



Essential Math for College and Careers (EMC²)

For more information or to become an EMC² school contact:

Anita Long, EdD; Academic Support Coordinator; Vermont GEAR UP, VSAC
long@vsac.org; 802-542-2227

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 Essential Math for College and Careers (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.

Over the first four years, EMC² has been offered in 11 schools and through VTVLC:

- BFA-Fairfax HS
- Green Mountain Union HS
- North Country Union HS
- Randolph Tech Center
- Richford Jr/Sr HS
- Rutland HS
- Springfield HS
- South Burlington HS
- Stowe HS
- West Rutland HS
- Windham Regional Career Center

Lessons from Years 1-4 (2019 – 2023) of the EMC² Course Delivery:

Findings from educators: EMC² has now trained 41 educators in 27 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 (VSCS), and educators from VSAC and the AOE.)

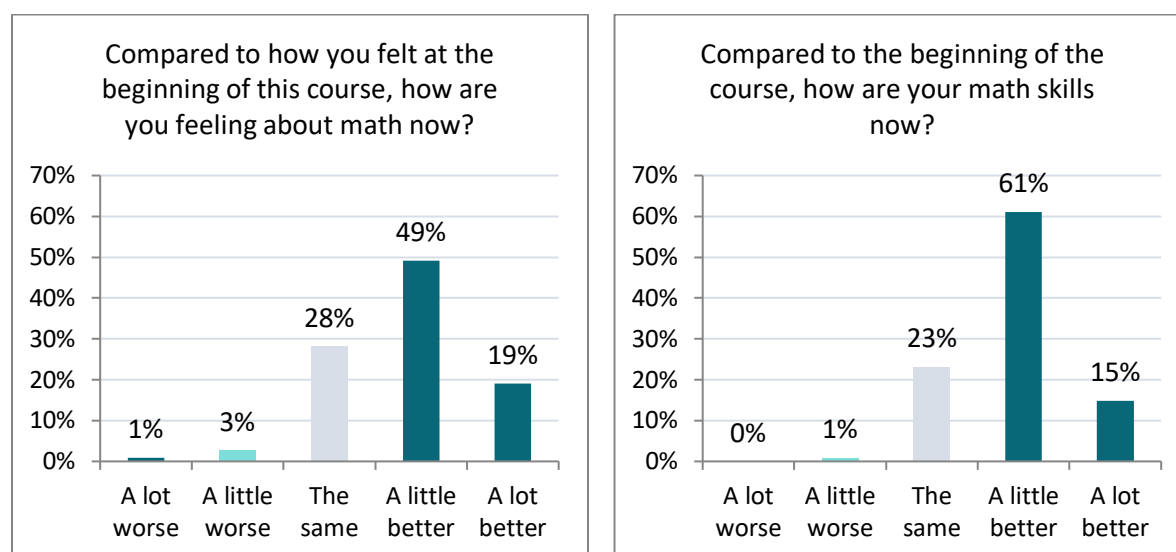
We have found that teacher professional development is essential and allows teachers to build a strong professional community around this course in Vermont.

- “Training session prior to delivery was key!!!” – from teacher surveys
- “I am excited to have a cohort of teachers to reach out to when I have questions.” – teacher during PD week
- “I really appreciate the engaging format, quality materials, thoughtful/responsive delivery and guidance throughout the week.” – teacher during PD week

EMC² contains 8 units. Over the first four years of offering the course, teachers reported completing at least 5 units about 60% of the time and all eight units about 20% of the time. Many teachers attributed their inability to complete all units to rapidly shifting hybrid school schedules, absences, and other COVID-related challenges. Despite these challenges, 90% of teachers surveyed thought the course met or partially met its stated goal.

Findings from student surveys: Students enrolled in EMC² were surveyed each May. Across the four years this course was offered, 110 students responded (75% response rate).

Results showed that students saw the value of the course and used the course to strengthen their skills and confidence in doing math.



When asked if they would recommend the course to other students, 66% answered “Yes,” 29% answered “Maybe,” and only 5% answered “No.” A selection of representative quotes from a follow-up question asking students to explain their answer appears below.

- “A lot of useful everyday practical math was involved in this course. It has really helped me and I'd like others to have that same help.”
- “It helps you actually understand the math you are using and why you are using it. You stop memorizing different formulas or rules because you've learned why they are set up that way.”
- “I would recommend this course to other students if they want to have their math skill intact before heading to college or where ever there going that involves math.”
- “It's a safe environment to learn for someone who isn't confident in math.”
- “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.”
- “I would recommend this course to other kids in my school because it was helpful for me on the things I forgot over the years, made me feel a bit more confident about math again.”



VERMONT
GearUP
A federally funded program



in partnership with
VERMONT
AGENCY OF EDUCATION

Findings from student postsecondary enrollment data: The Vermont State College System (VSCS) provided information about postsecondary enrollment and field of study for all students who previously completed EMC². Of the EMC² completers who have enrolled in the VSCS at any point following high school graduation, 65% were pursuing fields of study expected to require math (e.g. STEM, business). Enrollment information from institutions other than the VSCS is unavailable at this time.

Opportunities for 2023-2024 school year

- A total of four schools are offering EMC² during the 2023-2024 school year: BFA-Fairfax HS, Milton HS, South Burlington HS, and Vermont Virtual Learning Cooperative (VTVLC).
- VTVLC course is now running its first non-pilot year; enrollments remain low and we'll be working to improve enrollments for future years.
- Goals for the EMC² Course Design Team are to strengthen assessments and improve materials to better fit student needs in Vermont. A team of teachers is working on this project with a timeline of completing by June 2024.

Professional Development and Mentoring: A required one-week (30 hours) professional development seminar is provided and required for all EMC² teachers.

Best Practices for course implementation:

- Students should be in their senior year of high school; schools have had success with juniors in the course when they have completed Alg 1 and Alg 2 (not necessarily Geometry).
- 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.
- This course is best structured as a full-year course with ample time for practice and discussion. The course was delivered using a variety of hybrid in-person and remote teaching schedules during the pandemic but returned to fully in-person delivery by spring 2022. A fully-online version of the course is now offered through VTVLC.

