Student-Program Alignment and Teaching to Mastery

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When students are taught to mastery, they become smarter, acquire information faster, and develop efficient strategies for learning. Teachers must have an understanding of what masteryis and how to achieve it in their students. However, teachers cannot teach to mastery without referencing the performance of their students. In addition, teachers cannot teach to mastery without a program design that supports the approach. Teaching to mastery is built upon effective student/program alignment. This paper discusses the features of a program design that supports mastery, properties of mastery, criteria and procedures for measuring mastery, procedures for aligning program placement with student performance, and the benefits of mastery.

Features of a program design that supports mastery

A program design that supports mastery does not present great amounts of new information and skill training in each lesson. Rather, work is distributed so new parts in a lesson account for only 10–15 percent of the total lesson. The rest of the lesson firms and reviews material and skills presented earlier in the program. The program assumes that nothing is taught in one lesson. Instead, new concepts and skills are presented in two or three consecutive lessons to provide students with enough exposure to new material that they are able to use it in applications. So a lesson presents material that is new today; material that is being firmed, having been presented in the last two or three lessons; and material that was presented even earlier in the sequence and is assumed to be thoroughly mastered. This material often takes the form of problems or applications that require earlier-taught knowledge.

The amount of new material is relatively small because most students are not capable of assimilating more. This design provides for some "overlearning," but having the program err in the direction of providing too much practice is better than providing too little practice. Work on material presented in the preceding few lessons is needed to ensure that students are "automatic" with information or operations that were previously taught.

The review of earlier material assures that students use and apply what they have learned. Reviews also prompt students toward an understanding that they are expected to retain and use material learned—not just learn it for the moment. Basically, most things are taught in the program so they can be used in applications or problem-solving settings. Therefore, the program is constructed so students review and use what they have learned according to a systematic schedule. Because reviews are a regular feature of every lesson, the program design provides daily prompting that material presented will appear again. Also, applications that involve earlier-taught skills provide the kind of practice that students need to keep from mixing up different things they are learning. If students partially learn things, new learning is easily confused with things that are similar. If students learn material well, less confusion results.

Mastering a step at a time. A program designed with small amounts of new material in each lesson is something like a stairway. Like a stairway, it needs strong support. That support is in the form of the previously taught skills and knowledge that are logical underpinnings for what is to come

next in the program. Also, for the stairway to work well, the "steps" in this series should be about the same size. Certainly, they can't be fashioned with the accuracy of a physical stairway, but they can be designed so they are close to each other in size.

If we conceive of the program as being like a stairway that transports students to increasingly complex performance, we recognize the supreme importance of mastery, what it is, and how it relates to the curriculum. The following six points clarify the relationship between mastery and the stairway.

1. The program will function as a stairway if the student reaches every stair on schedule. If students are firmly on the fifth stair (which is analogous to the fifth lesson), the new learning that students must achieve to reach the sixth stair is manageable. The students' position on the fifth stair represents a foundation that places the sixth lesson within stepping distance. Because the foundation is in place, the sixth lesson does not overwhelm students with too much new vocabulary, unfamiliar or unpracticed operations, too much information, or too many unknown or unexplained details.

2. The steps are levelers of individual differences. Not all students who stand on the fifth stair are the same age, learn at precisely the same rate, have equal intelligence, or exhibit the same "style" of learning. However, every student who is firmly on the fifth step is the same with respect to the program sequence. Each has the skill repertoire and knowledge needed to take the next step and reach that step within 30–45 minutes of instruction. Because students could not reach the fifth step without specific skill and knowledge, the stairway structure of a well-designed program serves as a leveler. All students with a particular skill profile are placed on the same stair. Certainly, the program design does not guarantee that all students will progress at exactly the same rate; however, greatest individual differences occur on the very beginning levels. On higher levels, after students have mastered a battery of skills and knowledge, the difference in rate of ascent for appropriately placed students is far less because all students tend to have enough skill to master the new material at around the same rate.

3. The benefits of the design of the program are obliterated if a student falls below the level of a stair. This fact holds for students who are "smart" as well as those who have a history of failure. If a student is below the fifth stair and tries to reach the sixth stair with one step (which means thoroughly mastering the sixth lesson in one period), the student must learn substantially more than students who are firmly on the fifth stair. Furthermore, the student must learn this material during the same amount of time allotted for students who are firmly on the fifth stair. Therefore, the student who is below the fifth stair must learn the material at a faster rate. The student on the fourth stair must learn material at twice the rate of students who are correctly placed. The student who is on the third stair must learn at three times the rate. For the typical student, a step that requires three times the amount of new learning is too great. Even if the student is able to perform acceptably on lesson 6 after some repetition, the retention rate of the student on the subsequent lessons drops dramatically.

4. Just as the design of the program "guarantees" a successful future for students who are firmly based on a stair, the design suggests an unsuccessful future for a student who is greatly below that stair. The systematic stairway design does not provide relief because skills and knowledge do not go away. Once introduced, they are used throughout the rest of the program, either as elements that are used regularly (such as a word type that is learned), as details that are embedded in problems and applications (such as the math operation of carrying), or as items that are frequently reviewed (such as identifying the verb in sentences). Because of this program design, once a student

falls behind, the student will tend not to catch up. If the student is initially 3 steps below the lesson, the student will probably end up a little more than 3 steps below the next lesson, a little further below the following lesson, and so forth until the student is not 3, but 4, steps below the level of the lesson, then 5 steps below, and so forth.

This student is not able to benefit from the design of the program, because although the program presents small increments of learning, this student must master large increments of learning to catch up. For this student, the program presents a poorly designed sequence. It requires too much new learning and does not provide adequate reviews.

5. Because the program's design benefits are transmitted only to students who are on the lesson stairs, student performance must match the level of performance assumed by each stair. This goal is achieved if teachers teach to mastery. **Mastery assures that everything that is supposed to be taught is taught thoroughly and at the time it is introduced in the program (not 20 or 30 lessons later).**

Note, however, that DI programs are designed with enough redundancy that a student who is absent for two or three days will not be perfectly lost for the rest of the year. Also, if students do not master a new skill on the first day it is introduced, the following lessons provide at least one—possibly two—reviews of the introduction so that students will have sufficient opportunity to learn the skill before it is assumed to be in their skill repertoire and begins to appear in applications.

The problem occurs when students are not brought to mastery on skills that will be used later. For instance, students in Level 1 of *Reading Mastery* are supposed to be taught to follow the teacher's directions about "touching words" before lesson 30. The tasks that the teacher presents require students to follow directions to "Touch the first word. . . . touch the next word. . . . touch the next word. . . . "

Often students are not brought to mastery when this series of tasks is introduced. These students have problems in the lesson range of the 40s because now they are expected to first "touch the next word. . . ." and then "sound it out." If they are not firm on touching the next word on signal, the activity becomes very sloppy and students often become confused about what they are supposed to do. If students are taught on time, however, they have far less difficulty mastering the mechanical steps of touching the next word and then touching the individual letters as they sound it out. The program design provides for enough practice; however, that practice must not be mere exposure or practice with a very low standard of performance. The practice must lead to mastery.

6. Most programs do not require teaching to mastery. Teaching to mastery is a foreign practice to many experienced teachers because most programs do not require mastery. Instead of providing continuous skill development, these programs present topical or thematic units. Students will work on a particular unit for a few days and then it will be replaced by another unit that is not closely related to the first and that does not require application of the same skills and knowledge. This design, referred to as a "spiral curriculum," is more comfortable for the program designers, teacher, and students; however, it is inferior for teaching skills and knowledge.

It is comfortable for the designers because the design does not have to be careful. The designers do not have to document that everything that is presented is "teachable"; the amount of new learning does not have to be carefully measured. The amount of time required for a "lesson" does not have to correspond precisely to a period, because the design assumes that different teachers will take different amounts of time to get through a particular "lesson" and "unit." The amount of new material is not

controlled. The expectations for student performance is low because teachers understand that students will not actually master the material. They will simply be exposed.

The accountability of the teacher is therefore more "comfortable" because the teacher is not expected to get through the material in a specified period of time or bring students to mastery. The spiral curriculum is more comfortable for students because they are not required to learn, use, or apply the skills from one unit to the next unit. They quickly learn that even though they do not understand the details of a particular unit, the unit will soon disappear and be replaced by another that does not require application of skills and knowledge from the previous unit. The design clearly reinforces students for not learning or for learning often vague and inappropriate associations of vocabulary with a particular topic.

If the systematic program is like a stairway, the spiral curriculum is like a series of random platforms suspended on different levels. Students are mysteriously transported from one platform to another, where they remain for a few days as they are exposed to information that is not greatly prioritized. Mastery is impractical with a spiral curriculum design because many students lack the background knowledge they need to stand on a particular "platform." **The poor design relieves the program designer of assuring that earlier-taught skills and knowledge are mastered and used. The poor design also relieves students of the responsibility of learning to mastery and it relieves the teacher of teaching to mastery. It therefore promotes poor teaching and poor learning.**

In summary, a program that teaches to mastery is like a stairway. **Mastery is the guarantee that students are able to reach each stair without falling.**

Properties of mastery

Clearly, mastery is the handmaiden of a systematic program. Mastery is effective for a number of reasons. The most important reason is that mastery permits teachers to achieve steady reliable progress in student learning. **When teachers teach to mastery, we can make predictions about student performance. We can very accurately project where students will be 100 school days from now or 200 school days from now.**

Such projections are very powerful, but very foreign to traditional orientations about learning, which view the students' performance as a function of their ability to learn and motivation to learn. Therefore, to predict that student X will be accurately reading 30 words per minute by the end of the kindergarten year would be something of a contradiction because it assumes that the teaching somehow controls the student's learning.

The traditionalist hopes to reach and motivate the student and hopes that the student does not have some type of mysterious "learning disability" that interferes with learning to read. The traditionalist, however, is unable to predict who will read and who won't. Readiness tests are tools that are supposed to predict performance according to what the student brings to school. Because they don't take into account the kind of reading instruction the student will receive, readiness tests fail to predict accurately. In fact, the traditional orientation to reading has a classification for students who are predicted by readiness tests to succeed but who fail to learn to read on schedule—specific learning disabilities. Note that this label holds fast to the assumption that the student's failure to learn to read has to do with a flaw in the student, not a flaw in the instruction. The school or teacher does not have a "disability." The student does. In other words, for the traditionalist, the performance of the student is not clearly linked to teaching. **The more scientific orientation to teaching that by**

DI espouses assumes that the student who meets the entrance requirements for the program and who is taught appropriately (to mastery and on schedule) will respond in perfectly lawful ways and will be reading at a predicted skill level by the end of the kindergarten year.

Individualization must occur from the beginning. Projections are keyed to the performance of a student. Not all children entering kindergarten have the same projections because not all of them start at the same place. Those who enter with more skills have a headstart and are expected to be farther after nine months of instruction than the child who enters with a lower skill level. However, even if children begin as low performers, the prediction is that they will master beginning reading skills in kindergarten and will be reading by the end of kindergarten. For the child who enters with a low skill level, the projected end-of-K-year performance may be lesson 120. The projection for the higher performer may be double that number.

The fact that projections are met means that the DI orientation to teaching and mastery is correct. Students will learn if the teaching is appropriate. If they fail to learn, the reason lies not with their inability to learn but with the delivery system's inability to teach.

The concept of individualization is closely related to the issue of mastery and to projections about students' performance**. The teacher cannot teach to mastery without referring to the performance of the students being taught. The teacher bases decisions about what to do next on samples of each student's behavior.** This sample may come from tasks presented to the group, tasks presented to individual students, or worksheets and similar work samples. DI is designed so students' thinking is made overt. The teacher therefore receives samples of behavior at a high rate on everything that is being taught. The teacher uses this information to judge what rate of presentation is appropriate. If students have already learned the skill or concept, the teacher is to move on. If the teacher determines that some students have not mastered what is being taught, the teacher corrects the mistakes and possibly repeats parts of the exercise. If quite a few students missed the item, the teacher may repeat the entire exercise with the whole group, which is more efficient than presenting it to some students individually.

In summary, teaching to mastery is possible only if the teacher keys the amount and type of practice students receive to the performance of these children.

Criteria and procedures for measuring mastery

Teaching to mastery is a difficult procedure for teachers to learn. They must learn to reference what to do next according to the students' performance. They must learn high, but realistic, expectations for their students. They must also learn to coordinate mastery with fast pacing so that the lesson is neither a chore for students nor busy-work. The teacher uses efficient means of checking students' work, of providing additional practice and firm-ups for students who do not achieve mastery on skills that were taught, and of providing reinforcement for trying hard and for succeeding.

First-time correct procedures. An important key to teaching to mastery is the use of first-time correct procedures. Procedures for inducing mastery require the teacher to interpret students' performance.. **The primary indicator of mastery is how well students perform the first time a particular task or exercise is presented in the lesson**. Each time a task is presented, the group either responds correctly (all students correct) or incorrectly (some students giving the wrong response or no response). First-time correct means all students are correct the first time a task is presented in a lesson.

Also important is how well students perform on the task or exercise if the teacher presents it more than once. If the teacher corrects and repeats the task or exercise, it is important for students to perform correctly the second time. However, for diagnostic purposes, students' responses to the **first time** the task or exercise is presented provides the most critical information about where students are positioned on the stairway and whether they are appropriately placed in the program. For instance, the first time the teacher asks a question such as, "Do we multiply or divide to solve this problem?" or the first time students read a particular word list, their responses reveal information about the mastery level the students bring to the lesson.

The students' pattern of correct responses also provides important mastery information. If they are making too many mistakes, or if they are not firm on material that had been taught earlier and that is assumed to be firm, they are placed too far in the program and should be moved back. If students give solid indications that they already know what the lessons is teaching, the students may not be placed as far in the program as they might be, and the rate of lesson presentation should increase. Finally, the "correct-response" patterns of a group indicate whether all students belong in the group or whether some should be placed in other groups.

Four criteria permit precise interpretation of the correct-response performance for groups and individuals:

> **Criterion 1. Students should be at least 70% correct on anything that is being introduced for the first time.**
>
> **Criterion 2. Students should be at least 90% correct on the parts of the lesson that deal with skills and information introduced earlier in the program sequence.**
>
> **Criterion 3. At the end of the lesson, all students should be virtually 100% firm on all tasks and activities.**
>
> **Criterion 4. The rate of student errors should be low enough that the teacher is able to complete the lesson in the allotted time.**

Again, all the percentages are based on how students perform the **first time** a particular task is presented in the lesson. For material that is assumed to be mastered, the group should respond perfectly at least 9 out of 10 times.

As noted above, students' first-time performance shows what they have brought with them to the lesson. That is the material that is in their memory and skill repertoire. The performance of students after the teacher repeats the material indicates only what the students may retain for possibly less than 10 minutes. That time span does not measure mastery. When students master a skill they know it "as well as they know their own name."

All four criteria should be considered in evaluating the mastery of the group. If students meet the first three criteria but can't seem to get through lessons in the allotted time, something is wrong. The following sections examine the four criteria in more detail.

Criterion 1. Students should be at least 70 percent correct on anything that is being introduced for the first time. This percentage is based on the understanding that even the new skills or procedures that are being introduced are not composed entirely of material that is new. Much of it will be familiar. Therefore, the initial rate of correct responses should not drop below 70 percent. If students are at mastery on the preceding lessons, this outcome will occur in almost all cases.

If students perform much below 70 percent, they are not learning the material. If they are only 50 percent correct, they may be at a chance level—guessing at the answers or the steps in the operation. Their responses are not generated by an overall understanding of what they are learning. At 70 percent correct, their responses show that they are much closer to understanding the new material than they are to taking blind stabs at responding, and therefore should be able to master the new material during the lesson.

Criterion 2. Students should be at least 90 percent correct on the parts of the lesson that deal with skills and information introduced earlier in the program sequence. Criterion 2 is based on the fact that students must be completely at mastery on earlier-taught material. When earlier-taught material occurs in later lessons, no reteaching should be required. If substantial reteaching is needed, the amount of new learning that students must achieve to master the lesson becomes too great. If students are consistently not at the 90 percent correct level on material that had been taught earlier in the program, students need more extensive firming and more delayed tests. Possibly, the teacher should use a game format in which she asks students different questions at the end of the lesson. Students who respond correctly receive points. When virtually all students consistently earn points, they have learned good techniques for learning and retaining information presented in the lesson.

Criterion 3. At the end of the lesson, all students should be virtually 100 percent firm on all tasks and activities.

Criterion 4. The rate of student errors should be low enough that the teacher is able to complete the lesson in the allotted time. Criteria 3 and 4 go together. **When the rate of errors for the overall lesson is low, the teacher does not need to spend great amounts of time firming students, and the teacher should be able to complete the lesson in the allotted time.** If students enter the lesson with skills that permit them to attain 70 percent correct on new material and 90 percent correct on material taught earlier, students should be able to achieve virtually 100 percent on all exercises presented in the lesson. Achieving this performance level may require a little additional firming, but it should not be necessary or excessive lesson after lesson. Therefore, if Criteria 1 and 2 are met, students should easily achieve Criterion 3 and the teacher should able to complete the lesson during the allotted time.

Calculating percentages. Several different procedures are effective for teachers to learn how to "estimate" or calculate the percentage of first-time-correct responses. One way is to place sticky tabs in the teacher presentation book after each task, or affix a sheet of paper to the page so the teacher can mark whether the group (or individual) correctly responded to each task. After the children have responded to ten tasks, the teacher simply counts the number of tasks that were correct. If seven were correct, the percentage is 70 percent. (Note: if the teacher repeats a task, she would not mark the second-time performance the same way she would mark the first-time performance. She could circle the second-time performance, note the performance in a second column, or use another way to separate the first-time performance from performance on tasks or exercise that are repeated.)

After using a procedure of actually counting the responses within each exercise, the teacher should try to make estimates in her head. One way is to "ball park" patterns in terms of whether students are performing closer to 50 percent or 100 percent. If they seem closer to 50 percent (missing a little less than half of what the teacher presents) their first-time percentage is too low. If they are clearly closer to 100 percent than 50 percent, their performance tends to be high and in the ball park.

For some tasks, such as reading a passage, the percentage should be high, even on the first reading, because virtually all the words should be familiar. Students should not fall below 90 percent correct on the first reading of a passage. On the second reading, students should perform close to 100 percent.

Once the teacher becomes facile at estimating the percentage of correct responses, she has learned to respond sensitively to students' progress and problems. The teacher would apply this skill. If only some of students in the group consistently make mistakes, they should probably be placed in another group.

Decisions about mastery do not derive only from the percentages of first-time correct performance. The teacher also has information about in-program test performance and independent-work performance. The value of identifying the first-time-correct performance is that it affords the teacher the opportunity to correct problems of mastery when they first appear. This opportunity results in greater efficiency in teaching to mastery.

Assessing mastery through delayed tests. Delayed tests are simply selected tasks from the lesson that are presented again later in the lesson. Because of the "delay" between the time students worked the task and when they work it again, the teacher is provided with a good indication of whether students have the information in their memory.

Presenting delayed tests, either to the group or to individuals, is the best way to shape or improve students' ability to remember new information and to learn how to organize it mentally so that they are able to recall and use it. The tests work best when there is a contingency attached to them. If students know that they will be tested later on any exercise, skill, or problem type presented in the lesson, students will tend to learn the material far better than when no contingency exists. For instance, at the beginning of a reading lesson, the teacher indicates that at the end of the reading lesson, "I'll call on individuals to read some of the harder words in the lesson. Let's see if we can get a perfect score."

After the word attack, the teacher says, "Now you're going to read some of those harder words. Remember, if you read all the words correctly when I call on you, you earn five bonus points. If everybody reads the hard words, everybody receives another three bonus points." This procedure could be repeated at the end of the story before students begin independent work. Similar routines are effective for math and language lessons as well.

To further assure that students are at mastery, the teacher could present delayed tests at different times of the day**. A good rule is that whenever students are lined up in the classroom, ask them questions about the newly taught material.** Praise students who do well. Remember, the more students understand that they will use the information that they are learning, the more they will develop strategies that permit them to master new material quickly and efficiently. More importantly, by providing delayed tests, the teacher shows students what is important. If the teacher shows that their learning and retention of material are important—not simply within the time frame of the period during which the material is taught—the teacher models what they are to think about, mentally rehearse, and use. This message goes a long way to help students prioritize their thoughts and goals.

Procedures for teaching to mastery

One of the most obvious questions about teaching to mastery is: If mastery teaching has so many benefits, why haven't we seen the effects of mastery teaching on lower performers? The reason is simply that schools typically (and historically) have not been designed to provide for teaching to mastery. The schools have not been organized either to recognize mastery teaching as important or to address the technical details of achieving it, particularly with lower performers.

Three basic components must be in place if a school is to achieve the transformations that are possible by teaching to mastery:

a) programs in various subject areas that are designed to accommodate mastery teaching;

b) teachers who scrupulously teach **everything** to mastery; and

c) a system that provides for the grouping of students and the coordination that is required to achieve maximum acceleration of student performance.

Until very recently, no schools have incorporated these three components into a systematic plan that involves all the teachers and all the instruction. The following sections examine these three components in detail.

a) Programs for teaching to mastery. The requirements for instructional sequences are very different from the requirements that states and districts use to adopt instructional material. All instructional programs must have two primary features to make teaching to mastery uniformly possible:

1) The programs must be designed to present instruction for each skill and concept in a way that permits the teacher to teach it to mastery (given that the teacher follows program specifications).

2) The programs must be coordinated from level to level so they are continuous and so the later level builds efficiently on what was taught in the earlier level.

Program design. **A slogan for a well-designed program is that it teaches everything that students will need for later applications, and it doesn't teach anything that is not needed for future applications.** This feature sets the stage for mastery. Students who are at mastery in the program know at least 70 percent of any new skill or operation that will be taught in the program. Therefore, their first-time percentage on new material will be in the acceptable range. Traditional programs do not have this structure and therefore do not permit application of the rules about first-time correct. Although traditional programs may work adequately with higher performers, they tend to be very ineffective with the lower end of the student population (those students for whom the material is unfamiliar).

The small-step program has a "track" structure, which means that more than one separate skill is taught during each lesson. What had been taught earlier is reviewed. Traditional lessons are often organized around single topics, rather than around a series of continuing tracks. Also, traditional programs are frequently based on loose associations of ideas, such as the various meanings of a vocabulary word like **fine**. Except in limited cases, the well-designed program would present only the meaning that will be used in upcoming applications.

Traditional programs also do not provide the review students need. Advanced material presented in the traditional textbook is not actually designed to teach content. Rather, the text is a reference book—something like an encyclopedia organized around different topics. The teacher is expected to

transfer this information to the students, but the manner in which this transfer is supposed to occur is not clear. What is clear is the fact that it doesn't happen with many students.

A key element of the effective program is that it is designed so that it does not generate possible misrules. For instance, if students are actually taught to guess at the word by figuring out the beginning sound and the general shape of the word, teaching students to mastery will simply guarantee later failure. This is a false rule. If applied, students will certainly confuse words like **slop**, **shop**, and **stop**. A program with spurious teaching may work when there is a small range of examples (only the word **shop** appearing in what students read). Later, however, the program will fail (when **stop** also appears in what they read).

Also, the program cannot have false or spurious clues that permit students to give the right answer for the wrong reason. If students always recite number facts in the same order, they could learn a serious misrule, which is that the answers always follow the counting order. What's 1+1? What's 2+1? What's 3+1? What's 18+1? Students who have always recited the facts in the counting order will respond to the last question by saying, "Five." The sequence is seriously flawed and introduces a serious misrule.

Unless the program is well designed for teaching to mastery, it will often not produce gains, but frustration, both for students and the teacher. The program must provide both for the rapid teaching of new skills and for a high rate of student responses. These responses let the teacher know whether or not students are at mastery.

Level-to-level coordination. **For mastery teaching to be possible, programs must be thoroughly coordinated from level to level.** Different levels of traditional instructional programs present the same topics and the same examples. For instance, over 75% of a sixth-grade math program may be presented in the corresponding fifth-grade program. Obviously, this sequence makes no assumption that students have mastered anything that was taught in the fifth grade. In fact, math assessments regularly disclose that students have not mastered any of the content that is new to the current level of the program. Rather, students know only what had been taught 1 to 2 levels earlier. This relationship confirms that students have not received consistent experiences in learning what teachers and textbooks teach. They tend to learn the material much later, through experimentation and trial and error.

b) Teachers who teach everything to mastery. This criterion is necessary, but very difficult to attain. **Teaching to mastery is the most difficult skill for teachers to learn.** One problem is that teachers have a strong tradition of simply exposing students to material, rather than assuring that they master it. What often occurs, even in schools that are supposed to be full-immersion DI schools and that do well with the DI subjects, is that teachers tend to have split teaching philosophies. When presenting DI lessons, they teach to mastery, but when they present other instruction—social-studies units, art, vocabulary information—they don't. Instead of constructing variations of routines that they have used in DI sequences, they simply expose students and don't consider the effects of their instruction on how students' knowledge base and attitudes.

For example, we recently observed a good DI teacher presenting a "unit" on Sweden to children in the third grade. These children had completed *Reading Mastery 3*; yet, when the teacher presented the unit, she did not refer to anything they had learned in Reading 3, did not present the information about Sweden in a systematic way, and did not provide any tests to determine whether the students had mastered the new information about Sweden. Instead, she passed out a worksheet

that contained a map of Sweden, some facts, and some questions. She read the facts, briefly discussed some of the customs, told the students about several other things that characterize Sweden, and then directed the students to write answers to the questions and color the map.

At this point, we asked students a series of questions to determine whether they knew the new information and knew how to fit it into what they already knew about the world. Here are some of the questions.

"It says that Sweden is a country in Europe. Do you live in that country? . . . What's the name of the country you live in? . . . Can you find Sweden on the globe? . . . Can you show me where Europe is on the globe? . . . Have you read about any other countries in Europe? . . . " We then asked about several of the vocabulary words that appeared on the worksheet. The students failed nearly all of these items.

It would not have taken the teacher more than five minutes to teach students to mastery on all the information they would have needed to fit the worksheet material into the framework of knowledge they already possessed. They had read about Herman the fly, who flew around the world, landing in Italy. Students were able to locate Italy on the map. This is a good reference point for going north to Sweden. Once they saw Sweden on the globe and saw its distance from Italy and from the US, they would have had a good schema of its size and its relation to places they already knew. That was the purpose of teaching the global information in Reading 3—to provide them with "stepping stones" upon which to build new facts and operations.

The teacher, however, did not know how easy it was to teach to mastery on things that were not in the DI curriculum or how important it was. Her approach was very ill advised because it promoted compartmentalization of information and discontinuous learning strategies. When doing the social studies, the students had a dabbling attitude. Some of the material was so strange to the students that they apparently didn't even know what sort of questions they should ask to make sense of it. They didn't even try to understand it. In the case of Sweden, they didn't know clearly where it was, what it was, or how it related in any way to the things they had learned.

During the direct-instruction periods, in contrast, the students had strategies that permitted them to learn to mastery. The net result of the unit on Sweden was that the teacher lost lots of opportunities to build on what students already knew. Furthermore, she lost opportunities to help accelerate the intellectual growth of her students.

To make sure that they really learned the information on Sweden, the teacher would have to add several items to part of her daily routine—the openers—which consist of a series of questions the children are to answer. The new items would relate to Sweden. What's the name of the country you live in? . . . Is that country in Europe? . . . Name some countries in Europe. . . . Is Sweden as big as the United States? . . . I'll touch places on the globe. Tell me the name of the country I touch. . . ."

"Compartmentalized" teaching is far more common than teaching designed to build on what students already know. The general guideline for a teacher who wants to accelerate intellectual growth is**: If you teach anything, teach it to mastery.**

To do that, **the teacher figures out how the new material is related to what students already know and makes this relationship explicit and part of the mastery teaching.** Before teachers are able to teach everything to mastery, they must be trained and they must receive extensive models about how to do it.

c) A system that supports mastery and acceleration. Because students will not be seriously

accelerated unless they receive possibly three or more years of undiluted immersion in mastery teaching, the school must have a system that requires teaching to mastery. A system is necessary because immersing students in mastery instruction involves more than one teacher. In fact, if mastery-teaching immersion is to occur for all students, it must involve all teachers, all subjects, and virtually all aspects of the school day.

This system meets seven primary requirements:

1. All students must be appropriately placed in each instructional program. All placements are based on first-time-correct performance. Mastery is not possible unless students are placed according to the criteria for first-time-correct performance.

2. All groups must be homogeneous with respect to the performance level of all students in the group. This requirement is an extension of the first-time-correct requirements. Unless all students in the group are appropriately placed, the teacher will not be able to bring the group to mastery in a reasonable amount of time. The teacher will have to spend time providing additional practice to students who should not be in the group. This additional practice tends not to serve students who need it nor the other students, who waste time while the teacher works on firming skills that they have already mastered.

3. There are actually three critical scheduling issues. The first is that adequate time must be scheduled on a daily basis for teaching each group each subject. The second is that the schedules must be coordinated to permit relatively easy movement of students from one instructional group to another, based on their performance. If two students should be in a math group that is 55 lessons earlier in the program, the transfer is relatively easy if the group that is to receive these students is teaching math at the same time as the group in which the students are currently placed. The third issue is that movement of students from one instructional group to another should occur frequently throughout the year. A general rule for grades K–3 is that major regrouping should occur at least three times during the year. This regrouping assures that instructional groups remain homogeneous in performance. Note that regrouping is generally not required as frequently in the upper grades after the implementation is stabilized. However, periodic changes may have to occur in math and language. All schedules must be coordinated across classrooms and grades so that cross-class grouping and regrouping is possible. This need is met only if specified classrooms teach the same subjects at the same time.

4. Schedules must provide adequate time for each subject and each instructional group, and teachers must faithfully follow schedules. The schedules must include time for workchecks, so that students receive timely feedback on any mistakes they made, and so teachers receive information about any skills or items that need additional firming. The worksheets and possible firming periods are particularly important during the first several years of the implementation.

Many problems of scheduling periods occur in the beginning grades. Sometimes, schedules provide adequate time for two of three groups in a subject, but not for the third. Sometimes, the schedule is different on different days, which means that students may not receive instruction in some subjects on some days. Sometimes, the time allotted for the teaching of a subject is not adequate. All these problems must be corrected if adequate mastery is to be attained.

5. A group's progress in mastering new material must be continuous throughout the year. If the group completes level 3 reading in the middle of February, students must begin level 4 within no more than two or three school days. Level 4 should not be delayed until the beginning of the next

school year.

6. All teachers must enforce the same set of schoolwide management rules and practices for celebrating academic achievements. There should be rules for how students are to behave in the class, so that if students misbehave, they understand both the rule that they broke and the consequence. The system of rules should be designed so students receive reinforcement for complying with rules. The schoolwide celebration of students' achievement should be the centerpiece of the school's ceremonies. Students who achieve well should be recognized in a way that leaves no doubt about how important the school feels mastery accomplishments are.

7. **The performance of students must be regularly monitored.** The school must have systems for regularly monitoring students' progress. The monitoring information may consist of weekly summaries of progress in each subject, summaries of student performance on in-program tests, and reports on daily independent work. The purpose of the monitoring is to guarantee that no students fall through the cracks and that all receive the best instruction that the school is able to deliver.

This full set of seven requirements is rarely met. Each, however, is necessary if the school is to achieve maximum acceleration of student performance.

Four rules for teaching to mastery. One of the reasons that mastery instruction is difficult for teachers to learn is that facts about mastery soundly contradict beliefs that teachers have about individual differences and how children learn. Note however that the teachers' misconceptions are perfectly consistent with their experiences. The teachers' beliefs are based on exactly what they have observed. The problem is that they have usually never observed students who have received extensive mastery instruction. To engage in mastery instruction, teachers must adhere to four basic rules that contradict conventional wisdom and the beliefs that many teachers hold.

Rule 1: Hold the same standard for high performers and low performers. This rule is based on the fact that students of all performance levels exhibit the same learning patterns if they have the same foundation in information and skills. The false belief that characterizes the conventional wisdom about teaching is that lower performers learn in generically different ways from higher performers and should be held to a lower or looser standard. Evidence of this belief is that teachers frequently have different "expectations" for higher and lower performers. They expect higher performers to learn the material; they excuse lower performers from achieving the same standard of performance. Many teachers believe that lower performers are something like crippled children. They can walk the same route that the higher performers walk, but they need more help in walking.

These teachers often drag students through the lesson and provide a lot of additional prompting. They have to drag students because the students are making a very high percentage of first-time errors. In fact, the students make so many mistakes that it is very clear that they are not placed appropriately in the sequence and could not achieve mastery on the material in a reasonable amount of time. The teachers may correct the mistakes, and may even repeat some parts that had errors; however, at the end of the exercise, the students are clearly not near 100% firm on anything. Furthermore, the teacher most probably does not provide delayed tests to assess the extent to which these students have retained what had been presented earlier.

The information these teachers receive about low performers is that they do not retain information, that they need lots and lots of practice, and that they don't seem to have strategies for learning new material**. Ironically, however, all these outcomes are predictable for students who receive the kind of instruction these students have received.** High performers receiving instruction

of the same relative difficulty or unfamiliarity would perform the same way. Let's say the lower performers typically have a first-time-correct percentage of 40%. If higher performers were placed in material that resulted in a 40% first-time-correct performance, their behavior would be like that of lower performers. They would fail to retain the material, rely on the teacher for help, not exhibit self-confidence, and continue to make the same sorts of mistakes again.

If students are placed according to their first-time-correct percentages, they tend to learn and behave the same way, whether they are "lower performers" or "higher performers." In Project Follow Through, we mapped the progress of students of different IQ ranges. The results showed that regardless of students' entering IQ, the rate of progress was quite similar across all children and across different subjects. Lower performers learned as fast as higher performers. They simply started at a different place, with material that higher performers had long since mastered. Note that this conclusion may be somewhat biased because we paid particular attention to the instruction for the lower performers. They tended to have better teachers and their instruction tended to be monitored very closely. In any case, they learned at a very healthy rate, one that paralleled that of students with IQs 40 points higher.

The typical practices of placing and teaching students are completely opposed to appropriate placement and teaching procedures. At the University of Oregon, we place teaching-practice students in special-ed classrooms that use direct-instruction programs. During the years that we first offered these practica, we typically worked with teachers who were teaching DI but had not generally received much training. Before we arranged for a placement with a new supervising teacher, therefore, we made sure that the classroom was "appropriate" for our students, which means that the children the practicum students were to work with were placed appropriately and that the teacher was using and modeling appropriate practices. As part of the review of the new classrooms that were candidates for receiving practicum students, we checked the program placement of the students and changed their placement if necessary.

Our estimate is that in the first 40 or more classrooms we used, the children were moved back in DI reading programs an average of 100 lessons—sometimes 120 lessons. The children, in other words, were placed about 3/4 of a school year or more beyond the optimum first-time-correct percentages. Nearly all teachers had children that were seriously misplaced. Furthermore, I don't recall a single classroom in which children's percentages required us to move children ahead in the programs. Children were always "over their heads."

Coincidental with the inappropriate placement was inappropriate expectations. Often, teachers were good technicians—acting positively, exhibiting good pacing and other mechanical skills, and correcting mistakes in a timely and apparently appropriate manner. They often had noble motives for placing the students where they were, so that students would be closer to the appropriate placement for their age. Their error, however, was that this placement made mastery impossible. Without achieving steady and predictable mastery, children could not gain at a healthy rate.

An almost inevitable conclusion that teachers derive from observations based on inappropriate placement of children is that these children are different. For many teachers the difference suggests that the children need a "different approach." We have seen many teachers who have asserted that "that group has been through the program two times, and it just doesn't work with them." The teacher is not actually blaming the children for not learning, but rather suggesting that they may be able to learn more easily with some kind of approach that matches their different way of learning.

In about 12 cases, we were able to test the children who, according to the teachers' reports, had gone through the program and not mastered the material. In every case, it was very apparent that they had never been through the program at anything approximating mastery. In some cases, the appropriate placement (based on first-time-correct percentages) was the beginning of a lower level of the series—about 300 lessons from the end of the level the teachers said the children had completed two times. Furthermore, when children were placed appropriately and actually taught to a high standard of performance, they learned at a predictable rate, and they indeed mastered the material.

Rule 2: At the beginning of the school year, place continuing students who have been taught to mastery no more than 5 lessons from their last lesson of the preceding year. If something is thoroughly learned and applied, it will be retained by lower performers as well as by higher performers.

The conventional wisdom, in contrast, holds that lower performers "have it one day and forget it the next." And whatever they have, "they completely lose over the summer." Again, this expectation results largely from the kind of instruction students have received. Even after teachers have learned to teach students to mastery, however, they often retain their expectations about how much lower performers will retain. In the first ASAP schools we worked with in Utah, teachers routinely placed continuing students at the beginning of the school year 80 to 100 lessons behind the last lesson they had completed the preceding spring.

Teachers had been told the ASAP policy for placing students at the beginning of the school year: Go back no more than five lessons in the program sequence and bring students to a high level of mastery on the material. This firming is to take no more than five school days. After the review, students should be well prepared to pick up in the program where they had finished in the spring.

The teachers were openly skeptical about this procedure, and they ignored it. They argued that, over the summer, students forget much of what they had learned. We told them that learning didn't work that way. We pointed out that there is a lot of literature on learning and retention that shows that even if something that had been thoroughly learned and had not been practiced for years, there would be great "savings" in the amount of time needed to reteach this material to mastery. Therefore, if appropriate placement for students in the fall (based on error performance) is 80 lessons behind where they finished in the spring, the only possible conclusion is that they had never learned the material in the spring.

For several years, the teachers resisted following the fall-placement rules and continued to use their traditional practices. To correct this situation, we documented the mastery of all students several weeks before the end of the school year. We staged "show off" lessons that were observed. The observations confirmed what students did know, and in some cases, identified some things they had not adequately mastered. Before the end of the school year, students were placed according to the rules about first-time-correct percentages so they were firm in everything that had been presented in the program sequence.

At the beginning of the next school year, we controlled the placement of students to make sure that teachers were placing students no more than 5 lessons behind where they had left off in the spring. Students performed as predicted. After possibly one or two lessons, they clearly performed as well as they had in the spring.

The response of the teachers was overwhelmingly one of disbelief and revelation. Most of them

said something like, "I'm amazed. They actually retained what they had learned."

The magnitude of their surprise suggests how strong the belief was that students could not possibly retain the information over the summer. This strong belief had been supported by what they had observed in the past, which was based on spring placements that were far beyond what students had actually mastered.

Rule 3: Always place students appropriately for more rapid mastery progress. This fact contradicts the belief that students are placed appropriately in a sequence if they have to struggle—scratch their head, make false starts, sigh, frown, gut it out. According to one version of this belief, if there are no signs of hard work there is no evidence of learning. This belief does not place emphasis on the program and the teacher to make learning manageable but on the grit of the student to meet the "challenge." In the traditional interpretation, much of the "homework" assigned to students (and their families) is motivated by this belief. The assumption seems to be that students will be strengthened if they are "challenged."

This belief is flatly wrong. If students are placed appropriately, the work is relatively easy. Students tend to learn it without as much "struggle." **They tend to retain it better and they tend to apply it better, if they learn it with fewer mistakes.**

The prevalence of this misconception about "effort" was illustrated by the field tryouts of the *Spelling Mastery* programs. Over half of the tryout teachers who field tested the first and second levels of *Spelling Mastery* with lower performers indicated on their summary forms that they thought the program was too easy for the children. Note that most of these teachers were not DI teachers and had never taught DI programs before. When asked about whether they had ever used a program that induced more skills in the same amount of time, all responded, "No." Nearly all agreed that the lower performers had learned substantially more than similar children had in the past. When asked if students were bored with the program, all responded, "No."

What led the teachers to believe that the programs were too easy? **All cited the same evidence: students didn't have to struggle.** For them, it wasn't appropriate instruction if it wasn't difficult for the lower performers.

Often, good DI teachers place students who are behind as close as possible to their age-appropriate placement. Their rationale is that if students can make good progress at this placement, they will be farther ahead. Placing students at the edge of their ability to perform, however, means placing them where the students are "working very hard" and where they will make a high percentage of mistakes. This placement effectively negates good teaching.

One teacher we observed would have scored a 10 on the teaching behaviors that good teachers are supposed to exhibit. She was working with fourth graders who were placed far beyond where they should have been placed in the *Corrective Reading* program. In trying to read one of the longer sentences, the students missed five words. The teacher corrected each mistake with alacrity. The teacher faithfully returned to the beginning of the sentence and directed the reading again. At last, the students read the sentence without error, and the teacher praised them. They smiled and apparently felt good about their achievement. Later, we tested the students individually on the sentence. No student made less than 3 errors in reading the sentence. The teacher's expectations for these students were simply unrealistic, and although the teacher had superior teaching skills, all were effectively negated by the placement of the students. When asked why she placed the students where she did, she expressed her concern with their future if they didn't catch up to grade level. She wanted

them to learn as much as possible in the available time, and she assumed that the closer they were to working on fourth-grade material, the greater their chances of achieving this goal sooner.

In working with the ASAP schools in Utah, we had several demonstrations that tested this formula. During the first two years of the project, these schools had great concern over the math placement of fifth- and sixth-grade students. Very few sixth graders placed in the sixth level or even the fifth level of *Connecting Math Concepts.* Some barely passed the placement test for the fourth level of the program—Level D. This level assumes that students have mastery of a wide range of math facts and operations. Therefore, we were reluctant to place new students in D unless they had a strong performance on the placement test. The schools, like the teacher in the example above, assumed that the fastest way to get sixth graders into sixth-grade material was to start them as close to that material as possible.

On three occasions, we had the opportunity to split groups that were fairly homogeneous in performance and to place half the group at the beginning of D and the other half at the beginning of C, where they would learn the facts and operations that are assumed by Level D. The strategy for these students was to make sure they performed according to the ideal percentages of first-time performance and to move as quickly as possible. If students were clearly firm on something, we would either direct the teacher to skip it in half the lessons or present the problems as independent work. As soon as the percentages started to drop, we would return to presenting full lessons and continue at that pace until it was clear that the students could be safely accelerated. (Note: We tend not to skip material when we accelerate students. We simply go through the material faster. We've discovered that when teachers start skipping material, they often skip too much or skip material that should not be skipped even if students perform at acceptable percentages.)

In all cases, groups that started in C performed much better and actually passed up groups that started in D. In two cases, this occurred before the end of the first year. For the last case, it occurred in the middle of the second year. The students who started in D tended not to perform near the ideal first-time percentages. They often failed the ten-lesson tests, and teachers had to spend a great deal of time reviewing and reteaching things the students were expected to have learned. In contrast, the students who had been placed in C were able to do more than one lesson a day (until they reached about lesson 30 in D) and had a very high rate of passing the ten-lesson tests. For these students, the sequence of the program was congruous with their skill level, and the steps in the program were small; for the students who started in D, the program steps were too large and the climb too steep. The overall effect was that the D-starting students didn't like math as much as the other students did and had far less confidence about their ability to learn math. We later adopted the practice of starting all students with marginal understanding in Level C, not D.

Rule 4: Move students as quickly and as reinforcingly as their performance permits. This rule opposes the notion that teaching to mastery is somehow synonymous with having picky or punishing standards. For instance, I recently observed a teacher who seemed to confuse teaching to mastery with being a "taskmaster." She was teaching reading to a group of 10 first graders. Students were attempting to read a sentence in unison. After the second word, the teacher stopped the group because one of the students did not have both feet on the floor. On the second trial, one of the students did not point to a word on time. The third time, one of the students did not clearly respond to the last word in the sentence. On the fourth trial, three students did not read the second word, etc.

This teacher, and many others who attempt to teach to mastery, confuse form with function. The goal is to give the children the information and practice they need as quickly and efficiently as possible, secure evidence that they have mastered the material, and move on. While military precision may indicate mastery for some things, effective tests should be used to determine mastery.

After observing the teaching of the reading lesson for a while, I pointed to a student who had unwittingly been responsible for the group going back to the beginning of the sentence at least twice and asked the teacher, "Does he know all the words in this sentence?"

She said, "I don't know."

I asked, "If you presented an individual turn to him, would he know all the words?"

She said, "I'm not sure."

Her responses indicated that she had been largely looking at the wrong things. The student was at mastery, but his performance was being judged according to standards that were simply barriers—not indicators of mastery. The teacher was trying to teach to mastery without actually evaluating what was happening. She was being a taskmaster, not an evaluator. The teacher's behavior showed the students that they were failing, even though they were actually quite firm on the material. And it wasn't apparent to them what they should do to please her. It seemed inevitable that they would have to read each sentence many times, regardless of what they did.

Although these students were placed properly in the instructional sequence, the teacher's method of firming preempted her from being able to meet the criterion of getting through the lesson in a reasonable amount of time. That fact should have been a signal that something was wrong.

I told her to use a different format for presenting to this group. She would tell students that they would read the sentence only one time. If they made a mistake, the teacher would tell them the correct word and then they would move on. After the group read the sentence one time, the teacher would call on two or possibly three students to read the sentence individually. If they all read it correctly, everybody in the group would receive a point for the sentence. (Also, when students read the sentence, they were permitted one, but only one, re-read or self-correct of a word.)

Although this format is not appropriate in all situations, it was good for this teacher because it helped her separate the mechanical details from the substance of what is being learned and helped her present in a way that gave students a chance both to achieve mastery and to feel good about their success. When she was able to observe the performance of individual students, she was able to see more clearly whether they were at mastery. She was also able to increase the pace of the lesson so that it was far more enjoyable for her.

Benefits of immersing students in mastery

Teaching to mastery has benefits for students, teachers, and the school system. Students benefit by becoming much more competent and by gaining options for their futures they otherwise would not have. Teachers benefit because students who are taught to mastery tend to succeed; therefore, teaching becomes easier. Schools benefit because students are much easier to teach in the upper grades if they have a solid mastery foundation starting in kindergarten. In the upper grades, students are able to learn new material at a good rate, and the bottom end of the student population performs more like traditionally taught students.

Two types of performance change occur in students. The most obvious is that students learn **more material** during a specified time period. The second change is in their ability to learn **new material**. There is a simple relationship between the amount of material they master and their overall facility to learn new material: **The more success students have with a particular type of material, the better they become at it.**

Teaching to mastery also instills self-confidence in students because they learn they are capable of learning whatever new skills or material the teacher presents. Their positive attitude is firmly grounded in experience. Because students have learned everything the teacher has taught, students understandably have confidence that it will happen the same way for future instruction.

What governs these changes in student performance and self-confidence? The degree to which students benefit from being taught to mastery depends on the extent of the mastery teaching and on the number of areas in which students experience mastery.

Early work in the Direct Instruction Preschool provided many examples of the acceleration achieved in specific areas of knowledge by teaching to mastery. One of the cleanest demonstrations came from the teaching of classification concepts—vehicles, clothing, food, animals, etc.—to four-year-olds. For this demonstration, the order of introduction for the classes differed from one group of children to another. (One group started with food, another with clothing, etc. and learned the classes in different orders.)

Children learned one class to mastery, then learned the next in their sequence. Children were considered to be at mastery if they could name members of a class and correctly respond to inference games that asked about the larger class and the smaller class. For instance, after children had learned about clothing, the teacher would say, for instance, "I'm thinking of something that is clothing. Is it a shoe?" The answer is "Maybe," or "We don't know."

The teacher would also present tasks that referred to things in the class of clothing. "I'm thinking of something that is a shirt. Is it clothing?" The answer is "Yes." Also, "I'll name some things. Tell me if they are clothing or not clothing. Truck . . . glass . . . hat . . . etc."

The number of trials required for the children to learn different classes followed a predictable trend regardless of which class they learned first and which they learned fourth or fifth. **The class that required the largest number of trials was the first class or second class in their sequence.** The fourth or fifth class in the sequence required less than half the number of trials required for the children to learn the first class.

One of the reasons for this accelerated learning is that the children did not have to learn as much to master the fifth class as they had to learn to master the first. In learning the first class, they had to learn the names of higher-order class (vehicles, for instance) and some members of this class (boat, train, bus, etc.). Children also had to learn the relationship between the higher-order class and the members of the class. They had to learn basically that all trucks are vehicles, but that all vehicles are not necessarily trucks. This relationship is tricky and requires practice.

All the classes have this same structure. Children who learn the structure for the first class do not have to relearn it for each of the other classes. They still have to learn the name for the new higher order class and the names for the various members. But the children do not have to relearn the structure or relationship of higher-order class to members. Therefore, the children do not have to learn as much to master later examples. Consequently, children are able to master these classes faster, in fewer trials, and with less learning. Note, however, that these children could not benefit from the

savings in how much learning is required unless the children thoroughly learned the structure of at least one class. If the children "sort of" learned the earlier classes, there would not be a dramatic change in the number of trials or amount of practice the children needed to "sort of" learn later classes. These children could not "transfer" the structure from one class to another because the children did not thoroughly understand the structure.

Because they had more experience learning to mastery, they developed more effective strategies for categorizing new information or operations in a way that permits them to recall and use this information. In other words, *they are better at learning how to learn, simply because they have had more successful practice in thoroughly learning new information and skills.* This practice permits them to learn new material faster than students who don't experience mastery.

The same benefits that occur in this example apply to all bodies of related knowledge. If students learn one particular subject, such as math, to mastery, but don't learn spelling, reading, handwriting, language, and other skills to mastery, the students gain an advantage in math. Students develop the facility needed to learn new math concepts and applications faster. However, the benefits of the mastery instruction would not be greatly evident in other content areas. Not a great deal of "transfer" would be expected to affect the students' reading performance or writing performance.

Students who are immersed in mastery, in all subjects for at least three years, will become much smarter than comparable students taught in a traditional manner. Mastery-taught students will not only know more—these students will be far more proficient and faster at learning new academic material of any kind. Because these students have been immersed in mastery, the students have thoroughly learned everything taught and have **developed generalized mastery-learning skills that permit them to achieve mastery quickly with any academic content.** In other words, if students experience mastery instruction in all subjects for a substantial period of time, they are changed. They become smarter. They learn faster. They retain new information better.

Students who are taught mastery in all subjects for only a short period of time (a school year or less) will benefit, but not as much as those who receive mastery instruction for a much longer period. They tend to learn more skills during a given time period than students of the same initial performance level who are not taught to mastery. But these mastery-taught students will not receive the extent of learning to mastery needed to greatly change their rate of learning new material. If a student who starts at 7 years old has had no previous experience in being taught to mastery, the student's new-learning performance will probably not be greatly different than it was before this instruction.

What this means is that mastery teaching provided for several years has the power to take students who enter school performing at a relatively low level and transform them into students who are much smarter, as measured by any method we might choose to assess intelligence and skill. **Through mastery teaching for several years, the school has the power to change lower-performing students into higher-performing students.** In many Title I, full-school DI implementations, the lowest performing fourth graders complete Level 4 in reading, math, and language programs. Furthermore, the higher performers in fourth grade frequently complete Level 6 of these programs. **Mastery learning is the only vehicle that is capable of achieving this transformation.**

Results of not teaching to mastery

Just as teaching to mastery has a positive effect on students' self-image because it provides students with evidence that they are learning, failing to teach to mastery promotes a negative self-image. The student who is consistently incapable of performing correctly on the material presented is quite aware of this failure rate. In time, the student comes to the unfortunate conclusion, "I am a failure."

This attitude is dangerous because students who know they fail are quick to give up after experiencing evidence of failure. Failure is punishing; they understandably do not want to engage in punishing activities. Therefore, they often avoid the kind of practice that would actually help them become successful.

Reteaching students who have learned inappropriate strategies and negative attitudes requires great amounts of time. When students are not taught to mastery, they often mislearn the skills and concepts the teacher attempts to teach. For instance, they may learn to guess at words in sentences. Reteaching them requires many more trials and much more work than that required to teach them to mastery initially. Initial teaching may require only 10 or fewer trials on some skills. Reteaching the same skill after students have mislearned it and have practiced inappropriate strategies for years may require several hundred trials. Even with careful remedial instruction, however, the student leaves the school with unnecessary scars of failure. The student has experienced unnecessary pain and has drawn unfortunate negative conclusions about self and school. These conclusions could have been avoided by teaching to mastery.

Summary

Teaching to mastery represents the most effective use of available instructional time. It accelerates students' performance, provides students with demonstrations of success rather than failure, and reduces the total amount of work that must be done to transmit a given body of skill and knowledge to students. If students are immersed in mastery, they become smarter because they acquire information faster, and they develop efficient strategies for learning and retaining new material of any type.

For mastery to occur, the program design must be like a stairway, distributing new learning in small amounts and providing for mastery of each step before moving on to a new step. After being introduced, new learning is firmed for several days, then systematically reviewed across time. Students learn that once something is learned, it must be remembered and used again and again.

In addition, the teacher and the system must have provisions that permit continuity, appropriate placement of students according to their performance, close coordination of schedules within the school, ample models of what students are to do, and provisions for celebrating academic achievements of students. Teachers must be able to make predictions about student performance.

Teaching to mastery is difficult for schools to orchestrate because of the various details that must be coordinated and difficult for teachers to learn because the implications of teaching to mastery often contradict conventional wisdom about how to teach, place, and challenge students.

Mastery is difficult for teachers for three reasons:

1. It is contrary to their practices and expectations about how students will perform.
2. It therefore forces the teacher to view students and instruction in a way that hinders success.

3. Schools do not have good models of doing it the right way.

At the core of teaching to mastery is information about student performance, which is expressed as the percentage of first-time-correct responses for material that is introduced the first time and for material that is assumed to be at mastery.

Students taught with a mastery approach will change in three ways:

1. They will be able to learn new material that has the same structure in fewer trials.
2. They will know more information and more operations.
3. They will have more skill in applying what they have learned.

Students taught to mastery have learned how to learn. They have developed generalized mastery-learning skills they can apply to all subjects. When done properly, mastery is able to change the lives of children and provide them with a far brighter future than they would have in the absence of mastery.