

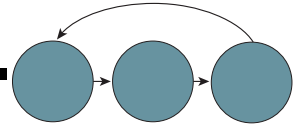
SECTION 7: MEASURING MASTERY



Administrator Leadership Institute
Kurt Engelmann/Tara Davis

Calendar for Full Implementation of Direct Instruction (DI)

[illegible]



The Critical Role of Mastery

Definition of mastery: students have mastered something when they know something as well as they know their own name and can apply it. They achieve automaticity in performing a task and know when to apply what they've learned.

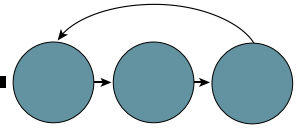
Advantages of mastery learning:

- Once something is mastered, it can be used as a basis for future learning.
- It is easily retained or can be relearned with a fraction of the number of trials needed to teach it originally.
- When the teacher knows what the students know, they can more easily build upon students' learning.

Mastery Versus “Challenges”

Students make greater academic gains when placed at material that matches their performance level:

1. Students take longer to achieve mastery if they make more mistakes while learning.
2. Students learn less thoroughly if they are presented with material that is too difficult rather than material that is easy.
3. There is a place for challenging content, *after all the component skills are taught to mastery*.

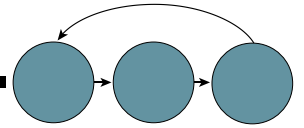


Criteria and Procedures for Measuring Mastery

First-time correct procedures are the primary indicator of mastery. First-time correct responses show what material students have already mastered **before errors are corrected**. Four criteria allow *precise* interpretation of correct-response performance.

1. Students should be at least **70%** correct on anything introduced for the first time in the program *before errors are corrected*.
2. Students should be at least **90%** correct on parts of the lesson introduced earlier in the program *before errors are corrected*.
3. At the end of the lesson, students should be **100%** firm on ALL tasks and activities.
4. The rate of errors should allow the teacher to complete the lesson in the allotted time.

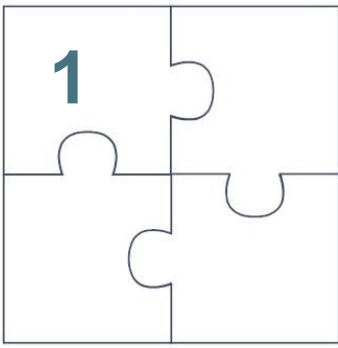
Mastery can also be measured through *delayed tests*, that is, selected tasks that are presented again later in the lesson or later in the day.



Benefits of Mastery Exercise

If teaching to mastery were taking place in a classroom, what would you see (i.e., what **observable behavior** would the students exhibit)? Take a couple of moments to reflect with a partner.

Children who are taught to mastery are....



Student-Program Alignment and Teaching to Mastery

Four Rules for Teaching to Mastery

Jigsaw Activity

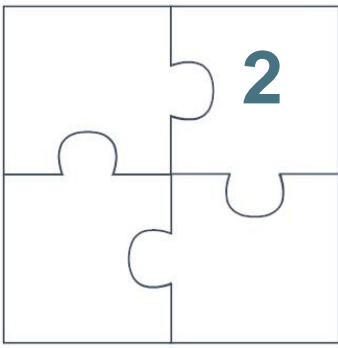
Instructions: In Chapter 4, read the paragraph after the subtitle, *Four rules for teaching to mastery* on page 42. Then read Rule 1.

For Rule 1: Discuss why the performance outcomes for higher performers would mirror that of lower performers if placed in equally difficult material.

Inappropriate placement can lead many teachers to erroneous conclusions about a student's ability to learn. Discuss some of the conclusions and decisions that teachers make as a result of these assumptions.

Briefly record your group's responses. Prepare to share these responses along with a summary of Rule 1 once back with your original group at the end of the reading time.

Notes:



Student-Program Alignment and Teaching to Mastery

Four Rules for Teaching to Mastery

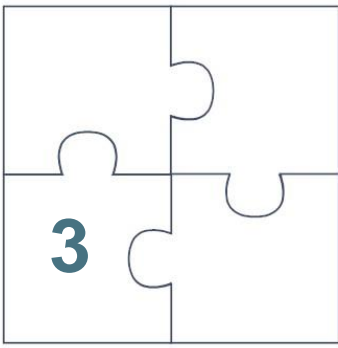
Jigsaw Activity

Instructions: In Chapter 4, read the paragraph after the subtitle, *Four rules for teaching to mastery* on page 42. Now read Rule 2.

For Rule 2: Discuss the rationale as to why students should be placed at the beginning of the school year at a lesson no more than 5 lessons back from where they ended the school year. How does this fit or not fit with current practices at your school?

Briefly record your group's responses. Prepare to share these responses along with a summary of Rule 2 once back with your original group at the end of the reading time.

Notes:



Student-Program Alignment and Teaching to Mastery

Four Rules for Teaching to Mastery

Jigsaw Activity

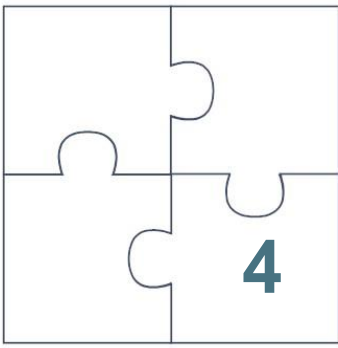
Instructions: In Chapter 4, read the paragraph after the subtitle, *Four rules for teaching to mastery* on page 42. Then read Rule 3.

For Rule 3: What are the benefits to students if they are placed in easy material they can mastery during a lesson relatively easily?

True or false: The fastest way to get below grade level students into grade level material is to start them as close to grade level material as possible. Discuss your answer.

Briefly record your group's responses. Prepare to share these responses along with a summary of Rule 3 once back with your original group at the end of the reading time.

Notes:



Student-Program Alignment and Teaching to Mastery

Four Rules for Teaching to Mastery

Jigsaw Activity

Instructions: In Chapter 4, read the paragraph after the subtitle, *Four rules for teaching to mastery* on page 42. Then read Rule 4.

For Rule 4: Discuss the difference between form and function during instruction. When evaluating student mastery, which should guide instruction?

Briefly record your group's responses. Prepare to share these responses along with a summary of Rule 4 once back with your original group at the end of the reading time.

Notes:

CHAPTER 4

Teaching to mastery is unfamiliar to many teachers. They weren't taught to mastery when they were in school, most instructional programs don't encourage mastery, and they may never have seen mastery learning occur. Teachers often believe—and are taught to believe—that some students will never really learn the material and that learning part of a subject or concept is all that can be expected of some students. Of course, the basic assumptions of DI are quite the opposite. Direct Instruction is built on the principle that all children can learn when they receive appropriate instruction. All children can master material if they are well taught.

In this chapter, Engelmann counters the traditional beliefs that many teachers have. He outlines four basic rules for mastery teaching. Along the way, he provides numerous examples that help explain why each of the rules is important and how they work.

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 percent 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 percent. If higher performers were placed in material that resulted in a 40 percent 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 practice teaching students in Special Education classrooms that use Direct Instruction programs. During the years that we first offered these practices, 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 $\frac{3}{4}$ 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 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 five 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 three 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 re-teaching 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 prevented 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.

Box 4.1 Four Rules for Teaching to Mastery

Rule 1: Hold the same standard for high performers and low performers.

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.

Rule 3: Always place students appropriately for more rapid mastery progress.

Rule 4: Move students as quickly and as reinforcingly as their performance permits.