



VERMONT
GearUP
A federally funded program



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VERMONT
AGENCY OF EDUCATION

Essential Math for College and Careers (EMC²)

For more information or to become a pilot school contact:

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Students who leave high school unable to meet entrance requirements for credit-bearing college-level math courses must spend time and money to overcome those entrance barriers. Studies show mixed results for students who leave high school without strong math proficiencies.

To respond to this challenge, Vermont Student Assistance Corporation (VSAC) GEAR UP, the Vermont Agency of Education (AOE), and the Vermont State College System (VSCS), together with high school and postsecondary math faculty, developed EMC². EMC² is an innovative math course designed for high school seniors. Using principles from the National Council of Teachers of Mathematics and supported by the Math Association of America, this course is designed to be project-based with guided student discussion. Concepts are not taught by giving students algorithms, but rather by discovering those algorithms within the tasks presented.

Successful completion of this course (proficient in ALL 16 Essential Concepts) means a student can enroll directly into a college-level math course at any of the VSCS schools without taking the Accuplacer or local math placement test.

2019–2020 school year EMC² pilot high schools: EMC² was taught in eight VT high schools.

- Green Mountain Union HS
- North Country Union HS
- Randolph Tech Center
- Richford Jr/Sr HS
- Rutland HS
- Springfield HS
- Stowe HS
- West Rutland HS

Lessons from Year 1 (2019–2020) of the EMC² Pilot Course Delivery:

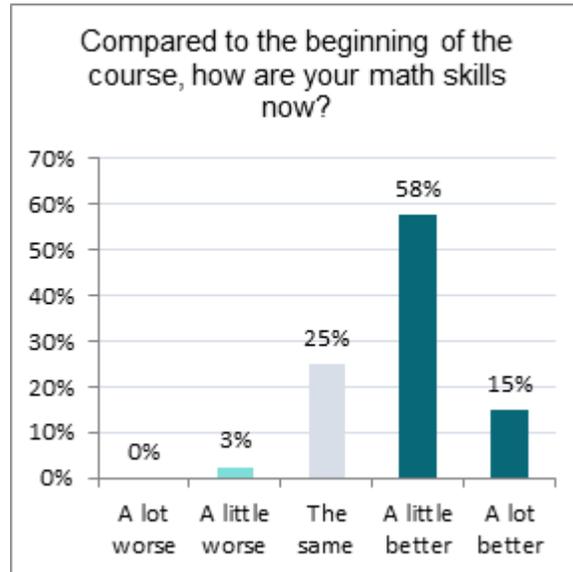
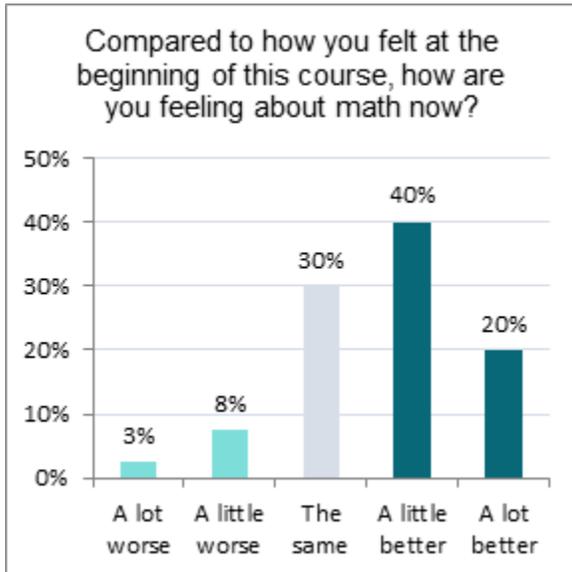
Findings from educators: EMC² has now trained 33 educators in 21 institutions around the state. (These educators include Vermont high school teachers and teachers at technical centers who implemented the pilot course, as well as the founding Course Design Team members who are educators with Vermont high schools, the Vermont State College System, and educators from VSAC and the AOE.)

We have found that teacher professional development is essential and allows teachers to build a strong professional community around this course in Vermont.

- 88% of teachers of the pilot teachers (all but one) thought the course met or partially met its stated goal during the pilot year.
- “Training session prior to delivery was key!!!” – from teacher surveys
- “I’m excited to have a cohort of teachers to reach out to when I have questions.” – teacher in this year’s PD week
- “I really appreciate the engaging format, quality materials, thoughtful/responsive delivery and guidance throughout the week.” – teacher in this year’s PD week

Findings from students: Students enrolled in EMC² were surveyed in May 2020. Forty students responded (a 70% response rate).

Students saw the value of the course and used the course to strengthen their skills and confidence in doing math.



- When students were asked if they would recommend the course to other students, 67% answered “Yes,” 31% answered “Maybe,” and only 3% (one student) answered “No.”
- “It helps you actually understand the math you’re using and why you’re using it. You stop memorizing different formulas or rules because you’ve learned why they’re set up that way.”
- “I’ve found that through this class, I’m finally understanding mathematical concepts that took me my whole high school career to understand. I think it’s giving me a good foundation going into university. It’s quite rewarding”
- “I would recommend this course to others because it’s very helpful in getting you to use your brain to think about the problem and how to solve it. This course makes you think a lot and can be frustrating at times, but extremely helpful.”
- “It forces you to work with other people and go outside your comfort zone, while also pushing you to think about the best solution to complex problems.”
- “It helped me get an extra grasp on math that I had trouble with two years ago or forgot about how to do.”

Due to COVID-19, no schools were able to complete all eight units of the course and therefore no student was assessed on all 16 Essential Concepts. Also due to COVID, the EMC² team was unable to administer the planned post-course test.

Opportunities for 2020–2021 school year



- Three new schools will offer EMC² during the 2020–2021 school year: BFA-Fairfax, South Burlington HS, Windham Regional Career Center.
- During summer 2020, EMC² teachers participated in a week-long professional development to prepare for the 2020–2021 delivery of EMC². Due to the COVID-19 pandemic, this professional learning experience was delivered virtually, and included a focus on online interaction and activities that can be used to deliver the course in an environment where not all students can be in the classroom sharing materials together.
- The EMC² Course Design Team is using outcomes of student and teacher surveys to make improvements in the course, including strengthening assessment tools, constructing maps linking EMC² concepts to proficiency-based grading requirements (PBGRs), providing best practice guidance, and including tools to use in an online environment.

Professional development and mentoring: A required one-week (30 hours) professional development seminar is provided and required for all EMC² teachers. This PD is currently being provided free of charge to pilot schools through the Vermont state GEAR UP grant.

To support the pilot teachers, we have arranged for members of the Course Design Team (CDT) to be mentors. The CDT mentors will visit the school three times over the pilot year. In addition, these mentors will be available through e-mail and over video conferencing. Schools are asked to work with teachers to find time to meet with their mentor and for the mentor to observe the class.

Best practices for course implementation:

- Students should be in their senior year of high school; smaller schools have had success with juniors in the course when sufficiently supported.
- This course is best structured as a full-year course with ample time for practice and discussion. There were two schools (Springfield and Rutland) who used a one-semester double block schedule; because schools were closed in response to the pandemic it is unclear how well this format does or doesn't work. Teachers were feeling success for the first few months in person. We understand that during the 2020–2021 school year, all schedules will be quite different.
- Teaching practices in this course emphasize small group work and mathematical discussions. Teachers are facilitators of productive struggle not deliverers of material.
- Frequent formative assessments are an essential element of the course. Providing students with targeted additional instructional time and instructional supports are best practice pedagogy.
- There is an expectation that students will have been exposed to concepts typically found in Algebra 1, Geometry, and Algebra 2. EMC² reviews all these concepts, but does not introduce them as new concepts.

