

Profiles From the Report



AMIND at Work

Maximizing the Relationship
Between Mindset and
Student Success

2019 NATIONAL REPORT





Productive Persistence Improves Course Completion

Carnegie Math Pathways

There's more to math than the numbers. Research shows that one of the biggest predictors of a student's success in mathematics is his or her degree of Productive Persistence, a combination of learning mindsets and skills. Many students enter the mathematics classroom with negative beliefs about their ability to learn, others' acceptance of them, and the value of mathematics in their lives. These beliefs can cause students to feel anxious, withdraw their efforts, and ultimately not succeed.

Therefore, when the Carnegie Foundation set out in 2010 to transform students' learning experience in mathematics, the team designed strategies, resources, and training to help instructors address these factors. Today, Productive Persistence interventions are used by more than 350 faculty at 90 institutions teaching the Carnegie Math Pathways' Statway and Quantway courses. The evidence shows that these interventions not only improve students' confidence as learners, increase their sense of belonging, and reduce their anxiety, but also that doing so translates into significantly higher course completion rates.^{1, 2, 3, 4}

One Productive Persistence intervention is the Growth Mindset Writing Activity. Most Math Pathways students enter their courses with a fixed mindset about their ability to learn mathematics. To improve students' mindsets, the Carnegie Math Pathways team adapted an intervention from a study with middle schoolers⁵ that featured an article about the neuroscience of learning and how students can grow their brains. Together with its network of researchers and faculty members, the Carnegie Math Pathways team iteratively refined the language in the article and instructions for how faculty and students should use it. The result was a 30-minute intervention embedded into the Carnegie Math Pathways curriculum.

In the intervention, students:

1. Independently read the article in class.
2. Write a summary of the article in their own words.
3. Write about a personal learning experience outside of mathematics.
4. Write a letter to a future student sharing the growth message of the article.
5. Independently engage in a rich challenging math problem.

In a randomized control study, 20% of the students in the control group withdrew from the course, compared to only 9% of the students who read the growth mindset article. (Students in the control group read an article that featured facts about the brain that did not include the growth mindset message.)

After this introductory intervention, Math Pathways students' growth mindsets are supported through engaging pedagogy and rigorous curriculum. For example, in Carnegie Math Pathways courses, students work together in class to understand problems drawn from real contexts, which helps them connect mathematics with their interests and long-term goals. To prepare students to engage in this collaborative problem solving, the program creates a classroom culture that reduces students' doubts about whether they belong.

For example, educators in the network developed a contract activity, which differs from other course contracts in the way that it focuses on personal and social commitments. After students get to know one another, the instructor gives them a starter list of course commitments. Each student reviews the list silently and is asked what he or she is prepared to commit to and what commitments he or she might need help meeting.

Next, the students talk in groups about commitments they might have trouble fulfilling and brainstorm strategies that can help them succeed. Following these group conversations, the instructor leads a full-class discussion about the contract. Through this discussion, the class acts as a team and develops a shared understanding of the course commitments and strategies they can use to meet those commitments. Only then do the students sign the contracts. The class also reviews and modifies the contracts halfway through the course.

These two activities, along with a comprehensive package of other interventions, help Carnegie Math Pathways students start their coursework from a position of strength. This approach introduces students to the idea that they can successfully learn math, creates an inclusive environment in which each student can identify as a mathematical learner, provides opportunities for students to connect math to their interests and goals, and teaches them effective learning strategies.

The Carnegie Math Pathways, a national network of educators, is now a program at WestEd, a nonprofit education research and services organization.

Seattle Central College

Based on the Carnegie Foundation's Math Pathways work, **Seattle Central College (WA)** began offering workshops on Productive Persistence to faculty and staff in fall 2013 and has continued to offer them annually. Productive Persistence focuses on noncognitive aspects of learning such as changing students' beliefs about learning, belonging, and relevance of subject matter. A major tenet of the approach is that students need a growth mindset so they believe their hard work and learning strategies will lead to success. To date, approximately one-third of faculty and staff at the college have been trained on how to integrate these practices into their courses and/or student support areas.

Faculty began implementing Productive Persistence activities into pre-college math courses in fall 2013. Since then, the work has expanded and the practices are now included in science, technology, engineering, and math (STEM); English; college-level math; and Basic and Transitional Studies classes. Seattle Central also incorporated Productive Persistence into its new student orientation and TRiO Student Success Program. Many of the activities are self-reflective and provide students with an understanding that their ability can grow with effort and good strategies. Activities also focus on creating strong social ties that have been shown to promote retention.

For example, instructors use Process vs. Person praise and feedback. They focus all conversations with students on the process of learning, such as improving the strategies students use, as opposed to discussing students' abilities or attributes. Instructors also use writing exercises to boost students' mindsets at difficult points in the coursework. In these exercises, students write to future students and give them advice for overcoming specific challenges, such as loss of confidence, studying with others, or a mid-course slump.

As the college was introducing Productive Persistence in fall 2013, it began offering accelerated math pathways through pre-college math. And in 2013, the number of students completing the pre-math sequence within one year increased 18 percentage points over the previous year. Additionally, Seattle Central was recognized by the Washington State Board for Community and Technical Colleges during the 2014–15 academic year for having some of the largest math completion gains statewide.

Footnotes

- 1 Silva, E., & White, T. (2013). *Pathways to improvement: Using psychological strategies to help college students master developmental math*. Carnegie Foundation for the Advancement of Teaching.
- 2 Edwards, A. R., & Beattie, R. L. (2016). Promoting student learning and productive persistence in developmental mathematics: Research frameworks informing the Carnegie Pathways. *NADE Digest*, 9(1), 30–39.
- 3 Krumm, A. E., Beattie, R., Takahashi, S., D'Angelo, C., Feng, M., & Cheng, B. (2016). Practical measurement and productive persistence: Strategies for using digital learning system data to drive improvement. *Journal of Learning Analytics*, 3(2), 116–138.
- 4 Huang, M. (2018). *2016–2017 impact report: Six years of results from the Carnegie Math Pathways*. San Francisco, CA: WestEd.
- 5 Blackwell, L., Trzesniewski, K., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development*, 78, 246–263.



Chippewa Valley: Starting Strong With Mindset

Chippewa Valley Technical College (WI) developed its learning module, Start Strong, to introduce and reinforce student success principles in the early weeks of the term. Ten instructors piloted Start Strong in fall 2017, and the program launched college-wide in spring 2018, reaching approximately 1,000 students. Today, the Start Strong module, which is offered in both online and face-to-face versions, is embedded in all of the college's more than 90 degree programs. Each program makes it part of a core course that all students take in their first term.

The learning module, which is built within the college's Learning Management System, includes six success strategies or units, one of which is growth mindset. Each unit includes simple and short activities such as an introductory video, a short PowerPoint presentation to review and discuss, or an

interactive quiz. One of the activities in the growth mindset unit is a Think-Pair-Share activity in which students briefly share with a partner a situation in which they faced difficulty, worked hard, and succeeded.

Approximately 300 students were part of the Start Strong pilot in fall 2017. More than 55% reported positive changes in an end-of-course evaluation that asked students if they were doing anything differently as a result of the module. One student reported "trying to have a better mindset when it comes to things that I feel I cannot accomplish . . . yet." Another said, "The growth mindset portion helped me understand how to steer thoughts into an optimistic direction."

The college's Start Strong task force will continue to meet every term to review program outcomes and guide ongoing improvements.



Cleveland State: Faculty Drive Mindset Efforts

The mindset work at **Cleveland State Community College (TN)** grew out of a series of voluntary faculty learning communities with a common read: Carol Dweck's *Mindsets*. Each faculty member identified opportunities to adapt his or her teaching practice to move students from fixed to growth mindsets. They then shared their strategies with one another. The statewide initiative on mindset that was launched in 2015 further energized the work that was already underway. To date, approximately half of the college's full-time faculty, along with some staff members who are also part-time faculty, have participated in a Mindset Learning Community.

Describing the book club learning communities, one faculty member said, "I think mindsets became such a big topic on this campus because we built it from the bottom up. People heard about it, talked about it [and wanted to know] 'How can I do that in my class? How can I grow a growth mindset?'"

Some faculty in gateway courses with high DFW rates (grade of D, failure, or withdrawal), such as General Biology and Accounting I, have taken this work to heart. They now teach with a goal of promoting a growth mindset. Changes to their teaching include altering their vocabulary when they speak to their students about success and failure. Faculty also help students learn to understand failure differently so they can see that a poor test grade, for example, can be a pathway to improvement.

As one student recalled, "We discussed how to avoid [failure], but we also discussed how it can teach you, how it's almost something that's required to be able to push yourself and move further."

Additionally, beginning in fall 2017, the college implemented a growth mindset module into its First Year Seminar, a course required for all degree-seeking students. PERTS, a research center at Stanford University, surveyed First Year Seminar students and found that 35% identified with a growth mindset before completing the module. That percentage increased to 55% after students completed the module.

In celebration of Cleveland State's 50th anniversary three years ago, it created a convocation event with new students that formally begins the academic year. The high point of the ceremony is the Chief Academic Officer's interactive address to students that challenges them to approach their learning with a growth mindset.

The college plans to continue its work to move the needle on students' perceptions of their own ability to learn and grow.