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A Historical Perspective on Closing Achievement Gaps

Thomas R. Guskey

Although much has been written recently about gaps in the achievement of different groups of students, the problem has been with us for many years. This manuscript presents a historical perspective of the problem, viewing it as one of reducing variation in students' achievement. Specifically, it reviews the work of renowned educator Benjamin S. Bloom, who argued that to reduce variation in students' achievement and have all students learn well, we must increase variation in instructional approaches and learning time. Bloom also outlined a specific strategy to accomplish this instructional differentiation, labeling it "mastery learning." Bloom's work is described, along with common misinterpretations of his ideas and the results of research on the effectiveness of their implementation.

Achievement gaps among different groups of students have concerned government and education leaders for many years. In the 1960s, President Lyndon Johnson's "War on Poverty" focused directly on inequalities in the educational achievement of economically disadvantaged students and their more advantaged counterparts. The Economic Opportunity Act of 1964, which established the Head Start program, and the Elementary and Secondary Education Act of 1965, which created the Title I and Follow Through programs, were specific attempts to address these gaps in educational attainment. More recently, the No Child Left Behind legislation revived these concerns. This law requires schools to report achievement results separately for various economic, ethnic, language, and disability subgroups. Schools must not only identify any achievement gaps among these different student subgroups, they must take specific steps to close them.

Over the years, researchers have learned much about reducing these achievement disparities. Too often, however, this important knowledge base is ignored. Instead of building on what is already known, established principles are continually "rediscovered" and little real progress is made. To succeed in the efforts to close achievement gaps and reach the goal of helping all students learn well, this hard-earned knowledge base must be recognized and extended.

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The Contribution of Benjamin S. Bloom

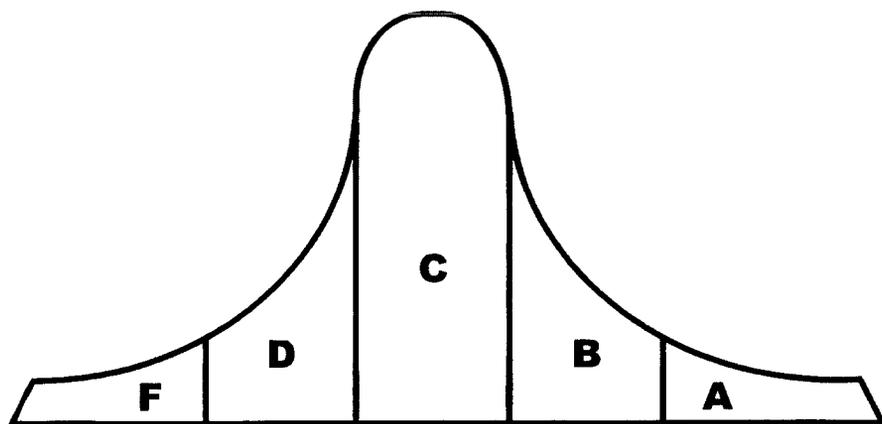
Researchers try to view problems in the simplest and most basic form. From a researcher's perspective, therefore, achievement gaps are simply matters of variation: students vary in their levels of achievement. Some students learn excellently in school and reach high levels of achievement and others learn less well and attain only modest levels. The purpose of most research is to explain variation. Researchers make educated guesses, called hypotheses, about what factors contribute to the identified differences among individuals. Then those factors are manipulated in carefully planned investigations to determine the effects. When a relationship is found between the factors that have been manipulated and differences in outcomes, success has been achieved in explaining variation.

One of the early researchers concerned with explaining variation in student achievement was Benjamin S. Bloom. In the early 1960s, Bloom's studies focused on individual differences, especially in school learning. Although he recognized that many factors outside of school affect how well students learn (Bloom, 1964), he believed that teachers had potentially strong influence as well. As he observed teachers in their classrooms, Bloom noted that there was little variation in their instructional practices. Most teachers taught all of their students in much the same way and provided all with the same amount of time to learn. Students for whom these instructional methods and the amount of time were ideal learned excellently. The largest number of students found these methods and time only moderately appropriate and learned somewhat less. Students for whom the instruction and time were inappropriate due to differences in their backgrounds or learning styles, tended to learn very little. In other words, little variation in the teaching resulted in great variation in student learning. Under these conditions, the pattern of student achievement was similar to the normal curve distribution shown in Figure 1.

To attain better results and reduce variation in student achievement, Bloom (1964) reasoned that there was a need to increase variation in teaching. Because students vary in their learning styles and aptitudes, Bloom suggested that instruction must be diversified and differentiated to better meet individual learning needs so all students learn well. The challenge was to find practical ways to do this within the constraints of group-based classrooms.

In searching for such a strategy, Bloom drew primarily from two sources of evidence. First, he considered the ideal teaching and learning situation where an excellent tutor is paired with each student. He was particularly influenced by the work of early pioneers in individualized instruction, especially Washburne (1922) and his Winnetka Plan and Morrison (1926) and his University of Chicago Laboratory School experiments. In examining this

Figure 1. Distribution of achievement by letter grade in traditional classrooms.



evidence, Bloom tried to determine what important elements in one-to-one tutoring and individualized instruction could be transferred to group-based classroom settings. Second, Bloom looked at studies of the learning strategies of academically successful students, especially the work of Dollard and Miller (1950). From this research he tried to identify the activities of high-achieving students in group-based classrooms that distinguish them from their less successful classmates.

Bloom saw value in teachers' traditional practice of organizing the concepts and skills they want students to learn into instructional units. He also considered it important for teachers to assess student learning at the end of each unit. But the classroom assessments most teachers use seemed to do little more than show for whom their initial instruction was and was not appropriate. Bloom knew that a far better approach would be for teachers to use their classroom assessments as learning tools and then to follow those assessments with a feedback and corrective procedure. In other words, instead of using assessments only as evaluation devices that mark the end of each unit, Bloom recommended using them as part of the instructional process to diagnose individual learning difficulties (feedback) and to prescribe remediation procedures (correctives). This is what takes place when an excellent tutor works with an individual student. If the student makes an error, the tutor first points out the error (feedback) and then follows up with further explanation and clarification (correctives) to ensure the student's understanding. Similarly, academically successful students typically follow up the mistakes they make on quizzes and assessments. They ask the teacher about the items they missed, look up the answer in the textbook or other resources, or rework the problem or task so that they do not repeat those errors.

Bloom's Mastery Learning

Bloom (1968) outlined a specific instructional strategy to make use of this feedback and corrective procedure, labeling it "learning for mastery," and later shortening the name to simply "mastery learning" (Bloom, 1971a). With this strategy, teachers first organize the concepts and skills they want students to learn into instructional units that typically involve about a week or two of instructional time. Following initial instruction on the unit, teachers administer a brief formative assessment based on the unit's learning goals. Instead of signifying the end of the unit, however, this formative assessment's purpose is to give students information, or feedback, on their learning. It helps students identify what they have learned well to that point and what they need to learn better (Bloom, Hastings, & Madaus, 1971).

Paired with each formative assessment are specific corrective activities for students to use in correcting their learning difficulties. Most teachers match these correctives to each item or set of prompts within the assessment so students need work on only those concepts or skills not yet mastered. In other words, the correctives are individualized. They may point out additional sources of information on a particular concept such as page numbers in the textbook or workbook where the concept is discussed. They may identify alternative learning resources such as different textbooks, learning kits, alternative materials, CDs, videos, or computerized instructional lessons. They may suggest sources of additional practice such as study guides, independent or guided practice activities, or collaborative group activities.

With the feedback and corrective information gained from a formative assessment, each student has a detailed prescription of what more needs to be done to master the concepts or skills from the unit. This "just-in-time" correction prevents minor learning difficulties from accumulating and becoming major learning problems. It also gives teachers a practical means to vary and differentiate their instruction to better meet students' individual learning needs. As a result, many more students learn well, master the important learning goals in each unit, and gain the necessary prerequisites for success in subsequent units.

When students complete their corrective activities after a class period or two, Bloom recommended they take a second formative assessment. This second, parallel assessment covers the same concepts and skills as the first, but is composed of slightly different problems or questions, and serves two important purposes. First, it verifies whether or not the correctives were successful in helping students overcome their individual learning difficulties. Second, it offers students a second chance at success and, hence, has powerful motivational value.

Some students, of course, will perform well on the first assessment, demonstrating that they have mastered the unit concepts and skills. The teacher's

initial instruction was highly appropriate for these students and they have no need of corrective work. To ensure their continued learning progress, Bloom recommended that teachers provide these students with special enrichment or extension activities to broaden their learning experiences. Enrichment activities are often self-selected by students and might involve special projects or reports, academic games, or a variety of complex, problem-solving tasks. Figure 2 illustrates this instructional sequence.

Through this process of formative classroom assessment, combined with the systematic correction of individual learning difficulties, Bloom (1976) believed all students could be provided with a more appropriate quality of instruction than is possible under more traditional approaches to teaching. As a result, nearly all might be expected to learn well and truly master the unit concepts or learning goals. This, in turn, would drastically reduce the variation in students' achievement levels, eliminate achievement gaps, and yield a distribution of achievement more like that shown in Figure 3.

In describing mastery learning, however, Bloom (1971b) emphasized that reducing variation in students' achievement does not imply making all students the same. Even under these more favorable learning conditions, some students undoubtedly will learn more than others, especially those involved in enrichment activities. But by recognizing relevant, individual differences among students and then altering instruction to better meet their diverse learning needs, Bloom believed the variation among students in how well they learn specific concepts or master a set of articulated learning goals could eventually reach a "vanishing point." As a result, gaps in the achievement of different groups of students would be closed.

Essential Elements of Mastery Learning

After Bloom described his ideas, numerous programs based on mastery learning principles sprung up in schools throughout the United States and around the world (see Block, 1971, 1974; Block & Anderson, 1975). Although these programs differed from setting to setting, those true to Bloom's ideas included two essential elements: (1) the feedback, corrective, and enrichment process; and (2) instructional alignment (Guskey, 1997).

Feedback, Correctives, and Enrichment

Teachers who use mastery learning provide students with frequent and specific feedback on their learning progress, typically through regular, formative classroom assessments. This feedback is both diagnostic and prescriptive. It reinforces precisely what students were expected to learn, identifies what was learned well, and describes what needs to be learned better. The National Council of Teachers of Mathematics (NCTM; 2000) emphasizes this same element in its latest iteration of standards for school mathematics.

Figure 2. The mastery-learning instructional process.

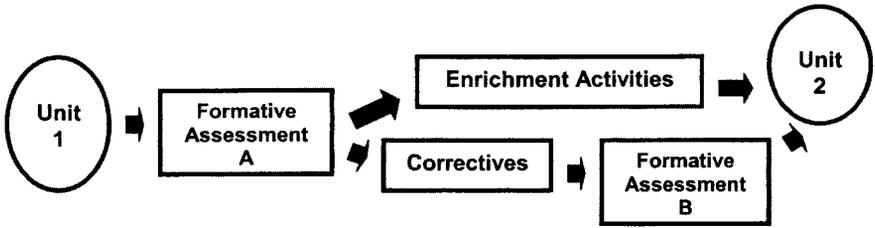
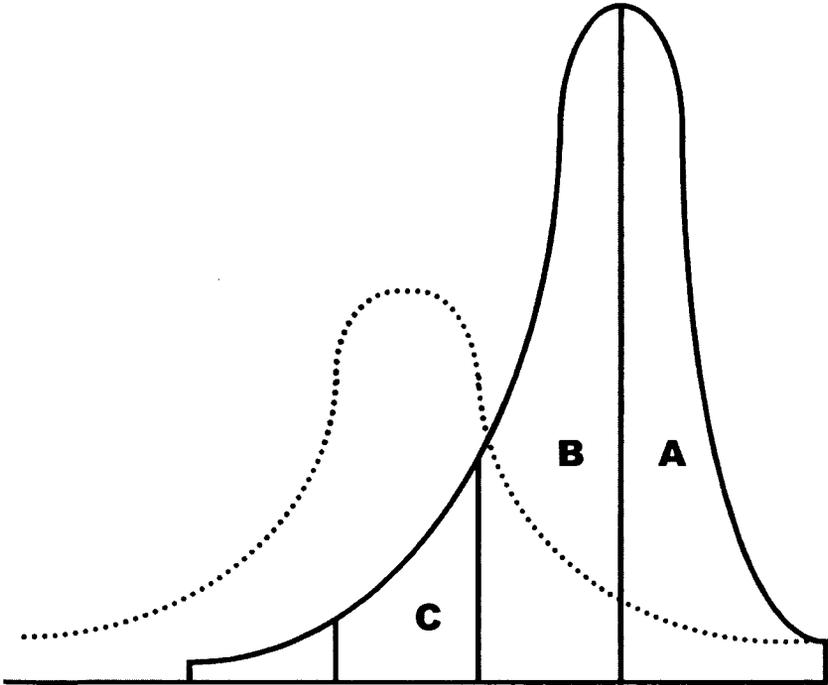


Figure 3. Distribution of achievement by letter grade in mastery-learning classrooms.



To overcome inequities in mathematics instruction, NCTM stresses the use of assessments that support learning and provide useful information to both teachers and students.

Feedback alone, however, does little to help students improve their learning. Significant improvement requires that feedback be paired with correctives—activities that offer guidance and direction to students on how to remedy their learning problems. Because of students' individual differences, no single method of instruction works best for all. To help every student learn well, therefore, teachers must differentiate their instruction, both

in their initial teaching and especially through the corrective activities (Bloom, 1976). In other words, teachers must increase variation in their teaching to decrease variation in results.

To be optimally effective, correctives must be qualitatively different from the initial teaching. They must provide students who need it with an alternative approach and additional time to learn. The best correctives present concepts differently and involve students in learning differently than did the initial instruction. They incorporate different learning styles, learning modalities, or types of intelligence. Although developing effective correctives can prove challenging, many schools find that providing teachers with time to work collaboratively—sharing ideas, materials, and expertise—greatly facilitates the process (Guskey, 2001).

Most applications of mastery learning also include enrichment or extension activities for students who master the unit concepts from the initial teaching. As described previously, enrichment activities offer students opportunities to broaden and expand their learning. Teachers reward students for their learning success and challenge them to go further. Many teachers draw from activities developed for gifted and talented students when planning enrichment activities, both to simplify implementation tasks and to guarantee these students a high-quality learning experience.

Teachers implement the feedback, corrective, and enrichment process in a variety of ways. Many use short, paper-and-pencil quizzes as formative assessments to give students feedback on their learning progress. But formative assessments can also take the form of essays, compositions, projects, reports, performance tasks, skill demonstrations, oral presentations, or any device used to gain evidence on students' learning progress. Teachers adapt the format of their formative assessments to match their instructional goals.

Following a formative assessment, some teachers divide the class into separate corrective and enrichment groups. While the teacher directs corrective activities, guaranteeing that all students with learning difficulties take part, the other students work on self-selected, independent enrichment activities. Other teachers pair with colleagues and use a team-teaching approach. While one teacher oversees corrective activities, the other monitors enrichments. Still other teachers use cooperative learning activities in which students work together in teams to ensure all reach the mastery level. If all attain mastery on the second formative assessment, the entire team receives special awards or credit.

Feedback, corrective, and enrichment procedures are vital to mastery learning because it is through these procedures that mastery learning differentiates and individualizes instruction. In every unit taught, students who need extended time and opportunity to remedy learning problems receive these through correctives. Those students who learn quickly and find the

initial instruction highly appropriate have opportunities to extend their learning through enrichment. As a result, all students experience more favorable learning conditions and more appropriate, higher-quality instruction (Bloom, 1977).

Instructional Alignment

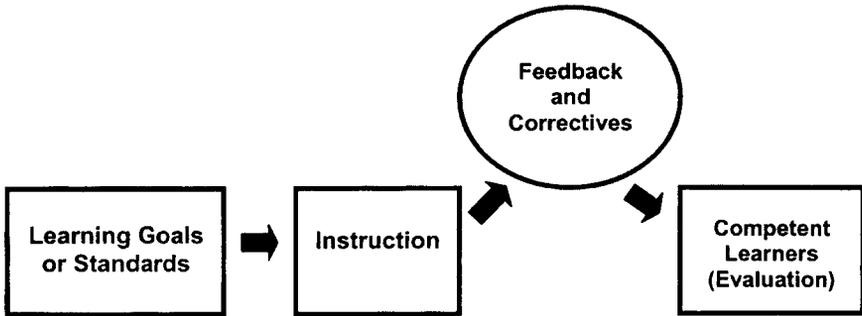
Although feedback, correctives, and enrichment are important, they alone do not constitute mastery learning. To be truly effective, Bloom stressed they must be combined with the second essential element of mastery learning: instructional alignment. Reducing variation in student learning and closing achievement gaps requires clarity and consistency among all instructional components.

The teaching and learning process is generally considered to have three major components. To begin, there must be some idea about what educators want students to learn and be able to do (i.e., learning goals or standards). Next comes instruction that, ideally, results in competent learners—students who have learned well and whose competence can be appraised through some form of assessment or evaluation. Mastery learning adds the feedback and corrective component, allowing teachers to determine for whom their initial instruction was appropriate and for whom learning alternatives may be needed.

Although essentially neutral with regard to what is taught, how it is taught, and how learning is evaluated, mastery learning requires consistency or alignment among these instructional components, as shown in Figure 4. If, for example, students are expected to learn higher-level skills such as those involved in making applications, solving complex problems, or developing thoughtful analyses, mastery learning stipulates that instructional activities must be planned to give students opportunities to practice and actively engage in those skills. It also requires that students be given specific feedback on how well they have learned those skills, coupled with directions on how to correct any learning errors. Finally, procedures for evaluating students' learning should reflect those higher-level skills as well.

Ensuring alignment among instructional components requires teachers to make a number of important decisions. They must decide, for example, what concepts or skills are most important for students to learn and most central to students' understanding. Are they satisfied with students learning only basic skills, or do they want students to develop higher-level skills and more complex cognitive processes? Teachers also must decide what evidence best reflects students' mastery of those basic or higher-level skills. Critics sometimes challenge teachers' abilities to make these crucial decisions. But, in essence, teachers at all levels do so already. Every time they administer an assessment, grade a paper, or evaluate students' learning, teachers communicate to students what is most important to learn. Using mastery learning

Figure 4. Major components in the teaching and learning process.



simply compels teachers to make these decisions more thoughtfully, intentionally, and purposefully.

Misinterpretations of Mastery Learning

Some early attempts to implement mastery learning were based on narrow and inaccurate interpretations of Bloom's ideas. These programs focused on only low-level cognitive skills, attempted to break learning down into small segments, and insisted that students "master" each segment before being permitted to move on. Teachers in these programs were regarded as little more than managers of materials and recordkeepers of student progress. Nowhere in Bloom's writing can the suggestion of this kind of narrowness and rigidity be found. He considered thoughtful and reflective teachers vital to the successful implementation of mastery learning and continually stressed flexibility in its application. In his earliest description of the process, Bloom (1968) wrote:

There are many alternative strategies for mastery learning. Each strategy must find some way of dealing with individual differences in learners through some means of relating instruction to the needs and characteristics of the learners....The alternative high school schedule...is one attempt to provide an organizational structure that permits and encourages mastery learning. (pp. 7-8)

Bloom also emphasized the need for instruction in mastery learning classrooms to focus on higher level learning goals, not simply basic skills. In 1978, he noted:

I find great emphasis on problem solving, applications of principles, analytical skills, and creativity. Such higher mental processes are emphasized because this type of learning enables the

individual to relate his or her learning to the many problems he or she encounters in day-to-day living. These abilities are stressed because they are retained and utilized long after the individual has forgotten the detailed specifics of the subject matter taught in the schools. These abilities are regarded as one set of essential characteristics needed to continue learning and to cope with a rapidly changing world. (p. 578)

Modern research studies show mastery learning to be particularly effective when applied to instruction that focuses on higher-level learning goals such as problem solving, inferring, deductive reasoning, and creative expression (Guskey, 1997). The process helps teachers close achievement gaps in a broad range of learning goals from basic knowledge and skills to highly complex cognitive processes. In addition, some secondary teachers worry about the constraint of class time. With limited time available, they fear the introduction of feedback, corrective, and enrichment procedures will reduce the amount of material they will be able to cover. As a result, they will have to sacrifice coverage for the sake of mastery.

The first few mastery learning units typically do require more time. Students must be oriented to this process, and class time usually needs to be set aside to engage students in corrective work. Teachers who assign correctives as homework or who ask students to complete correctives during a special study session before or after school generally find that those who most need the extra time and assistance are the least likely to take part. By providing class time for these activities, mastery learning teachers often find themselves “behind” those teachers who teach in more traditional ways after the first two or three units.

Once students become familiar with the process, however, mastery learning teachers begin to pick up the pace of their instruction. Because students in mastery learning classes spend a larger portion of their time in class actively engaged in learning, they typically progress faster than students in more traditionally taught classes (Arlin, 1973; Fitzpatrick, 1985). As students catch on to the process, they also do better on first formative assessments. With fewer students involved in correctives and less corrective work needed, teachers can reduce the class time allocated to corrective activities. And because mastery learning students learn the concepts and skills from early units well, they are better prepared for more advanced units later. Instruction in later units can therefore be more rapid and include fewer review activities. Most teachers discover that with adjustments in the pacing of their instruction—more time spent in early units but less time in later ones—they can cover just as much material using mastery learning, and in some cases more, as they were able to using more traditional approaches to instruction (Block, 1983; Guskey, 1983, 1987).

Research Results

Because mastery learning builds on the practices that teachers have developed and refined over the years, most find that implementation requires only modest changes in their instructional procedures. Excellent teachers undoubtedly use many aspects of mastery learning in their classes already. Others find the process blends well with their present teaching strategies. Yet despite the modest nature of these alterations, extensive research evidence shows that using mastery learning can have exceptionally positive effects on student learning. Kulik, Kulik, and Bangert-Drowns (1990) conducted a comprehensive, meta-analysis review of the research on mastery learning and concluded:

Few educational treatments of any sort were consistently associated with achievement effects as large as those produced by mastery learning. . . . In evaluation after evaluation, mastery programs have produced impressive gains. (p. 292)

Providing feedback, correctives, and enrichments, and ensuring instructional alignment takes little time and effort, especially if tasks are shared collaboratively among teaching colleagues. Still, studies consistently show that the systematic use of these elements helps many more students learn well, significantly reduces variation in student learning outcomes, and closes gaps in the achievement of different groups of students at any level of education (Walberg, 1986). Some researchers (see Waddington, 1995, for example) have even suggested that the superiority of Japanese students in international comparisons of achievement in mathematics operations and problem solving may be due largely to the widespread use of instructional practices similar to mastery learning in Japan.

Research evidence (see Guskey & Pigott, 1988) also indicates that the positive effects of mastery learning are not limited to cognitive outcomes. The process also yields improvements in students' confidence in learning situations, school attendance rates, involvement in class lessons, attitudes toward learning, and a host of other affective measures. This multidimensional effect has been referred to as mastery learning's "multiplier effect" and makes it an especially powerful tool in school improvement efforts.

Conclusion

Numerous factors affect student learning, many lying beyond classroom walls and outside of teachers' control. A recent Educational Testing Service report (see Barton, 2003), for example, identified a wide range of environmental factors that may contribute to achievement gaps, the majority of which are external to schools. Denying the role of these outside influences will not endow teachers and schools with the capacity to reduce achievement gaps,

and efforts to address these home and community-based challenges must continue (Rothstein, 2004).

Nevertheless, the impediments to learning in students' environments outside of school should never become a basis for lowering expectations about what can be done to help them learn well in school. The feedback, correctives, and enrichment process, and instructional alignment elements of mastery learning represent powerful tools that teachers can use to capitalize on the influence they have. They are not, of course, the only factors of importance. In his later writing, Bloom (1984, 1988) described exciting work on other ideas designed to attain results even more positive than those typically achieved with mastery learning. Still, careful attention to these elements allows educators at all levels to make great strides in their efforts to reduce variation in student achievement and close achievement gaps. They offer the tools needed to help students of different racial, ethnic, and socioeconomic backgrounds learn excellently, succeed in school, and gain the many positive benefits of that success. ♣

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