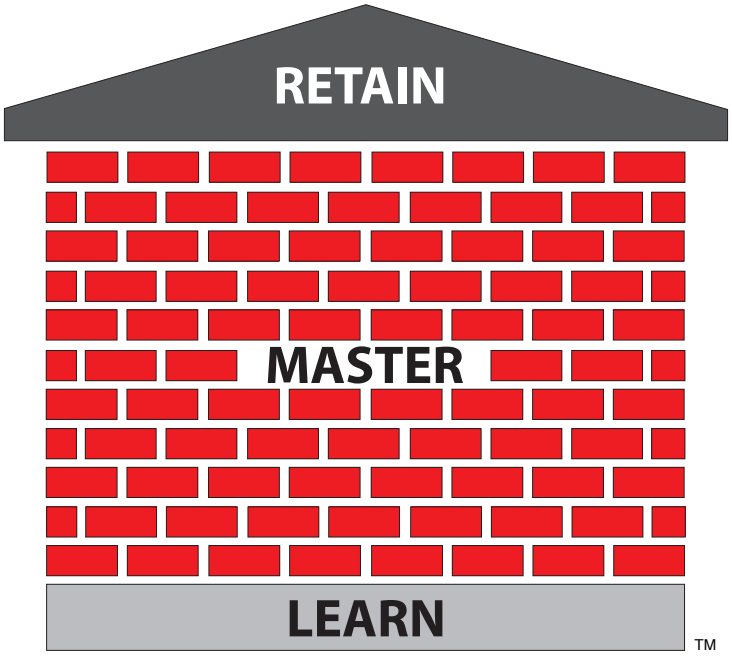
Mastery-Based Teaching and Learning



A Guide for Parents

produced by Novare Science & Math

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Greetings parents. It is back-to-school time once again. We have prepared this pamphlet to give you a heads up about some of the important features of the curriculum chosen for your child's science class. Whether your child is in a regular classroom or studying at home, please take a few minutes to read this information so you can be properly informed.

A Bit of Background

If you wear corrective lenses, you probably remember the first day you put on glasses or contacts as a kid. Suddenly, for the first time, you could see all the individual leaves on the trees! What a surprise! You had no idea that what was "normal" for you—fuzzy vision—was actually not the way things were supposed to be.

This is how it is with education today, and how it has been for most of the past half century. For two generations, the norm for classes in middle and high school has been what we call the *Cram-Pass-Forget cycle*. No doubt you remember this cycle yourself, from your own school days: students cram for tests, pass them, and then forget most of what they crammed in just a few weeks! This practice is so widespread that everyone we talk to about it immediately recognizes what we are talking about. It's how school was back when we were students, and everyone tends to laugh it off as *normal.* Most of us think, *that's just the way school is*.

Teachers across the nation know exactly what the Cram-Pass-Forget cycle looks like because they see it day after day. But we believe the Cram-Pass-Forget cycle is a waste of time for teachers and students. In fact, it's worse than a waste of time. It's a practice that leads to frustration and apathy. In classes dominated by the Cram-Pass-Forget cycle, students know from the start they will not acquire much from the course, despite all the hoops they will have to jump through. They will be required to turn in dozens of homework assignments, complete several time-consuming projects, and prepare for over a dozen chapter tests. In the end, they may remember a few of the class highlights but not much else. Who wouldn't be frustrated by such a situation? As adults, we all know that if we are required to attend a course or training session of some kind that we feel is pointless, we resent it and can't wait for it to be over.

What Is To Be Done?

Our vision for our students is far different. We know that when teachers use appropriate methods and curriculum materials, and when students study correctly, students experience the empowerment and satisfaction that come from true *mastery* of their course content. We have found this to be true for all students—across the spectrum of ability levels—and especially for those who may have shown limited aptitude for academic study in previous courses. Time and again, we have known students whose educational experience has been completely transformed by a shift from the Cram-Pass-Forget cycle to studying for mastery.

Accordingly, we have committed to the bold mission of eliminating the Cram-Pass-Forget cycle from the classroom. And since we develop science curriculum, this is where our program for ending the Cram-Pass-Forget cycle is reflected. This curriculum is being implemented in your child's science class this year.

We have developed a teaching model for teachers and a study for students based on this simple goal: Instead of cramming, passing, and forgetting, students should *learn*, *master*, and *retain* what they have learned. These are the goals of the science course your child is in.

Program Highlights

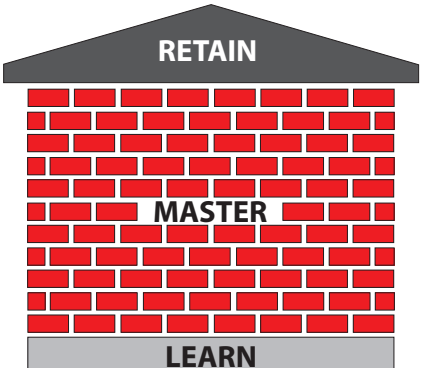
Three highlights from this program bear mentioning here. The first pertains to the text used in the course. Typical secondary science texts are 600 or 700 pages long, or even longer. This is due to misguided

trends in curriculum development as educators attempt to address declining performance by increasing the amount of material covered in each course. The trouble is there is no way students can learn this much in one year. On their part, teachers and home educators feel the obligation to "cover" what is in the text, or at least most of it, trusting that the author of the text must be a good judge of what course content for a year of science should look like. As a result, the text is covered superficially, perpetuating the Cram-Pass-Forget cycle.

The texts developed by Novare Science & Math and Centripetal Press are designed to provide something completely different. A mastery-based course philosophy requires reining in the curriculum and narrowing down the topics covered to a small enough set that true mastery becomes possible. Most middle and high school students, including the really bright ones, cannot master a 500+ page text in one year. If mastery is the teaching goal, as it is ours, deliberate choices must be made so that the course demands remain reasonable within the framework of other course programming. The process of culling the curriculum down to focus on basics results in a text that is modestly sized and, happily, much easier to carry around!

As it turns out, mastery of a smaller set of basic topics is vastly more powerful and satisfying than covering more topics superficially and forgetting most of them. In fact, we have found that across the board students in mastery-based courses typically retain core knowledge for years. This sort of retention smooths the path for further science study because students remember basic skills and are better prepared. This applies to both upper-level science courses in high school as well as introductory courses in college.

A second highlight is in the way the course will be conducted. Our goal is for students to learn, master, and retain what they learn. Mastery requires staying on topics long enough and with enough focus that students move beyond vague familiarity to achieving proficiency. It also requires students to pay close attention to guidelines for solving problems and answering questions. Retention requires regularly revisiting questions and problems from earlier chapters. Depending on the course and the age of the students, that can entail review days, drill sessions, review problems, review discussions, and other activities. Importantly, a goal of long-term retention requires that students are routinely tested on older material to make sure their skills are kept current. This leads us to the next highlight.



A third highlight is that the assessments in the course are cumulative back to the start of the course. In other words, the quizzes or tests used to assess students all include significant amounts of content from prior chapters. This is actually the key to the entire program. When students know they are required to continue to demonstrate mastery of old skills month after month, and when they study appropriately to meet this requirement, the Cram-Pass-Forget cycle is broken and long-term retention naturally occurs. Appropriate study strategy is critical to success in this environment, so we address this specifically in the next section.

The Study Plan

The keys to success in the course are for students to master each new topic as it arises and study in a way that promotes long-term retention of these topics. To be prepared for the cumulative quizzes or tests that occur in the course, students should establish a weekly study regimen encompassing the tasks listed below. Students should spread out their review work so they spend time with the material at least two or three separate days each week. These are the documents students must pay attention to and use in their weekly studies:

- Chapter Objectives Lists, located at the beginning of each chapter in the text
- Scientists List, if applicable
- Table of Conversion Factors, Metric Prefixes, and Constants required for memory
- Weekly Review Guides (applies primarily to students in grades 7–9)

With these tools in hand, students should study according to the following comprehensive study strategy. This strategy, or one similar to it, is presented in the Student Preface in the textbook for the course. Note in particular the references to the Weekly Review Guide, a key study tool for students in grades 7–9, although in some cases the Weekly Review Guide applies to students in other grades as well.

1. Study the Objectives List for each new chapter carefully. Make it your policy that you will be able to do everything on the list (that is, for the objectives that have been covered so far in class) before quiz day each week.
2. Look over Objectives Lists from previous chapters regularly. Identify any item that you cannot do or cannot remember how to do and follow up on it.
3. Develop, maintain, and practice flash cards for each major category of information that you need to know. We recommend these four separate stacks of flash cards: 1) technical terms, laws, and equations; 2) scientists and experiments; 3) special lists to memorize (as indicated by the Objectives Lists); and 4) conversion factors, prefixes, and constants. Also, on cards for equations, indicate the units of measure for the variables involved and make saying those units part of your flash card practice routine.
4. Read every chapter in the text at least once, preferably twice. Ideally, every time your instructor or tutor covers new material you should read the sections in this book corresponding to that material within 24 hours.
5. Go through the exercises described in the Weekly Review Guide every week. If the Review Guide includes review computations, work each of them. The Review Guide prompts you to rehearse your flash cards, review older topics, and so on. Take the Weekly Review Guide seriously and do what it says.
6. Raise questions as often as you can. Asking questions and interacting with the instructor (or tutor) and the rest of the class is an effective way to help your brain engage, focus, and remember.
7. Go back and read the chapters in this book again when you are a month or two down the road. You will be amazed at how much easier it is to remember things when you have reread a chapter. (Besides, reading is more fun than rehearsing flash cards.)
8. When you are working on exercises involving computations, check your answers against the answer key. Every time you get an incorrect answer, dig in and stay with the problem until you identify your error and obtain the correct answer. If you can't figure out a problem after 10 or 15 minutes (or perhaps 30 minutes for students in upper-level courses), raise the question in class.
9. Every time you lose significant points on a quiz or test, follow up and fill in the gaps in your learning. If you didn't understand something, raise the question with your instructor. If you forgot something, rehearse it more thoroughly until you have it down. If you failed to commit something to memory or didn't have it in your flash cards, then add it to the cards and commit it to memory. If you were not proficient enough at one or more of the computations, look up some similar problems from the exercises or from previous quizzes and practice them thoroughly, with mastery as your goal. Always follow up before the next quiz. Remember, the quizzes are cumulative and the same questions come up again and again. Correcting every quiz and test gives you excellent study tools for future assessments.

Conclusion

For over a dozen years, we have seen amazing results produced by teaching and learning in accordance with the methods summarized here. Student achievement is high, students retain what they learn for an extended time, and students' attitudes about school and learning are often completely transformed. By breaking the Cram-Pass-Forget cycle and replacing it with a program designed around learning, mastery, and retention, we recalibrate what *normal* education is like. On behalf of your child's teacher, we wish you and your child success in the coming school year!