

The Value of Rote Learning – and How to Make it Fun

Rote Learning has long been taken to task by educators and parents as a poor way to teach Math, or any other subject. Certainly it cannot be the only approach to the topic. If a student is to have a full and solid grasp of Math, they also need a good conceptual understanding. Nonetheless rote learning is an important component for mastering the basics in Math, as we all know from trying to teach our kids the times tables. A rote knowledge of the basic facts in Math is a necessity for your child to be able to fully engage the topic.

Memorization is Unavoidable

Math is like a language, and it's a good idea to have the basics of any language memorized so that one can get on with the more interesting (and conceptual) conversations. An impaired ability to speak the basics, usually translates to failure later on. As an analogy I offer the conjugations of irregular verbs in most languages. These verbs are irregular (i.e. not following the normal rules) largely because they are the verbs that are used most often in every day speech, and thus most prone to mutations over time. They are the verbs one needs to know most in order to speak, and yet they are the hardest to learn because they don't follow simple rules. They simply have to be memorized. Once they are memorized, one can start to speak far more easily, and thereby learn the rest of the language. In Math the basics that should be mostly memorized are addition & subtraction, and multiplication & division. When a student has memorized many of these, they will be far more fluent, fast, and able to be much more engaged and interested in more advanced concepts.

Slow, Wrong, & Misunderstood

An ability to engage with the topic leads to more practice and use, and ultimately far greater conceptual understanding. Rote learning allows students to engage much more with Math. I linked addition & subtraction because they are best memorized together. This in fact heightens conceptual understanding, as subtraction is learned as the opposite of addition (or reverse addition). For instance when calculating $5-3$, one can simply ask $3+?=5$. If the student has a good memorization of addition, they can quickly translate this into excellent subtraction skills through this simple reversal. Further, this gives students an ability to check their work independently and verify their answers. For

example, many students will make mistakes in $201-138$. A typical error in regrouping would come to the answer of 163 (rather than the correct answer of 63). A student with good fluency will have no difficulties in quickly seeing that $163+138$ is not 201, and then correcting their mistake. A student whose rote skills are weak in addition & subtraction will be more than a little reluctant to do yet another calculation of addition to check their answer, as it took them so long to get to 168 in the first place. Multiplication & Division, like Addition & Subtraction, are also best learned as the inverse of each other. Lack of memorization of the basics in Math leads to slowness, poorer conceptual understanding, and far more errors.

Conceptual Understanding is Required

Students still need to understand the concepts. In fact this allows for much easier memorization. Some popular Math programs, particularly from East Asia, over-emphasize rote learning to a serious fault. It is the only method that they use, and they fail to realize that by combining memorization and practice with conceptual understanding that students will be far stronger, and more interested, in Math.

One particularly good example of the need for conceptual understanding in conjunction with memorization is the times tables. For example a student might not immediately remember $6*7$, but they can remember $6*6$. A student with a good conceptual understanding and a reasonably good memorization will quickly be able to conclude the following: $6*6$ is 36 and they only need to add 6 to get to 42 (i.e. the answer to $6*7$). One can immediately see the need here for conceptual understanding (i.e. that $6*7$ is the addition of 6 seven times, or the addition of 7 six times), combined with a good knowledge of the basic facts (i.e. some memorized knowledge). Having memorized $6*6$ (if not yet $6*7$), and knowing that $6+6$ will lead to the next set of 10 ending in a 2 (42 in this case), the student arrives at the right answer quickly and capably. The times tables are easy to memorize for such a student precisely because they have already memorized their basic addition & subtraction facts, and they understand what multiplication really means conceptually.

Areas to teach Rote Learning

The primary areas to teach rote learning are: 1) addition & subtraction; and 2) multiplication & division. Thereafter the merits of rote learning in Math are greatly

reduced. Before learning addition and subtraction, it is best to master basic numeracy, and then introduce the concept and practice of +1. Shortly thereafter the idea of -1 should also be introduced and be presented in different ways (the fact family format is excellent). All combinations of adding and subtracting up to 12 will ideally be memorized, in conjunction with a conceptual understanding of the relationship between adding and subtracting. Students with a good fluency in adding and subtracting can much more easily memorize their multiplication and division.

When first learning the times tables, always pull back to having students work out the unknown answer on their own. When a student asks, what is the answer to 6×7 , (re)explain the concept of adding 6 seven times and then have them work it out from the beginning by writing out each and every combination from 6×1 to 6×7 . This process will really help them learn. It will be tedious at first, but quickly get easier. As they master each multiplication table, take the time to also introduce the idea of division as a fact family, e.g. 6×7 is 42, 7×6 is 42, $42/6$ is 7, and $42/7$ is 6. Ideally they are memorized together. The big hurdle for most parents is finding a pleasant and fun way to do this. Many parents run into trouble with times tables precisely because their children's addition & subtraction are still weak.

Fun Ways to Teach Rote Learning

There are many popular and fun tools to teach rote learning. As many of us spend inordinate amounts of time commuting with our kids (at least in southern California), take advantage of this time to make verbal games of the times tables. You may have to polish up your own skills in the process! Make a game of who can get the answer first. Be sure to lose every now and then, even if you have to do it intentionally. When your child gets it wrong, verbally work out the right answer together by working from the beginning of the table or from an easy known point (for the higher times tables you can use the easy 10 times table to add or subtract from). There are also easy ways to teach and memorize the 9 times table (both with fingers and on paper).

In addition to the verbal games you can do while commuting, there are other tools. Most traditional are flash cards, these can be bought for a few dollars at gas stations, Staples, Lakeshore Learning, and Amazon. Better yet, have your kids make their own. One particularly popular CD or DVD is Schoolhouse Rock (less than \$10 for a used copy on Amazon). There are also a ton of free or very cheap video game apps to memorize

times tables. For the unfortunately high number of kids addicted to their tablets and phones, this might be one way of getting through to them.

Good luck and don't give up! Memorization of the basic facts in Math will do wonders for your child's later enjoyment and ability to engage with the subject, even if it's not always a lot of fun to memorize the basics.

