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## Co-designing Instruction With Students

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## II. Students at the Center of Personalized Learning





## Co-designing Instruction With Students

*Melinda S. Sota*

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Learner choice is a defining feature of personalized learning (Patrick, Kennedy, & Powell, 2013), setting it apart from the related concepts of individualized and differentiated learning. Although these related concepts imply some change in instruction based on learner skills, knowledge, or performance, only personalization implies that the learner is an active agent in the decision-making process.

In its National Education Technology Plan, the U.S. Department of Education (USDOE, 2010) defines personalized learning as “instruction that is paced to learning needs, tailored to learning preferences, and tailored to the specific interests of different learners. In an environment that is fully personalized, the learning objectives and content as well as the method and pace may all vary” (p. 12). In this definition, personalization encompasses both differentiation and individualization but adds learner interests as a specific element of personalization.

The International Association for K–12 Online Learning (iNACOL) is more explicit in including learner choice as part of its working definition of personalized learning, defining it as “tailoring learning for each student’s strengths, needs, and interests—including enabling student voice and choice in what, how, when, and where they learn—to provide flexibility and supports to ensure mastery of the highest standards possible” (Patrick et al., 2013, p. 4). Adding to these features, Redding’s (2013) model of personalized learning emphasizes interpersonal relationships and explicitly includes motivation as well as metacognitive, social, and emotional competencies:

Personalization refers to a teacher’s relationships with students and their families and the use of multiple instructional modes to scaffold each student’s learning and enhance the student’s motivation to learn and metacognitive, social, and emotional competencies to foster self-direction and achieve mastery of knowledge and skills” (Redding, 2013, p. 6).

Although these features—varying time, pace, place, content, goals, instructional methods, and especially learner choice—define personalized learning, it is also important to note that instruction can be more or less personalized, involving different levels of

choice within different aspects of an instructional episode. For the purposes of this chapter, an instructional episode will be defined as any activity undertaken to reach a learning goal. Breaking down an instructional episode into relatively standard parts can help to both define personalization as a continuum of choice and serve as a framework for thinking about how to design and implement partial or complete systems for personalizing learning.

Within instruction, what can be personalized? Any instructional episode involves key parts and aspects, including (a) types and features of learning activities; (b) where the learner engages in these activities—at home, at school, or elsewhere; (c) the pace of instruction; (d) the amount of instruction and practice; (e) the instructional goals or objectives; and (f) the standards by which learning or performance will be evaluated. In what is typically thought of as traditional, standard, teacher-directed instruction, the teacher or educational system specifies each of these factors. All learners may go through a fixed instructional sequence at a fixed pace with a fixed amount of instruction and practice in an attempt to reach standard objectives with performance evaluated against standard criteria. At the other extreme is completely self-directed learning. Here, the learner may set her own learning goals and her own criteria for meeting them. She may select her own preferred method to reach them and move at her own pace at home or at school, with an amount of instruction and practice that she deems necessary to meet her goal. In between these two extremes are variations on differentiated, individualized, and personalized

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learning. In an individualized program, for example, the goals, standards, and activities may be set, but the pace and amount of instruction may vary based on individual learner performance. In a personalized system, the teacher may select from a fixed set of learning goals but work with the learner to choose appropriate and preferred learning activities to reach those goals (see USDOE, 2010, for definitions that differentiate among these three concepts).

Why would a school want to develop a system of personalized learning? First, it can support lifelong learning when implemented with student training in developing self-regulated learning (learning-to-learn) skills such as (a) selecting goals, (b) identifying criteria to indicate when a goal is achieved, (c) selecting learning activities, and (d) monitoring learning to determine whether the selected activities are working and how much more work is required to reach mastery. Each of these skills can be taught in a well-developed personalized learning system that includes explicit, systematic instruction focused on building and using these skills as students advance across grade levels. Explicit and systematic teaching of self-regulation strategies may incorporate scaffolding and teacher models or demonstrations as well as guided and independent student practice with feedback. Activities should be carefully planned and should systematically build on prior knowledge and previously taught skills (see Zumbrunn, Tadlock, & Roberts, 2011, for an overview of self-regulated learning and teaching strategies for developing it).

A second reason for implementing a personalized learning system lies in its potential to increase motivation and learning. Some studies have shown that even very limited choice over seemingly irrelevant factors within a learning activity can increase motivation and learning (see, for example, Cordova & Lepper, 1996). When choice is implemented

within a mastery-based system, motivation and learning may be further increased. In mastery-based systems, learners work at their own pace to meet learning goals and move on once they've met a specific criterion on an assessment of the learning goal. Mastery-based systems that include proactive goal selection and learner-involved formative assessment can support learners in developing growth (vs. fixed) mindsets and learning-goal (vs. performance-goal) orientations, both of which predict important outcomes, such as academic achievement, persistence, and resilience in the face of setbacks. With a growth mindset, learners believe that their effort will result in learning and performance gains (rather than believing they are either good at something or not). With a learning orientation, learners' focus is on learning and mastering challenges rather than demonstrating ability or lack thereof (Dweck, 1986; Dweck, Walton, & Cohen, 2014; Grant & Dweck, 2003). Within a well-developed personalized learning system, learners can regularly see their skills and knowledge grow as a result of their effort.

However, learner choice related to factors affecting instruction, such as the best learning method to use or the amount of instruction and practice necessary, requires that learners know what they know, what they don't know, and how to best go about gaining the necessary skills or knowledge—abilities often referred to as “metacognition” (see Redding, 2013, on metacognitive skills and how to support their development in the classroom). This is a tall order even for adults (Dunning, Heath, & Suls, 1994), and without well-developed self-regulation skills, learner choice is likely to have a detrimental effect on learning (Kirschner & van Merriënboer, 2013).

How can the positive effects of learner choice be maximized while minimizing risk that learners will not be able to choose in their best interests? By designing models in which teachers and learners co-design instruction, with learners making choices coached by a teacher and informed by knowledge of current and desired skills. In this type of model, learners not only work on the knowledge and skills related to the instructional materials but also on self-regulated learning skills—learning how to learn. Three components are important in such a system: (a) detailed maps that link learning goals to standards, specify the skills and knowledge necessary to meet learning goals, and show hierarchical relationships among goals; (b) continuous formative assessment that involves the learner in a proactive manner; and (c) a systematic, explicit focus on developing self-regulated learning skills, with learners gradually taking on more responsibility in determining what they need to learn, how they can go about learning it, and measuring their own skill mastery to determine whether their chosen method is working for them. Self-regulated learners choose challenging learning goals, select learning strategies to help them reach those goals, and continuously monitor their learning to determine whether the learning strategies and methods that they have selected are working and make changes when they are not (Zimmerman, 1990). Here, the goal is to help learners develop mastery over the process of learning as well as the products (skills and knowledge).

Implementing a fully personalized learning system is a major undertaking often requiring cultural shifts in the way students and educators view learning and school (see Berger, Rugen, & Woodfin, 2014, and Mechner, Fiallo, Fredrick, & Jenkins, 2013). However, personalization can also be implemented in differing degrees and within different parts of the learning process. The following sections describe issues related to personalized learning in each aspect of the instructional episode and how that aspect may be co-designed with the learner.

## Co-design Within the Instructional Episode

Each part of an instructional episode—from setting goals to evaluating progress and achievement—can involve differing degrees of learner choice. Although learner control over all aspects of learning may not be optimal (Kirschner & van Merriënboer, 2013), co-designing instruction with learners can help to increase learning and motivation (Ames, 1992; Corbalan, Kester, & van Merriënboer, 2006, 2008, 2009), and learners at all levels can play some role in setting their learning goals, selecting activities to reach those goals, and monitoring their learning as they work to achieve mastery.

### Setting Learning Goals

Learning goals are fundamental to a personalized learning system, although the degree of learner choice in selecting goals may vary. For example, whereas young learners may have very limited choice in which goals to pursue at any given time, older learners may be offered more choices. Goal choice may also be constrained by standards and learners' current skill level within a particular area. To personalize learning around learning goals while ensuring that all learners master the necessary fundamental skills, it is important to develop goals that are (a) clearly aligned with standards, (b) well-defined so that they are specific and measurable, (c) written in terms of what learners will be able to do upon mastery, and (d) depicted in a manner that makes the relations among them (e.g., prerequisites or component skills) clear. Goals with these attributes are more easily communicated and understood and can make goal setting, activity selection, and progress monitoring easier for both students and teachers. In addition to fundamental skills that all learners should master, the scope of learning goals may also include advanced goals for learners who have a particular interest in or facility for the area.

### Standards, Goal Definition, Relations, and Scope

A detailed goal map can guide both teachers and learners in choosing appropriate learning goals. Beginning with standards helps to ensure alignment between standards and goals. To be most useful, however, goals should *not* be equivalent to standards. Instead, goal analyses should be conducted in order to analyze the standards (and perhaps other sources) for the purpose of creating clearly defined learning goals. Goal analysis is a process in which a larger, more general goal is analyzed to clearly outline what achievement of that goal would look like and what skills, knowledge, or attitudes it would be necessary to develop in order to achieve the goal (the process of identifying the necessary skills, knowledge, and attitudes is often called *instructional analysis*). As a simple example of the process, imagine that one of the goals for an elementary science class is that students understand the concept of *density*. An analysis of this goal would first focus on defining what exactly is meant by the term “understand.” In other words, if students *understand* density, what will they be able to *do*? Will they be able to calculate the density of a material given its mass and volume? Will they be able to create a conceptual model of density? Will they be able to employ density as an explanation of a phenomenon? Will they be able to state the definition? Will they be able to do all of these things?

To conduct a goal analysis:

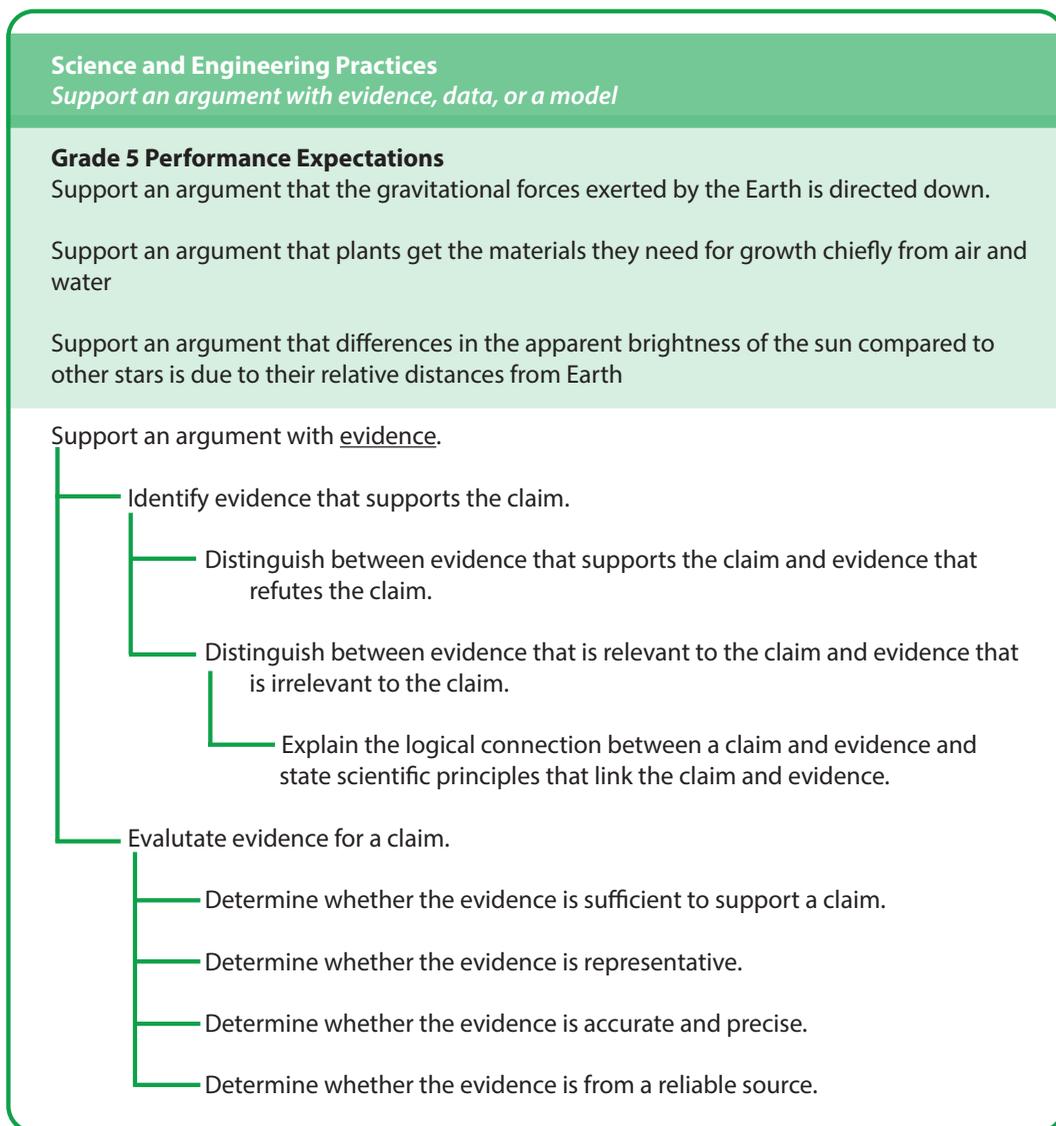
1. Write down the initial goal statement—for example, “understand density,” “read with understanding,” or a specific standard.

2. Make a list describing what someone who has reached the goal can do—for example, “calculate the density of an object,” “create a conceptual model of density,” “retell the main events of a story,” or “answer questions that require an inference from the text.”
3. Review the list to ensure that each description is clear and truly describes what the goal means. Ask yourself, “Am I sure that another teacher would be able to write an assessment of the goal based on this statement that would accurately measure everything I intend?” If not, clarify the goal further.
4. Create the final list of goals by writing the goal statements in complete sentences.
5. Ensure that your list is complete. Ask yourself, “If a student were able to do all of these things, would I agree that the student had mastered the goal?” If the answer is no, work to figure out what is implied by the initial goal statement that is not in your final list (Mager, 1997).

In addition to clarifying what a goal means, analysis of goals can be useful in deriving learning goals from statements of standards because a single standard may encompass a number of skills and an array of knowledge. Analyzing each standard into multiple, more specific goals can help to clarify the standard and make it easier to align assessment, instruction, and practice (see Mager, 1997, for a step-by-step description of the goal analysis process,).

After you’ve clarified your goals through goal analysis, think about what component skills and knowledge students will need to master in order to achieve the goal. Analysis of the goal in these terms is often called *instructional* analysis and portrays the component knowledge and skills in terms of their hierarchical relationships. Figure 1 illustrates a partial instructional analysis of a standard that could be used to construct a goal map based on the Next Generation Science Standards (NGSS Lead States, 2013). This analysis is based on the science practice of “supporting an argument with evidence, data, or a model,” and focuses on using evidence to support a claim. Grade 5 performance expectations related to the practice across content areas are listed below it. Below those is a partial analysis of using evidence to support a claim. To read the analysis, first read one line and then read a connected line below it in the pattern: “in order to \_\_\_\_\_, students will need to be able to \_\_\_\_\_.” For example, in order to “support an argument with evidence,” students will need to be able to “identify evidence that supports the claim” and “evaluate evidence for the claim.” In order to “identify evidence that supports the claim,” students will need to be able to both “distinguish between evidence that supports the claim and evidence that refutes the claim,” and “distinguish between evidence that is relevant to the claim and evidence that is irrelevant to the claim.” In order to distinguish between relevant and irrelevant evidence, students will need to be able to “explain the logical connection between a claim and evidence and state scientific principles that link the claim and evidence.” This analysis shows that, while basic skills related to working with evidence cut across subject areas, science practice and science content are connected in that—to identify relevant evidence for a claim—the student will need relevant subject matter knowledge and skills in making logical connections between claims and evidence in that subject area.

**Figure 1. A Partial Analysis of the Next Generation Science Standards, Identifying Embedded Component Skills and Knowledge**



Note. A portion of this analysis was conducted for Outthink, Inc. Used with permission.

The process in Figure 1 also suggests how such an analysis can support work across and within grade levels. For example, when just beginning to learn these skills, students might focus more energy on mastering each of the component skills (for example, by practicing distinguishing relevant from irrelevant evidence across a variety of relatively simple or familiar content). Once these skills have been mastered, they may be incorporated into the broader task of supporting an argument. The full skill set can also be taught across grade levels by increasing the complexity of the arguments and the level of subject matter while still employing the entire skill set at an appropriate level.

A clearly defined learning goal allows both the teacher and learner to evaluate work and determine when the learner has reached the goal. It also allows the teacher and learner to

work together in identifying appropriate activities to help the learner work toward that goal. For example, although identifying learning and evaluation activities for “understanding density” might be unclear to both teacher and student, being able to state a definition, perform a calculation, or build a conceptual model are more straightforward.

It is important to note that, although a goal should be specific, it should not be trivial. A risk in writing for specificity is writing the intended meaning out of the goal. Care should be taken to write goals that are both specific *and* meaningful (see Tiemann, 1971, for a description and example of this process; see Berger et al., 2014, for descriptions of writing and using learning goals or *targets* within a personalized learning system). For example, although the three performance expectations in Figure 1 specify particular arguments to support, it is unlikely that the true goal is to support only *those* claims with evidence. Rather, educators hope that the skills involved in supporting an argument would transfer to a variety of claims in addition to those encountered in school (provided that the learner has the requisite content knowledge). Specifying the component skills involved in supporting a claim with evidence can help ensure that the necessary general skills are gained and applied across a variety of content areas.

*More specific goals also allow for project-based or problem-centered group work in which learners joining a group may have different levels of skill mastery.*

More specific goals also allow for project-based or problem-centered group work in which learners joining a group may have different levels of skill mastery. By understanding where students are in terms of skill mastery, groups of students with complementary skill sets can be created for larger projects requiring a combination of skills. Learning and problem-solving activities can occur flexibly within individual, small-group, and large-group activities. For example, students who each have differing levels of skill in math, problem solving, argument, and science content knowledge could each use their respective skills to solve a problem more advanced than an individual could solve independently.

By linking goals with standards, the fundamental skills necessary for all students to master should be identified. However, extended goals—goals that build on the fundamentals but that are not required for all students to master—may also be available for advanced students to work on if they have mastered the necessary prerequisite skills and have a particular interest or aptitude in an area. Extending the scope of potential learning goals beyond those required allows for additional personalization as students have an opportunity to extend their skills as their particular interest and aptitudes allow. An extended scope may also motivate students to master lower level skills in order to attain higher level and potentially more interesting goals.

Table 1 lists a sample of performance expectations from the Next Generation Science Standards along with related goals based on the analysis shown in Figure 1. All of these goals are relevant to the standard related to supporting an argument with evidence and can be repeated across grade levels. While the topic areas and complexity of the subject matter increases across grade levels, the goals in this case would remain essentially the same. Performance expectations such as these with related goals may make up part of a goal map in order to link standards and goals within and across grade levels.

**Table 1. Sample Performance Expectations from the Next Generation Science Standards and Related Goals Derived from Goal/Instructional Analyses**

Next Generation Science Standards Performance Expectations	Related Goals*
2-PS1-4. Construct an argument with evidence that some changes caused by heating or cooling can be reversed and some cannot.	State what you would expect to happen if the claim was true.
3-LS2-1. Construct an argument with evidence that some animals form groups that help members survive.	Explain what would make you believe that the claim is true and why.
3-LS4-3. Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.	Given evidence, state whether it makes you believe that the claim is true or false and why.
5-PS2-1. Support an argument that the gravitational force exerted by Earth on objects is directed down.	Given data, state whether it is relevant to the claim and why or why not.

\*Note: All of the related goals apply to each performance expectation.

**Goal setting with students: Interim goals and learner choice**

Goal setting for a particular student requires knowledge of the student’s current achievement level because goals should be challenging yet achievable. In addition to selecting an appropriate goal toward which to work, goal setting may also involve further break down of a selected goal into interim goals. For example, if a defined goal is to read at a particular rate with fluency and accuracy, the specific student goal selected may not be that particular rate but an interim rate based on the student’s current reading rate. For example, an interim goal might be to increase reading rate by 1.5 times the student’s current rate. Interim goals such as these can help ensure that students see continuous improvement in their skills as a result of their effort (see Lindsley, 1992, for an example of continuous progress monitoring).

For younger students, goals may be set that can be achieved in shorter time frames; for example, an interim goal may be met in a single activity session. More advanced learners may work on extended goals that take significant time and effort to achieve and may contain several interconnected parts. For advanced students undertaking performance or production goals, co-creating rubrics with the student by analyzing expert or advanced-level performance can help to more fully define the goal and aid in progress monitoring and self-evaluation. After standards of final performance are agreed upon, interim goals may be created and set at challenging yet achievable levels by considering the ultimate goal (expert performance) in combination with the students’ current performance level. Even young students can play a part in selecting interim goals, and as students advance, they can take on more responsibility in identifying and selecting their own interim goals.

## Selecting Activities to Reach Goals

Results of studies investigating the effects of learner control on learning have been equivocal, with some studies finding benefits, some finding no effects, and others finding detrimental effects (Schnackenberg & Hilliard, 1998; Williams, 1993). One reason that learner control may result in poorer outcomes is that learners do not have the skills necessary to make informed choices regarding their own learning (Williams, 1993). First, to make informed decisions, people need to be able to accurately judge their current state of knowledge. However, in general, people are often poor at making this evaluation, often overestimating their knowledge and skill (Dunning et al., 2004; Williams, 1993). To reach a selected goal, learners will need to engage in learning activities designed to help them achieve that goal. Choice in activity selection may be informed by both learner preferences and how effective a particular activity or type of activity may be in helping the learner to reach that goal and may involve choice related to differences in simple surface features or significant differences in instructional type or strategy. Because making an informed choice about instructional type or strategy is often difficult—requiring knowledge about the content area that a novice may not have, knowledge of how a learner’s current skills may influence success in an activity, and knowledge of how effective different instructional strategies are in helping learners acquire different types of skills—teacher coaching is particularly important in making an informed choice when factors other than surface features differ among possible activities.

*Results of studies investigating the effects of learner control on learning have been equivocal, with some studies finding benefits, some finding no effects, and others finding detrimental effects.*

### *Surface versus instructional differences in activity type*

Choice in activity may involve surface features (e.g., two computer-based programs that both teach the same skills in the same ways but differ in their game-like elements, characters, or similar features) or features fundamental to learning. Although choice of surface features may not have a great effect on learning progress, choice related to instructional factors may have a significant effect. For example, a learner may attempt to learn a concept by reading about it or by reading followed by a classification or analysis activity related to identifying or analyzing instances of the concept. Based on research on concept learning, classification or analysis of examples and non-examples should result in greater learning than reading only (Tennyson & Park, 1980). Thus, when choosing activities that involve instructional differences, coaching by the teacher as to what type of instructional activity may be best suited for achieving a particular learning goal can be important. However, learners may still be able to choose learning activities based on their preferences when activities differ only in surface features.

### *Selection versus design and resource use*

Another issue in choosing activities is whether to select from activities readily available or to design new activities. More advanced students may choose to develop a unique learning sequence by selecting a number of different resources available in print, on the web, or via other sources. For example, a student might look up instructions and work examples in a textbook, watch a Khan Academy video, search for other relevant information available on the Internet, and work with the instructor and other students to discuss and solve problems. Because learning from resources is more challenging for learners

with lower prior knowledge, self-directed, resource-based learning activities may best be used by more advanced students who already have acquired knowledge of the subject area and skills in resource use (Kirschner & van Merriënboer, 2013).

When selecting activities, it is important to identify those that align well with the learning goal. For example, if a student's goal is increasing fluency in recalling math facts, a suitable learning activity might involve engaging in computer-based math games that require learners to recall math facts under some time pressure or that reward fast, accurate recall. If a student's goal is solving math word problems, then different activities would be most appropriate unless the student is struggling with word problems because of a lack of prerequisite skills in math fact fluency.

Finally, when possible, information about activities should be used in determining what activity might be best for a particular student working on a particular goal. This information may come from the publisher (e.g., information on necessary prerequisites, characteristics of target learners, and results of any studies that have been done) or from information gathered from prior use (e.g., have students like this one succeeded in this activity in the past; has it helped students achieve this goal?).

If choice of activity involves more than choice of surface features, then teacher input regarding the most appropriate learning activities for that learning goal is warranted. Because students are likely to be novices both in the subject and in optimal learning activities for different learning types, the expert input of a teacher is invaluable. However, when multiple activities are appropriate for similar learning outcomes and when learners are more sophisticated in terms of prior knowledge, skills in learning from resources, and monitoring their own learning to determine whether what they are doing is working, learner preference may play a larger role in activity selection and planning.

### **Monitoring Learning: Formative Assessment**

In formative assessment, information on student performance is gathered and used, not to evaluate the learner, but to evaluate whether learning methods and strategies are working for that learner. If learner performance indicates that specific methods or strategies are not working, a different learning method or strategy is indicated. Here, the focus is on evaluating the effectiveness of the learning activity during the learning process rather than on evaluating final learner achievement. As noted by Black and Wiliam (2009),

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. (p. 9)

There may be several reasons why a learning method or strategy is *not* working: (a) the activity itself may be poorly designed and therefore not effective, (b) the activity may be misaligned with the learning goal and therefore not teaching what the assessment is measuring, (c) the learner may be missing some prerequisite skills that the activity assumes are in place, or (d) the activity may not be effective for some other reason related to learner and activity characteristics. If a learner is not showing progress with a particular activity, then a different or modified activity should be tried and evaluated.

Studies have shown that students engaging in learner-controlled instruction who receive information on their mastery level do better than students in learner-controlled conditions

who do not receive such information (see Williams, 1993). When learners take an active role in measuring their own progress and use that information to continue or change what they have been doing to reach their goal, they are practicing important skills involved in self-regulated learning (Nicol & Macfarlane-Dick, 2006). Formative assessment can also be a potentially powerful tool in helping students adopt learning (vs. performance) goals and a growth (vs. fixed) mindset, predictors of learning and perseverance (Grant & Dweck, 2003). Although formative assessment can be conducted by the teacher or program, as often occurs in individualized and differentiated instruction, a *personalized* learning system with emphasis on active student involvement in gathering and interpreting performance information can help to encourage application of self-regulated learning skills (Andrade, 2010; see also Berger et al., 2014; Lindsley, 1992, for examples of learning systems focused on progress monitoring and formative assessment systems that feature high student involvement).

### **Mastery Learning: Pace and Practice**

When learning pace is set by the teacher or system, learner achievement must vary. When learning pace is variable and the signal to move on is mastery rather than a set period of time, time varies rather than achievement, and more students are able to reach higher achievement levels (USDOE, n.d.). Under the right instructional conditions, all students can achieve at higher levels (Bloom, 1968, 1974, 1984).

A fully personalized instructional system with a focus on continuous formative assessment and learner choice with teacher support in which students move at their own pace in meeting their selected goals is a type of mastery-based learning system. Mastery-based learning systems can result in increased student achievement (Kulik, Kulik, & Bangert-Drowns, 1990) and can support the development of positive motivational factors such as learning goal orientations and growth mindsets (Ames, 1992; Covington, 2000). In this type of system, assessments that show a lack of mastery indicate that more practice or a change in learning strategy or instructional materials is necessary to successfully reach the learning goal. The idea that learners can master learning goals with effort combined with the right learning methods illustrates the growth mindset and supports a learning goal orientation in which students persist in learning and mastering challenges.

### **Designing a System**

A school where each student is motivated and engaged in mastering challenging learning goals matched to his or her skills and interests is one where most students would love to learn, where educators would love to teach, and that communities would love to see. People have been imagining and writing about such a system since at least the late 1800s (Keefe & Jenkins, 2002).

However, setting up such a system is a challenge—one that requires cultural shifts in school systems and that will only result from focused experimentation. The process of designing this type of system is parallel to the process of co-designing learning. First, goals for the system—criteria by which it would be evaluated as being successful—should be discussed and clearly outlined. Second, methods and strategies to reach those goals should be identified. These methods and strategies might be inspired by or borrowed from others or designed from first principles. Third, continuous progress monitoring regarding a number of measures needs to be undertaken as new things are tried. The design process is not cheap or quick, but it is invaluable for innovation and is necessarily

iterative. When designs fail (and they will, again and again), that evidence is not evidence for the claim that “personalized learning systems are not effective,” just as a student failing is not evidence that “the student is dumb.” Rather, it is evidence only for the claim that what was tried did not work. A “mastery learning” perspective would indicate that you modify what you did and try again. Just as a student’s instruction can be co-designed with the teacher, learning systems and school cultures can be co-designed with students, faculty, administrators, and state agencies (see Brown, 2009, for a description of design thinking).

Although a schoolwide personalized system might be the ideal, this analysis also illustrates that single instructional episodes can be more or less personalized in different ways. Small, informal, localized experiments with these factors within a classroom or subject area can help build personalization into the curriculum at a smaller, more manageable scale while offering the opportunity to try out different methods and strategies and assess their effects. In this way, the system can grow via a bottom-up, organic process as different practices are tried and effective practices are identified and implemented on a wider scale.

### **Action Principles for States, Districts, and Schools**

#### **Action Principles for States**

- a. Provide resources for the design, development, and testing of co-designed personalized learning systems. Resources may include funding for design research as well as for development and dissemination of key principles and processes.
- b. Identify and develop evaluation measures that capture the range of criteria for judging a “successful” system. For example, student measures may focus on learning motivation and learning-to-learn skills as well as achievement in subject areas.
- c. Set an expectation that districts will continually experiment in order to reach goals. Districts should report successful and unsuccessful experiments as each provides information on what worked and what did not work (see Mirabito & Layng, 2013).
- d. Identify “showcase” districts that can serve as examples of design processes as well as outcomes.
- e. Embrace failure as a learning mechanism. Failure in experimentation should not be punished because innovation is unlikely without failure, and failure offers important information on what did not work. To mitigate the consequences of large-scale failure, a model with multiple local, small-scale, limited-duration experiments with frequent monitoring and adjustment should be adopted.

#### **Action Principles for Districts**

- a. Offer professional development in design thinking for teachers and school administrators.
- b. Reward thoughtful experimentation and consistent implementation of design processes within schools.
- c. Celebrate achievements without punishing failures. Failure is likely when trying something new and is important for innovation.

- d. Collect and disseminate case studies from district schools that illustrate design processes, what worked, what did not work, and what unexpected outcomes may have resulted.
- e. Develop clear goals for schools to reach that include process as well as product criteria for the school, classroom, and student levels.

### Action Principles for Schools

- a. Create detailed goal maps aligned with standards that clearly define knowledge and skills and the relationships among them. Goal analysis is a challenging but invaluable process for defining goals that are specific enough to work with yet still capture the spirit of the intended outcome.
- b. Design a system for continuous formative assessment that involves the student. Continuous, proactive self-assessment can empower learners and keep them actively engaged in working toward their goals.
- c. Move toward a mastery-based system. Although mastery-based systems can be challenging to implement because of their conflict with time-based instructional systems, even limited mastery-based systems can help students see their progress and achieve goals they may otherwise not have achieved.
- d. Develop and implement a learning-to-learn curriculum. Learning-to-learn or self-regulation and metacognitive skills support informed student choice in personalized systems and can help students develop the skills necessary to become lifelong learners.
- e. Work on developing a schoolwide culture focused on key values of mastery and autonomy.

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