SPEED AND FLUENCY:
TAKING AN INDIVIDUALIZED APPROACH

David Dockterman February 10th, 2015

How many of you do puzzles? Come on, raise your hands so I can see them. Remember when you first started? With Sudoku puzzles, it took me a very long time to complete my first ones. The “easy” levels weren’t so easy. I had similar experiences with KenKens, crossword puzzles, and those logic activities in the back of airline magazines.

Over time, though, the easy levels eventually became, well, easy. They no longer took a lot of effort or a lot of time. They actually got a bit boring, and I sought out more challenging levels. Or, if I couldn’t find more difficult puzzles, I self-handicapped by setting time goals for the same level of puzzle. Could I complete the puzzle in, say, fewer than 10 minutes?

Indeed, improved speed is a common measure of growing fluency. The more expert or practiced I become at something, the more efficiently and accurately I can perform it. Common clues across crossword puzzles become familiar and automatically retrieved with almost no effort. I begin to see good starting points on Sudoku or KenKen boards. I see word patterns in acrostics. That 3 letter word is likely a “the”; that combination looks like an “I am.” As the repeated tasks or patterns become automatized, I can take on more complex levels. Processing power gets distributed to other parts of my brain freeing working memory – the part of my brain with limited capacity that manages current tasks – to handle more.

Similarly fluency in reading and math involve automating common subtasks like decoding or recalling math facts, freeing up some of that limited processing power for the harder levels of comprehension or problem solving. Again, improved speed and accuracy are great indicators of improved fluency. That I get

faster at recognizing words or calculating common combinations lets me know that I'm getting better.

So speed is good. But speed, here, is relative. The baseline is *my* processing time. Just as the time it takes me to do my first Sudoku puzzle might be slower than my wife's time (it definitely was), so too will processing times vary for students learning to read or master their math facts. The starting points might be different, but everyone can get faster, and more fluent, with practice.

Practice activities like Mad Minute that ask students to complete a list of math facts in a set amount of time ignore those individual differences. Not everyone can do 50 problems in 60 seconds, and that time pressure can produce anxiety, particularly among students who already doubt their mathematical abilities. The thing about anxiety is that it can eat up working memory, potentially undermining the whole goal of Mad Minute practice. Oddly, according to Sian Beilock of the University of Chicago, students with the most robust working memory capacity may be the ones most harmed by this anxiety. She hypothesizes that those students may be leveraging their strong working memories to be more strategic. Instead of just retrieving the answer to 8+4 or counting on, they employ a make-10 strategy, decomposing the 4 into 2+2, adding 2 to 8 to get 10, and then adding the remaining 2 to get 12. That's great number sense, but it's also a lot of information to juggle, taxing working memory capacity. Add in anxiety and the brain goes into cognitive overload.

So speed is good, but arbitrarily timed activities are bad. What we need is a way to build fluency that doesn't use external time limits, a way that responds to individual processing differences. Here's where technology can help, using an adaptive, fluency-building system pioneered by Ted Hasselbring at Vanderbilt University. This system, which plays an integral role in some of Scholastic's successful literacy and math intervention programs, first identifies each student's starting processing time for tasks like math fact retrieval or sight word recognition. The software then systemically helps the student build fluency (and speed) through distributed practice that shifts the cognitive processing out of working memory and into long term storage in the brain.

Fluency is critical to tackling higher order tasks in both math and reading. Without being fast and accurate with the underlying subtasks, we're stuck doing the entry level, easy puzzles. Let's just make sure we personalize the fluency-building process so that we don't leave learners less, not more, fluent by eating up precious working memory resources with anxiety.

http://edublog.scholastic.com/post/speed-and-fluency-taking-individualized-approach