

Essential Math for College and Careers (EMC²): Findings from Student and Teacher Surveys

For more information or to offer EMC² at your school, contact:

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Essential Math for College and Careers (EMC²) is a course designed by the GEARUP program at Vermont Student Assistance Corporation (VSAC) in collaboration with the Vermont State College System (VSCS) and the Vermont Agency of Education (AOE). The course aims to meet the needs of students who might otherwise graduate high school without the skills or confidence to succeed in college level math courses. 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. This course emphasizes understanding math concepts over learning procedures. This is done through actively engaging students in real-life problem-solving and critical thinking tasks in which they work together to solve problems and communicate solutions.

The EMC² course was first piloted during the 2019-2020 school year. Starting in spring 2020, student and teacher surveys have been administered at the end of each school year to assess what has gone well and identify areas in need of improvement. Results from the pilot year (spring 2020) are discussed in a separate report. This report summarizes the results of all surveys taken between 2021-2023.

Summary of key findings

- Survey response rates were high, at 87% among EMC² teachers and 79% among students across participating schools. These strong participation rates suggest students and teachers felt invested in the course.
- A large proportion of students reported positive outcomes following the course. For example:
 - 73% of students reported feeling better about math after taking the course compared to before taking it. 27% of students said their feelings did not change, and none reported feeling worse about math after the course.
 - 78% of students reported improved math skills after taking the course compared to before taking it. The remainder said their skills did not change.
 - 71% of students reported improved confidence in their math ability after taking the course compared to before taking it. Only 3% (two students) reported worse confidence. The remainder said their confidence did not change.
- When asked if they would recommend EMC² to other students, 65% of students answered "yes" and 28% answered "maybe." Only 7% (5 students) said they would not recommend the course.
- Results suggested the perceived impact of EMC² on students' futures ranged from neutral to positive:
 - 43% said EMC² made them feel better about passing postsecondary math courses, and the rest said the course had no effect.
 - 67% said the course did not impact their plans for after high school, 19% said EMC² was helpful for their existing plans, 7% said the course improved their confidence about fulfilling their plans, and 3% said the course encouraged them to expand their options for their future.
- All but one teacher felt the course fully or partially met its stated goal, and feedback about the course was largely positive. Teachers offered constructive feedback about various aspects of the course, including suggestions for ongoing improvement of the materials and discussion of challenges around course enrollment and scheduling practices (number of students, length of class meetings, etc.) at various schools.



Student Survey Results

About the students

Across all schools that participated in the student survey between spring 2021 and spring 2023, 89 students were enrolled in EMC² when the survey was administered. A total of 70 students responded for a survey participation rate of 79%. Among participating students:

- 78% of participating students were seniors, 21% were in grade 11, and 1% were in grade 10.
- 74% had taken Algebra 2 or equivalent and 13% had taken Pre-Calculus.
- 55% identified as male, 42% as female.
- 51% said at least one parent/guardian had formal education or training after high school, 37% said their parents/guardians did not have any formal education/training after high school, and 12% did not know.

Student-reported outcomes after taking EMC²

Positive responses from students overwhelmingly outnumbered negative responses, and frequency of neutral responses varied by question.



• 73% of students reported improved attitudes toward math (60% in 2020):





• 78% believe their math skills improved (73% in 2020):

• 71% reported increased confidence in their math ability (45% in 2020):





Impact of EMC² on students' futures

The majority of students reported having plans to pursue postsecondary education or training: 49% planned to attend a college or university, 13% planned to attend trade school, an apprenticeship, or some other training program, and 4% planned to enter the military. An additional 4% planned to pursue careers that require formal education or training but they did not mention any specific plans for obtaining it. The remaining 30% included students who planned to work, to take time off (with no mention of education afterward), to pursue a career that may not require additional formal education/training (business owner, salesman), or were undecided.

Survey responses indicated that although EMC² did not cause many students to change their postsecondary plans, the course positively impacted students' confidence and helped students prepare for their futures.



 When asked how the EMC² course changed or influenced their plans for the future, 3% said the course changed their plans, for example by making them "want to reach out and do more" or "think about considering online classes." An additional 19% said the course covered math content that would be helpful for their futures and 7% said the course improved their confidence about being able to use math in the future.





Student feedback about who should take EMC²

Student responses indicated strong support for the EMC² course. 65% of students said they would recommend the course to other students, whereas only 7% (five students) would not recommend the course. The remaining 28% answered "maybe."





Students were given the option of explaining why they would or would not recommend the course.

Among students who would recommend the course:

- Many responses described the course as a good review of material they had either forgotten or had never fully understood. For example, "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" and "It helped me understand certain topics that I was taught before and didn't understand at all but now I do."
- Some students described aspects of the course such as the focus on real-life applications and the pace. One described it as "a safe environment to learn for someone who isn't confident."
- Some students based their recommendation on their enjoyment of the course, describing it as fun, easy, or good.
- Others said the course helped them meet proficiency requirements for graduation, for example, "It's the only reason I am on track to graduate right now."

Among the nineteen students who answered "Maybe," thirteen shared their reasoning, including the following examples:

- Six students said, "it depends," for example on the teacher, on the student's skill set, on whether the student needs extra help in math, etc.
- One student "could see how it's useful for the other people" but thought pacing was too slow for their needs.
- One student described the course as "repetitive of previous math classes, but a lot more thorough".
- One said, "it was much more real life applications of math concepts, which is very useful."



Among the five students who would not recommend the course:

- Two said math is boring.
- One thought the course was too long and should be a half-year instead.
- One thought the material was too basic, but concluded "I felt that my placement in the course wasn't right."
- One used the space to praise how their teacher "always explains things very well and always keeps the class interesting," which suggests the student may have clicked "No" by accident.

Students also gave feedback about what type of student is a good fit for the course. Common themes included the following:

- Students who struggle with math or dislike math
- Students who want to review math concepts
- Students who are interested in the unique content or style of the course, such as "learners who prefer to know why we use math for different things."
- College-going students
- Students who are willing to put in hard work
- Students who are smart or good at math
- 12% of students said "any kind of student" would be a good fit for this course.

Student perceptions of the course recruitment process

To gain a better understanding of how students were recruited into EMC², we asked two questions that focused on the course enrollment process.

First, we asked students how they first heard about the course. The majority reported first hearing about EMC² from their school counselors (60%) and/or math teachers (35%). Smaller proportions reported hearing about the course from other teachers (8%), students (9%), and parents (6%). These results confirm that, as expected, most students are being recruited for the course by school counselors and math teachers at their school. However, the fact that some first heard about the course from their peers suggests that news of the course is beginning to spread by word of mouth.





We also asked students how much choice they had in whether to take the course. Most students (72%) believed they had at least some influence over the decision. The remaining 28% of respondents felt they had "little or no choice" in whether to take the course. There was limited evidence of a link between the amount of choice students felt in taking the course and their responses to other questions: Students who felt they had "little or no choice" in whether to take the same (as opposed to better) about math and about taking future math courses, and a higher proportion answered "maybe" when asked if they would recommend the course to other students.





Student feedback about the course overall

The survey included two open-answer questions focused on (a) what about the course went well and (b) what did not work or should be improved. A surprisingly high proportion of students not only answered these questions but provided thoughtful and constructive feedback. Response rates on these questions (other than "IDK" or "I don't know") were 94% and 91%, respectively.

Responses about what went well focused on the following themes:

- Specific activities or topics covered, such as the Bucky the Badger unit, scale picture drawing, learning about loans, using math packets, reviews
- Aspects of the course approach or design such as "hands on," "cross referencing real world examples," "teamwork," "the way the units fit together," and how it is "up to the student to learn the material and decide when they're ready to test on it"
- Aspects of the classroom environment such as "being able to ask questions," "engaging the class and getting a laugh," and "keep it fun"
- Pace or ease of the course

When asked what did not go well or needs improvement, 8 students (27%) used the space to say they could not think of anything to improve (one even said, "It is a perfect course."). The remaining responses focused on the following themes:

- Aspects of the materials used for the course, such as "some confusing things in the workbook," and "questions in the print offs were not thoroughly explained"
- Specifics related to the course format, such as the group work, one on one time, and pacing
- Two students simply said "graphs"
- A disconnect between what was covered in assessments vs. other parts of the course, for example, "some of the tests were a lot different than the packet assignments"



Results specific to students who took the course online though VTVLC

EMC² was offered online through VTVLC for the first time during the 2022-2023 school year, and any qualified Vermont high school student could sign up for free. While remaining as flexible as possible to support the mission of VTVLC, the online version of EMC² still included some common meeting times when the teacher could hold live whole-group discussions. Other discussions occurred asynchronously through a structured discussion board format. All students who took EMC² through VTVLC during the pilot year attended one of two schools that both arranged a common meeting time for students to meet with an educator present to keep the groups on track. Four students, two from each participating school, completed the survey. Survey responses from students who took EMC² online are included in all results presented thus far, but they were also examined separately to look for any unique trends.

Overall, survey results from online students were more neutral in nature compared to the overwhelmingly positive results from those who took the course in person during the same school year. For example, half of online participants felt "the same" about math after taking the course compared to before, and half felt "a little better." Among in-person participants the same year, only 21% felt "the same" whereas 43% felt "a little better" and 36% felt "a lot better." Similarly, when asked if they would recommend the course to other students, three of the online participants said "maybe" and one said "no" but among in-person participants, none said "no" and 93% said "yes." Nevertheless, results show that the online students all found the course valuable in some way, with even the student who would not recommend the course commenting that, "I feel like it ended out well and it feels good to finish and it was fun at times but it was a lot of work."

Some of the feedback from online participants could apply to nearly any online course. For example, comments about what they liked included mentions of the independence, the zoom sessions, and the fact that "you can work on it whenever." In terms of their least favorite aspect of the course, two students commented about the amount of work (e.g., "it was a lot of work"), one said, "online work," and one said, "lack of instruction." Because comments like these could reflect lack of student readiness for an online learning format in general, it is difficult to disentangle which aspects of their feedback are specific to this course versus reflective of online learning more broadly. However, the online nature of the course was clearly helpful for one student, who responded to the question about how the course influenced their postsecondary plans by saying, "It made me think about considering online classes."

Conclusions from the student survey



Across all years students were surveyed, the detailed quality of their individual comments was notable, especially for a voluntary student survey about a math course. Although not every school participated in the student survey, responses showed evidence of the positive impact this course had on many students, such as increased confidence about their math ability and improved attitudes toward future math courses and math in general. For students taking the course in person, responses overall have been increasingly positive each year since the course was first offered. Importantly, there has been no evidence that the course had a negative impact on students: In each survey year, the vast majority would consider recommending the course to others, and any negative feedback students gave was remarkably constructive in nature.



Teacher Survey Results

About the teachers and their courses

Thirteen EMC² teachers participated in the end-of-year survey between spring 2021 and spring 2023 (note that 3 of these were repeats from teachers who took the survey in two different years). The EMC² teachers were highly experienced, with 84% having taught math for 10 or more years and only one teacher having taught math for less than 4 years.

EMC² was taught during the full year at 54% of the time and during one semester 46% of the time. Two teachers reported completing all 8 Units of the EMC² course, and 85% completed at least 4 units.

The extent to which the course met its goal

The stated goal of the course was to *strengthen students' foundational math skills and conceptual understanding, making them better prepared for post-secondary career and learning opportunities.* Over the past three years, only one teacher (from the 2020-2021 school year) thought the course did not meet its goal. The remaining 92% thought the course met or partially met its goal. Of the six teachers who thought the course only partially met its goal, five thought it could meet its goal if refined and one thought "maybe" it could.

Feedback about whether the course reached the intended student population

When we asked teachers what kind of students are the best fit for EMC², their answers included the following:

- Seven focused on the preparation level of the students, with five saying they needed Algebra 2 exposure to be successful.
- Three described students who are interested in college but are (or feel) underprepared mathematically.
- Three described students whose goal is to improve their math ability "choose to enroll with a personal goal to grow math skills and knowledge."
- One said students who need to complete proficiencies they missed earlier.

We also asked if the course reached the intended students. Two-thirds of the teachers said yes. The remainder said some or most of their students did not fit the description, with half of those attributing this to students being placed into the course for misguided reasons (e.g., counselors not understanding the requirements or students' missing proficiencies).



Feedback about the course overall

Like the student survey, the teacher survey included two open-answer questions requesting feedback on what went well this year and what needs to be changed or improved. Their feedback is summarized below:

- The top themes for feedback about what went well included the small class size and the course materials. Additional comments praised the sequence and choice of topics covered in the course. Others mentioned the applied and deep-thinking tasks used.
- In terms of areas of improvement, the most common theme focused on improving assessments used, followed by organization of the materials provided. Other comments included feedback about a specific activity, about the sequence of the course, and about challenges related to how students were placed into the course. One comment focused on challenges unique to the new fully-online format piloted through VTVLC during the 2022-2023 school year.

Conclusions from the teacher survey

Across all years, responses on the teacher survey were largely positive with helpful and constructive feedback. Responses have focused on issues related to course materials less over time, indicating that improvements to the materials have been successful. As schools returned to fully in-person instruction after COVID we saw fewer comments focused on the challenges of hybrid instruction, but recent responses suggest teachers continue to struggle with challenges related to how the course is filled and scheduled in some schools.

