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In Search of a Useful Definition *of* Mastery

What way of thinking about mastery will most effectively guide curriculum and instruction?

Thomas R. Guskey and Eric M. Anderman

Mastery is a term that all educators use and believe they understand well. But when pressed to describe precisely what it means to "master" a concept, skill, or subject, everyone has a different definition.

We can trace the concept of mastery back to the time of Geoffrey Chaucer's *Canterbury Tales*. In the 13th century, becoming a member of a guild raised one's social status and income potential. The process followed a specific sequence of steps, from apprentice to journeyman to master. Individuals progressed from apprentice to journeyman after learning the rudiments of the profession. They could then advance from journeyman to master only by producing a *masterpiece* that satisfied the existing members of the guild. In other words, competence could be achieved, but mastery was conferred (Lucus-McEwen, 2010).

Many professions still practice similar systems, including the field of medicine. Medical students serve as apprentices in various settings, progress to a journeyman role as medical residents, and finally receive their licenses to practice independently.

But our thinking about mastery has evolved and become more complex since Chaucer's time. By considering the views of various educators and thinkers, we can gain insight into the question, What concept of mastery will most effectively guide curriculum and instruction today?

Mastery vs. Competence

Educators have engaged in an ongoing debate in education about the difference between *mastery* and other terms, such as *competence* or *proficiency*. Some consider these terms synonymous. The Nellie Mae Education Foundation, for example, uses the terms interchangeably, titling its recent report, *Making Mastery Work: A Close-up View of Competency Education* (Priest, Rudenstine, & Weisstein, 2012).

Other educators, however, believe these terms describe strikingly different levels of skill or expertise. Mosher (2007) suggests that mastery is simply reaching a certain level of understanding of particular content, whereas competence represents the ability to apply what has been mastered. But Rosenberg (2012) argues the opposite, describing competence as only the second step in a four-step process to mastery, the four steps being *novice*, *competent*, *experienced*, and *master/expert*. He makes the point that if we were facing a serious medical procedure, we would much prefer a "master" physician to one who was merely "competent."

Bloom on Mastery

Although the basic tenets of mastery in education can be traced to such early educators as John Amos Comenius, Johann Heinrich Pestalozzi, and Johann Friedrich Herbart (Bloom, 1971), Benjamin S. Bloom brought the idea to the forefront in modern education with his 1968 article "Learning for Mastery." Building on the work of John B. Carroll (1963), Bloom theorized that nearly all students could attain mastery of any learning task if they were provided with enough time and "favorable learning conditions" (Bloom, 1977). The challenge for educators was to structure schools and organize classroom instruction in ways that would provide individual students with the time and conditions they needed. Bloom went on to describe an instructional strategy he labeled *mastery learning* as a practical means for educators to meet these challenges.

In addition to being a brilliant scholar and theoretician, Bloom was also politically savvy (Guskey, 2012). He knew that no matter how he described mastery, certain groups would disagree. Because he wanted educators to pay attention to his ideas and not argue about jargon, he simply turned the idea back to teachers. Bloom noted that nearly all teachers evaluate students' performance and assign grades or marks on the basis of their evaluations. If those grades or marks are criterion-based and designate distinct levels of student achievement, then teachers have already identified mastery: It is the level of performance the teacher has established for a grade of A. So rather than press teachers to define mastery anew, he simply asked them, Tell me what you expect of students to receive an A? As Bloom (1968) put it,

> Thus, we are expressing the view that, given sufficient time and appropriate types of help, 95 percent of students . . . can learn a subject up to a high level of mastery. We are convinced that the grade of A as an index of mastery of a subject can, under appropriate conditions, be achieved by up to 95 percent of the students in a class. (p. 4)

Bloom believed that debates about what level of student performance represents true mastery were useful and necessary. But he also recognized that these decisions are matters of choice and involve value judgments. He did not want debates about terminology to stand in the way of teachers implementing more effective instructional practices that could potentially help all students learn excellently.

Motivation Researchers on Mastery

Although many discussions of mastery focus on learning specific content and skills, another way of looking at mastery is from the students' perspective. Motivation researchers have demonstrated that mastery can be the learner's purpose for engaging in a task or activity. Consider, for example, the following two students.

Judy and Ben are both 10th grade students enrolled in a biology class. Judy loves biology. She wants to be a physician, and her goal in the biology class is to truly understand and master the material that is being taught. Ben also enjoys biology, but his goal in class is to get good grades and to demonstrate his superior ability as a science student.

Judy and Ben want different outcomes and would approach learning differently. Motivation researchers would refer to Judy as a student who holds *mastery goals* and to Ben as a student who has *extrinsic* or *performance goals* (Anderman & Wolters, 2006; Dweck & Leggett, 1988).

Do these different types of goals matter? Absolutely! Decades of research indicate that holding mastery goals is related to a host of beneficial outcomes. Students who focus on mastery are more likely to persist at academic tasks, particularly challenging ones (Harackiewicz, Barron, Tauer, Carter, & Elliot, 2000). They use more effective self-regulatory and metacognitive strategies (Wolters, 2004). They also are less likely to engage in self-handicapping strategies, such as going out with friends on the night before the exam rather than studying (Midgley & Urdan, 2001).

Motivation researchers also find that teachers' classroom practices can facilitate students' adoption of mastery goals. Students adopt mastery goals when teachers (1) allow them to resubmit assignments that need more work; (2) do not pressure students by consistently talking about grades and assessments; and (3) encourage self-comparisons and avoid comparing students' achievement with that of other students. Studies indicate that when students learn in these types of classrooms, they experience numerous academic benefits (Midgley, 2002; Turner et al., 2002). Research further shows that when middle school and high school math teachers encourage students to adopt mastery goals, the students are much less likely to cheat (Anderman & Midgley, 2004).

Mastery Definitions

The *Oxford English Dictionary* defines *mastery* as "comprehensive knowledge

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Students who focus on mastery are more likely to **persist at academic tasks**, particularly challenging ones.

or skill in a particular subject or activity" (http://oxforddictionaries.com/definition/english/mastery). In other words, mastery is a construct that cannot be observed directly but can be inferred from observable performance on a set of items or tasks related to a particular concept, skill, or subject.

In education settings, we verify mastery by asking individuals to respond to a series of questions or to perform a sequence of tasks. We then judge the adequacy of their responses or performance as measured against specific criteria. So in essence, we determine mastery through some form of assessment.

Mastery as Percent Accuracy

The dilemma in this process is establishing what level of performance is sufficient to denote mastery. As we described earlier, in many contexts mastery is defined through a simple percentage: For example, students demonstrate mastery when they score over 80 percent accuracy on an assessment. But in practice, it's not that simple. Setting percentage cutoffs on any form of assessment is an arbitrary decision that says little about the rigor of expectations set for students' performance. A much more important consideration is the cognitive complexity of the assessment questions students are required to answer or the difficulty of the tasks they are required to perform (Guskey, 2001).

Focusing on only a percentage cutoff in establishing mastery is seductive, but misleading. Without careful examination of the questions or tasks students are asked to address, percentage cutoffs are just not that meaningful. Tests and assessments vary widely in how they are designed. Some assessments include such challenging items or tasks that the cutoff score must be set low, meaning that students who answer even a low percentage of items correctly are

considered to have achieved mastery.

Consider, for example, the Graduate Record Examinations (GRE). Individuals who answer only 50 percent of the questions correctly on the GRE physics test perform better than more than 70 percent of those who take the test. For the GRE mathematics test, 50 percent correct would outperform approximately 60 percent of the individuals who take the test (Gitomer & Pearlman, 1999; Guskey, 2013). In most classrooms, of course, students who answer only 50 percent correct would receive a failing grade. Yet we should scarcely conclude that

Focusing on only **a percentage cutoff** in establishing mastery **is seductive, but misleading**.

the majority of prospective graduate students in physics and mathematics did not master their undergraduate coursework and are failures. Rather, these exams are composed of highly complex and extremely challenging items.

In addition, there are some circumstances in which setting a specific, high cutoff score on a challenging assessment may make it impossible for many students to demonstrate mastery. Imagine what would happen if Judy, the student we described earlier who loves biology, does not achieve a cutoff score of 80 percent on an extremely difficult assessment.

Even though Judy may be given the opportunity to retake the assessment, and even though her scores may rise each time, her desire to master biology may be thwarted if the 80 percent cutoff is used to define mastery. Judy may become frustrated, particularly if she is not acknowledged for the improvement in her scores.

Matters become even more complicated when we consider the nature of the learning goal. Because of safety issues or potentially dire consequences, some goals must be mastered at a 100 percent level. In teaching young children how to cross a busy street safely, for example, an 80 percent cutoff would clearly be inadequate. Similarly, operating certain types of machinery and performing some health care tasks require 100 percent mastery. Anything less is unacceptable.

Researchers suggest that an appropriate approach to setting cutoffs for mastery must combine teachers' judgments of the importance of the concepts addressed and consideration of the cognitive processing skills required by the items or tasks (Nitko & Niemierko, 1993). Researchers further suggest that students will be more motivated to master a topic if

they are given opportunities to show improvement in their learning over time (Anderman & Maehr, 1994). When teachers employ cutoff scores in these ways, assessment results will better reflect the quality of student thinking instead of simply the number of points students attain.

Sadly, this ideal is seldom realized. Rarely does such thought and consideration go into setting the cutoff levels for students' performance. Even with high-stakes assessments, where the consequences for students and teachers can be serious, this level of deliberative judgment is uncommon.

Mastery as Professional Judgment
How can we determine mastery, if not simply through a percentage of accurate responses? In essence, it comes down to professional judgment.

Even the most sophisticated technical procedures used to determine mastery on large-scale assessments involve some degree of professional judgment. Typically, a panel of judges with expertise in the subject reviews the assessment items or tasks and estimates what portion of students who have mastered the concept or skill would be expected to answer each item or perform each task correctly. These estimates are then combined through various procedures to determine a cutoff score or threshold that divides students into two mutually exclusive groups: masters and nonmasters (Cizek, 2001; Haertel & Lorie, 2004).

Recognizing that scores on any assessment are never completely accurate, educators often adjust cutoff scores for measurement error, depending on the consequences of the results. The cutoff score may be slightly lowered if the concern is false rejection—that is, erroneously classifying masters as nonmasters. This would be the case for many assessments of student achievement in which the consequences of rejection

for borderline but able students could be detrimental (for example, talented students not passing a course). But cutoffs also may be raised to avoid false acceptance—that is, erroneously classifying nonmasters as masters. For example, the consequences of false acceptance on certification exams for physicians and other health care professionals could be extremely serious.

Because all these methods involve fallible human beings making professional judgments, however, they are all wrought with problems (Rekase, 2000). Even when assessment designers are trained, judgment-based methods for standard setting can be untrustworthy and sometimes manipulated (Shavelson, 2013). Still, until more accurate, objective ways of setting cutoffs can be found, factoring in human judgment is the best available approach.

Implications for Practice

The many factors that go into defining and achieving mastery help us understand how educators can plan their classes and their daily instructional practices in ways that will help more students achieve mastery.

First, if teachers want students to achieve mastery on a particular task or assignment, they must make sure students understand the goal and must clearly articulate to students what constitutes mastery. If mastery will be determined by answering 80 percent or 90 percent of the questions on an assessment correctly, then students should know that in advance. Likewise, if mastery means being able to demonstrate a particular level of

skill on a complex task, then students need to know the criteria by which their performance will be judged and the level of skill that will be expected. Students can work toward mastery only if they know what is involved and how mastery is defined.

Educators also can do much to facilitate students' adoption of mastery goals (Midgley, 2002). If teachers want their students to focus on mastery of content and tasks, they need to allow students to work on tasks repeatedly, without penalties, until they achieve mastery. Thus, if mastery in solving a particular problem in science involves formulating hypotheses, collecting relevant data, analyzing those data, and drawing reasonable and verifiable conclusions, then students must be given opportunities to practice those skills and receive formative feedback from the teacher on their performance as a part of their instructional experience. These are essential steps on the pathway to mastery.

Just as a coach has players run a play over and over again until they have mastered its execution, teachers must give students multiple opportunities to achieve success. In addition, teachers must emphasize that the goal is mastering the task, rather than simply getting a high grade. They also should encourage students to seek help and assistance when they are not achieving mastery.

Complexity Calls for Judgment
Setting a level of performance considered "mastery" on any assessment of student learning—regardless of the assessment's scope, structure, or

format—is a more complex process than most policymakers and educators anticipate.

Even when statistical procedures are used to summarize the consensus of panels of experts, professional judgment is still involved in defining mastery. The process requires thoughtful examination of the questions students are asked to answer, the tasks they are asked to complete to demonstrate their learning, and the goals that students set when engaged with tasks and assessments. Only when such examination and judgment become a regular part of the assessment process can we make accurate and valid decisions about the quality of students' performance and the determination of true mastery. **EL**

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