A newsletter of the North Carolina State Improvement Project (NC SIP)

IDEAs that Work
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Math & Leadership

PROMOTING ACTIVE IMPLEMENTATION OF RESEARCH-BASED MATHEMATICAL PRACTICES FOR ALL STUDENTS IN NORTH CAROLINA

RESEARCH UPDATE

Want to know what predicts long-term growth in mathematics? The answers may surprise you!

Predicting Long-Term Growth in Math Achievement

It has been a long-standing interest of educators and psychologists to isolate the variables that are associated with greater academic achievement in students. Some of the most robust and scientifically sound tools that have been developed in this endeavor are standardized assessments of intelligence (i.e., IQ tests). While we are learning more about how these assessments measure distinct psychological processes that appear linked to the structures and physiology of the brain, operationalizing valid linkages between assessment results and effective instructional practices has been more daunting. Notwithstanding, these tests do have a proven track record of being associated with future achievement.

Particularly in regards to mathematics, you may be inclined to believe that achievement is largely a result of talent—in the form of measured intelligence. A corollary to this would be that some students are destined to become great mathematicians, while others would be hypothesized to struggle despite monumental instructional efforts.

If this were your inclination, you will find the research by Murayama, Pekrun, Lichtenfeld, and vom Hofe (2013) rather surprising. These researchers found that broad measures of intelligence were strongly related to static initial measures of math achievement; however, long-term growth in mathematics was most closely associated with intrinsic motivation and deep learning strategies. Most notably, those students who held beliefs that hard work would pay off in regards to their math achievement, who were willing to invest effort because they found math interesting, and who actively attempted to make connections across math concepts experienced the greatest growth. In fact, after accounting for these variables, intelligence had no relationship with growth. This study (and others with similar findings) have deep implications for educators. To start, it is imperative to consider how we are developing motivation and deep learning strategies in the students we serve.

Eye on Early Prevention

- Based on findings from longitudinal data sets, 70 percent of students who enter and leave kindergarten below the 10th percentile in math achievement remain below the 10th percentile in 5th grade (Morgan et al., 2009).
- A meta-analysis of six data sets indicated that school entry math skills are the strongest predictor of later academic achievement. Early math skills showed more predictive value than early literacy, attention, and social-emotional skills (Duncan et al., 2007).

RESEARCH APPLICATION

What is "grit" and why does it matter?

Angela Lee Duckworth left a demanding job in management consulting to pursue an even more demanding job...teaching math to middle school students in New York City. Based on her astute observations, she came to realize that her most intelligent students were not consistently her best math students. Conversely, she had students who failed to score astronomically on tests of intelligence who received strong grades in the class and developed deep understandings of some of the most challenging concepts. The underlying question of why this was occurring drove her to pursue the study of psychology and how students learn from a motivational perspective. Based on her work that ranged from working with West Point cadets to students studying for the National Spelling Bee, a consistent trait emerged that was predictive of long-term success. The name for this trait: **grit**. So what does it mean to have grit? "Gritty individuals are tortoise-like, distinguished by their propensity to maintain effort and interest over years despite failure, adversity, and plateaus in progress" (Duckworth, Peterson, Matthews, & Kelly, 2007, p. 1088).

Dr. Duckworth goes on to ask, "How do life experiences encourage and discourage grit?" In her view, grit is understood within a "cost-benefit rational choice framework." In other words, if we think sticking with a challenge will ultimately pay off, we are more likely to stick it out.

With this in mind, how can we build grit in our math classroom? Questions we may want to ask ourselves: How do we promote a safe environment? Do we specifically and consistently praise effort? Do we model that it is alright to make a mistake and that learning is the result of authentic mathematical discourse in which misunderstandings must be articulated? Do we value multiple solution strategies and model perseverance in our own think alouds? Do we celebrate the small successes for each of our students?

Scan the QR code to see Angela Lee Duckworth's TED talk on grit.

Mind Set

"In a growth mindset, people believe that their most basic abilities can be developed through dedication and hard work—brains and talent are just the starting point. This view creates a love of learning and a resilience that is essential for great accomplishment. Virtually all great people have had these qualities." - Carol Dweck

GRIT IN ACTION

STEM

SCIENCE
TECHNOLOGY
ENGINEERING
MATH

Career Showcase for Students with Disabilities

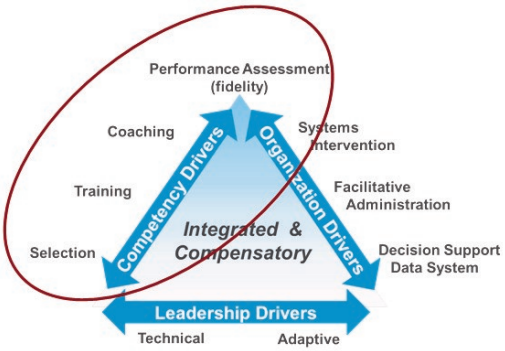
The North Carolina Museum of Natural Sciences hosted the STEM Career Showcase for Students with Disabilities on October 16th, 2013. The showcase provided students access to individuals who have made lasting impacts on the fields of Science, Technology, Engineering, and Mathematics (STEM) while overcoming disabilities and challenging cultural perceptions of who can succeed in such fields. The event featured a keynote address by Ed Summers, a senior manager of accessibility and applied assistive technology at SAS, who is blind. Ed challenged the student audience to cultivate three keys to success, which he described as passion, grit, and positive impact. He provided the audience with thoughtful reflection on how these keys had influenced his own life, and how they could be applied by students regardless of the goals they may ultimately pursue. The keynote was followed by a panel discussion that was playful, poignant, and above all, provided students with model examples of individuals who had overcome similar challenges. The event culminated in small breakout sessions where students and parents were able to engage at a personal level with the panelists. It was readily apparent throughout the event that students and parents were inspired and comforted by the frank discussions surrounding the diverse paths traveled by each of the panelists.

Implementation Science

What are competency drivers?

Competency drivers are the activities to develop, improve, and sustain educator and administrator ability to put programs and innovations into practice, so students benefit. The Competency Drivers are: Selection, Training, Coaching and Performance Assessment.

A goal of the NC SIP project is to develop these competency drivers in districts by providing professional development on research-based practices in mathematics, selection criteria for the implementation of research-based programs, fidelity monitoring for implementation of selected programs, and assistance to districts in developing and supporting math coaches.

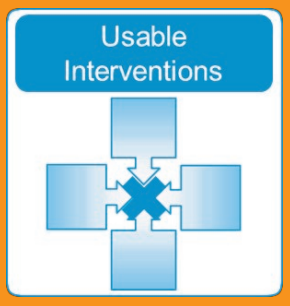


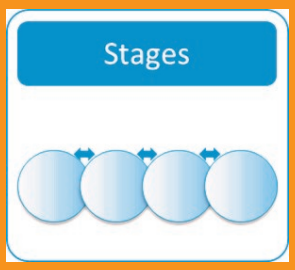
Rationale—Coaching

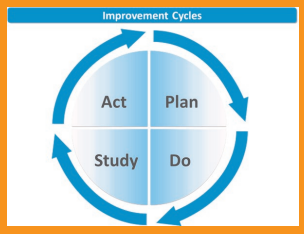
A 2002 meta-analysis by Joyce and Showers makes a compelling case for the need for skillful coaching. The authors noted that even very good training that included demonstration, practice, and feedback resulted in only 5% of teachers using the new skills in the classroom. Only when training was accompanied by coaching in the classroom was there substantial use in the practice setting.

These findings move supervision, monitoring and support to active coaching processes that are embedded in the learning environment and that support adherence to effective practices and quality instruction. This coaching approach also supports the development of judgment needed to differentiate instruction, use data for decision-making, and engage in evidence-based and evidence-informed instructional and intervention practices. Quality coaching offers critical support for trying out new approaches during that "awkward stage" just after initial exposure through training, and helps teachers and staff persist in developing skill, judgment, and the artful and individualized use of the new practices or programs.

Implementation Science
Research to Practice







The information on this page was adapted from the Active Implementation Hub : http://implementation.fpg.unc.edu/

Math Foundations: Updates

THINGS TO NOTE:

- **There have been substantial updates to Unit Seven related to several key understandings regarding proportional reasoning. Please review these prior to delivering your next Foundations.**
- **Regional instructor assessments have been scheduled on a quarterly basis. Please contact Matt Hoskins (matt.hoskins@dpi.nc.gov) if you are ready to take the assessment.**

SPRING NETWORKING:

- **The NC SIP Spring Networking meeting for math will be held on March 26th and 27th at the Embassy Suites in Greensboro.**
- **Focused sessions on coaching will occur on March 26th and will be conducted by Dr. Jim Knight and Dr. Marci Rock.**
- **Focused sessions on mathematics will occur on March 27th and will be conducted by Dr. Ben Clarke, Dr. Marci Rock, and Dr. Jimmy Scherrer. The topics will include RtI and mathematics, assessment systems for mathematics, coaching in the mathematics classroom, and enabling opportunities for students to become mathematically literate.**

CONGRATULATIONS AND CONFIRMATION

Congratulations to Dr. Valerie Faulkner and Dr. Chris Cain for their article! The citation is:

Faulkner, V.N., & Cain, C. (2013). *Improving the Mathematical Content Knowledge of General and Special Educators: Evaluating a Professional Development Module That Focuses on Number Sense.* Teacher Education and Special Education, 36 (2), 115 –131.

The article highlights that teachers participating in Foundations make significant gains in content knowledge for teaching mathematics!

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