced tasks, and the scoring rubrics that accompany the items and tasks. The Global Learning Observations for a Better Environment (GLOBE) assessment templates are such a resource for teachers to use in constructing performance assessments (GLOBE Program, 2002; SRI International, 2005). On the GLOBE assessment website, which is also linked to the PALS site, the template presents a form that teachers can use to develop performance assessments in which students solve real-world problems by using GLOBE data. The template provides cues for inserting GLOBE visualizations and data displays, an applied environmental problem to which the data are relevant, and sequences of "stem questions" as starters for questions related to the GLOBE assessment investigation framework. Another project, the Formative Assessment Delivery System (FADS) provides online templates and resources such as graphing and table tools for teachers to create their own classroom assessments (Scalise et al., 2010).

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To date, the state assessment consortia are in the early stage of developing supports for formative assessment related to the Common Core standards. The Partnership for Assessment of Readiness for College and Careers (PARCC) is developing strategies for formative assessment (for more information, see http://parcconline.org/non-summative-assessments), and the Smarter Balanced Assessment Consortium is funding development of a digital library that will help states implement effective formative assessment strategies. A set of quality standards will guide screening of formative assessment resources to be made available in the Smarter Balanced library. The consortium is developing professional learning materials on assessment literacy and educational resources that will include exemplar instructional models that embed formative assessment (http://www.smarterbalanced.org/k-12-education/teachers/). State networks of educators will provide feedback on the development and dissemination of resources and tools and recommend additional resources for the library.

Technology-enhanced, curriculum-embedded assessments

A new generation of assessments is moving beyond the use of technology only for resource collections or for test assembly, delivery, and scoring of conventional item formats. A goal of these new assessments is for technology to enable assessment of those aspects of cognition and performance that are complex and dynamic and that were previously impossible to assess directly. For English/Language Arts and 21st-century skills, technology-based assessments can capture the process and depth of students' comprehension, as well as gauge their research skills involving internet searches, evaluation of sources, and use of multimedia to access, analyze, and communicate (Quellmalz & Kozma, 2003). In mathematics, the sequences that students follow to solve problems can be traced. In science, digital technologies can represent dynamic causal, temporal, and spatial phenomena, giving students opportunities to deploy active inquiry practices. The technology-based, next-generation assessments are characterized by rich, complex, authentic contexts; interactive, dynamic responses; individualized feedback and coaching; diagnostic progress reporting; and links to supplemental instructional resources (Quellmalz, Timms, Buckley et al., 2012).

One example of such next-generation assessments is the set of simulation-based, curriculum-embedded science assessments developed by WestEd's SimScientists program (SimScientists, 2013). The SimScientists assessments are intended to function as resources for formative assessment practices by: (1) aligning with science system model progressions and science inquiry practices; (2) presenting dynamic, interactive simulation environments that support active inquiry investigations; (3) providing intelligent tutoring that gives immediate feedback contingent on an individual student's performance; (4) offering graduated levels of coaching in real time; (5) supporting self-assessment of explanations; and (6) providing diagnostic information to guide a teacher's assignment of off-line reflection and extension activities. The SimScientists assessments are coupled with follow-up, off-line self-assessment and reflection activities. The curriculum-embedded assessment and reflection activities incorporate features of effective formative assessment: *frequent* use of standards-based classroom assessments; feedback that is *timely*, *individualized*, and *diagnostic*; online *supplementary instruction* that is individualized; and *self-assessment* and reflection activities that help students confront misunderstandings, make new connections, and become more reflective, self-regulating learners (Herman et al., 2005).

The SimScientists technology includes a Learning Management System that collects data on diagnostic variables as students engage in inquiry investigations. The technology supports giving students a range of response formats. In SimScientists simulations, students can change input variables using sliders, generate experimental designs, save multiple trials, draw arrows, drag and drop items on the screen, and use buttons to select things. The simulation-based, curriculum-embedded assessments generate progress reports for multiple content and inquiry targets that classify students as Needs Help, Progressing, or On Target. The Learning Management System generates a report for each student, and for the teacher it generates reports on individual students and on the class as a whole. Based on the reports, the system recommends groupings of students for follow-up reflection activities.

The SimScientists curriculum-embedded assessments have been field tested for the topics of middle school ecosystems, force and motion, and atoms and molecules. Findings from implementations in four states, 28 districts, with 59 teachers and 6,000 students, documented the embedded assessments' high quality, feasibility, and utility (Herman et al., 2010; Quellmalz, Timms, Silberglitt et al., 2012). A separate field test found that students who had participated in the embedded assessments and reflection activities had significantly increased learning in comparison with students who had not participated.

Another example of technology-based assessment resources comes from the ChemVLab project, which uses intelligent tutoring and a formative assessment framework similar to that of SimScientists (ChemVLab, 2013). The ChemVLab provides activities that use formative assessment in three ways. As students progress through an activity, the system checks their responses and provides just-in-time feedback through an intelligent tutoring system. The system also keeps track of student performance on different subskills and provides each student with a report at the end of the activity that estimates student proficiency based on the amount of help the student needed and errors the student committed. Finally, when all students in a class have completed the activity, the teacher receives a report that shows the skills students have mastered and those needing more practice, thereby allowing the teacher to adjust ongoing instruction as needed (Davenport et al., 2012).

Other technology-based, curriculum-embedded science assessments have been systematically designed and studied. The Modeling Across the Curriculum project, for example, uses interactive technology for instruction that strategically integrates formative assessment tasks (Buckley et al., 2010). As students progress through a unit, the technology provides scaffolding and feedback to them. For teachers, the computer program also produces reports on students' learning. The information gathered about students' learning is able to support inferences about students' complex learning and inquiry skills.

Another example, Diagnoser Tools, is an online system developed by Facet Innovations to support teachers in enacting formative assessment practices in middle school and high school physics, physical science, and chemistry (Minstrell et al., 2008). Diagnoser Tools includes questions to elicit and engage students in conversation about their ideas (elicitation questions), lessons that prompt students to explore their ideas (developmental lessons), diagnostic questions, and activities targeted to address specific problematic ideas (prescriptive activities). The components of the system are organized into "facet clusters," which consist of a related set of concepts and misconceptions about them.

Similarly, the Science Assistments project has developed computerized microworlds that align with Massachusetts science standards. The microworlds present tasks and questions on science inquiry supported with "widgets," or tools to scaffold students' inquiry into science topics (Gobert et al., 2012).

These technology-based projects that feature embedded assessments can provide teachers and students with fine-grained, nuanced scoring, analyses by content and process targets, and real-time reports of student progress that can be used formatively to adjust instruction during a unit. Although dozens of other online assessment products with automated scoring already exist—either contained within e-learning systems, offered as products to accompany textbooks, or included within classroom management systems—rarely do these other products match the ones described in this section in terms of taking advantage of the recent development of learning progressions, incorporating rich meaningful tasks and complex interactive item formats, providing individualized feedback and coaching, or monitoring progress reliably.

Technology supports for teacher use of formative assessment processes

The next section presents a vignette that describes how a teacher could use a variety of technology tools to plan, implement, and refine her classroom practice by incorporating attributes of effective formative assessment, as delineated by FAST SCASS (2008). The process teachers may use to plan, implement, and refine formative strategies in their classrooms involves a series of steps:

1. Define goals of the instruction and place them along a learning progression.
2. Define criteria for success.
3. Select or create a range of appropriate assessment strategies to evoke evidence of learning.
4. Share learning goals and criteria with students.
5. Evoke evidence during instruction.
6. Record evidence.
7. Analyze and interpret evidence for individuals and the class to inform action.
8. Set new goals in collaboration with students.
9. Evaluate and revise assessment strategies, as needed.

The following vignette represents a small sample of the many possible combinations of these steps for planning and implementing formative assessments.

Middle school life science vignette

Planning formative assessments

As part of a seven-week unit on ecosystems, Ms. Herman plans to monitor her students' progress as they learn science concepts and inquiry skills. Prior to teaching the unit, Ms. Herman and the two other teachers of grade 8 life science *log on to the American Association for the Advancement of Science (AAAS) website* and the *Atlas for Science Literacy* to refer to the progression of key ideas within the AAAS Benchmarks for Diversity of Life. The life science teachers collaborate on *identifying learning progressions* of the key ideas and inquiry skills in the unit, starting with students' understanding the traits of individual organisms in the ecosystem and the organisms' roles and relationships in food webs, and progressing to students' using inquiry skills to investigate impacts that changing conditions and numbers of predators and prey have on the ecosystem. The teachers *post* the learning progressions for the unit on the district's *Learning Communities website* under the Science Units-Ecosystems-Learning Targets section. In addition, the teachers refer to the *indicators and criteria* on the district's testing website to *select and create assessment strategies,* including questions and assessment tasks and items the teachers will embed within lessons throughout the unit.

In this part of the vignette, the formative practices include specification of learning goals and learning progressions, defining criteria for success, and selecting or creating assessment strategies to elicit evidence of learning. Technology supports include the online AAAS Atlas and item website and the district's Learning Communities website.

Implementing formative assessments

Ms. Herman plans questions to ask pairs of students as they work through a simulation of an ecosystem. She introduces the *simulation activity* with a discussion of the purpose of the simulation and *points to a listing of the learning targets* (science concepts and inquiry skills) on the board. Students observe organisms in an ecosystem, inferring their roles as consumers or producers, then drawing arrows to construct a food web. In a later embedded assessment, students manipulate the number of organisms in the ecosystem to determine how different population levels of predator and prey affect the balance of the ecosystem. As student pairs work at computers on the simulation activities, Ms. Herman circulates, *stopping to observe and ask questions* about the task each pair is completing. She has *recorded* the content and skills addressed in the simulation lesson and *makes notes* on her *handheld device* about any difficulty an individual or pair is having. She *provides input and scaffolding on a troubling concept, such as how to figure out the source of an organism's energy, and asks a pair to review particular simulation activities and try again to observe the organisms as they feed or take in sunlight*. The simulation *software records* the student responses and *provides immediate feedback* and *customized coaching*. The feedback might be that the food web arrows do not connect the appropriate organisms, or that the direction of an arrow is incorrect. Graduated coaching might ask students to observe again the organisms interacting in the ecosystems or, after a second try, remind them to draw the arrows from the energy source to the organisms. At the end of the simulation lesson, each pair of students and the teacher *receive a diagnostic report* for each assessment target that shows if a student is On Track, Progressing, or Needs Help. The teacher refers to the progress reports to decide how to *adjust instruction* the following period. For the students with Individualized Education Plans, Ms. Herman emails the performance reports to the special education teachers.

The simulation software records the student responses and provides immediate feedback and customized coaching…. At the end of the simulation lesson, each pair of students and the teacher receive a diagnostic report for each assessment target.

In this part of the vignette, formative assessment strategies include using learning progressions to plan where to embed assessments during the lesson and to guide the kinds of specific, descriptive feedback. The teacher shares learning goals and criteria with students, uses the simulation-based assessment to evoke evidence during instruction, and records the evidence. The simulation generates a progress report that the teacher and students analyze to inform action and adjust goals and/or instruction. Technology tools include simulation-based assessments that record student responses, provide immediate individualized feedback, offer customized coaching, and produce progress reports on each assessment target. In addition, the teacher uses a handheld device to record observations of the students as they work through the simulations.

Providing opportunities for feedback and self-reflection

Before the next class, Ms. Herman reviews the *progress report of student performance* by science concept and inquiry skill *provided by the simulation software*. She assigns student pairs into groups to *participate in self-assessment and reflection activities*. Student *pairs review the report* of their responses to the simulation and *identify tasks* they need to understand better. For responses that students entered on the computer as part of the simulation activities, *students refer to samples of appropriate responses that the simulation software provides*, *discuss whether their responses* *match the samples*, and practice using the *student version of the scoring rubrics* to determine the levels of their responses. The groups follow guidelines for sharing their responses, questioning each others' responses, and reviewing additional information on the concepts and inquiry skills. The pairs complete a reflection activity by *rating on the computer how well they think they know* each concept *and can do* each inquiry skill and *if they are ready to proceed* to the next simulation-based activity.

After the period, Ms. Herman reviews the pairs' self-assessments and decides if additional *coaching should be provided by the simulation software* before each pair proceeds. She *meets with the pairs* to select the additional instruction offered by the *technology-based coaching system, such as examples of accurate responses and explanations of concepts in the simulation*. She looks at the *class-level report provided by the software* and decides if additional whole-group discussion is necessary.

Every two weeks, the science teachers meet to review the information provided by the simulations about student progress on the learning progressions of concepts and skills and to *discuss whether the questions and guidance* they are giving during the simulation activities are helping students to progress. The teachers participate in the district's *Learning Communities website* discussions of the reflection and self-assessment activities and scoring rubrics.

In this part of the vignette, the formative assessment strategies include specifying learning goals and criteria, referring to learning progressions, providing descriptive feedback, and using students' self-assessment to adjust instruction. In addition, there is collaboration between students and teachers about the learning progress, setting new goals, and planning subsequent instruction. Technology supports include the use of simulation-based assessment and system-generated individual and class reports by targeted content and inquiry skills. In addition, the teacher takes advantage of the district's Learning Communities website to share revisions to instruction and formative assessment strategies.

Summary

This paper describes ways that technology can help teachers plan, implement, and refine classroom formative assessment strategies. A wide variety of technology tools are currently available for teachers to use. Teachers can use criteria to screen the quality and suitability of tools for helping them align their formative assessment strategies with standards and specific conceptual, reasoning, and problem-solving targets. Teachers can ask if the tools help them to develop strategies that have the attributes of effective formative assessment processes.

Cognitively principled assessment design guides teachers to address assessment targets that go beyond simple facts and focus on deeper learning of key concepts, reasoning, and problem solving. Research suggests that assessments should be planned to monitor progress along a learning progression, and assessment targets should be clear and communicated to students. Embedded assessments should be developed or selected to allow teachers to observe students' progress on the targets, gather appropriate evidence, and steer instructional adjustments.

Technology tools to assist teachers in creating and using such formative assessment strategies may include websites for learning communities, alignment tools, collections of assessment tasks and items, online training on how to score assessments, software for creating and assembling assessments, technology-enhanced assessment resources, links to supplemental instructional resources, and online communities or websites focused on assessment. These tools can help teachers create, use, and share formative assessment strategies that represent cognitively principled assessment design to improve their students' learning.

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