Essential Math for College and Careers (EMC^2) in its Third Year:
Findings from the 2021-2022 Student and Teacher Surveys

For more information or to become a pilot school, contact:
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Essential Math for College and Careers (EMC^2) 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 EMC^2 course was first piloted during the 2019-2020 school year. Since then, 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 of the surveys administered in spring 2020 and spring 2021 were promising and are discussed in detail in separate reports.

During the 2021-2022 school year, seven high schools in Vermont participated in the EMC^2 course. These schools were BFA-Fairfax HS, Green Mountain Union HS, Randolph Tech Center, Rutland HS, South Burlington HS, Springfield HS, and Windham Regional Career Center. The total enrollment across these high schools was 59 students.

In May 2022, EMC^2 teachers and students were invited to take a survey to share their feedback about the course. This report summarizes the results of both spring 2022 surveys.

Summary of key findings

- Survey response rates were high. Six of the seven EMC^2 teachers took the teacher survey. The student survey response rate across participating schools was 76%. 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.
    - 73% of students reported improved math skills after taking the course compared to before taking it. The remainder said their skills did not change.
    - 68% of students reported improved confidence in their math ability after taking the course compared to before taking it. Only 5% (one student) reported worse confidence. The remainder said their confidence did not change.
- When asked if they would recommend EMC^2 to other students, 64% of students answered "yes" and 23% answered "maybe." Only 14% (3 students) said they would not recommend the course.
- Results suggested the perceived impact of EMC^2 on students' futures ranged from neutral to positive:
    - 41% said EMC^2 made them feel better about passing postsecondary math courses, and the remaining 59% said the course had no effect.
    - 24% said EMC^2 was helpful for their existing plans, 62% said the course did not impact their plans, and 14% said the course provided information that would help them in the real world.
- All teachers felt the course fully or partially met its stated goal and provided positive feedback about various aspects of the course. Many of the challenges teachers cited were related to how the course was filled or scheduled (number of students, length of class meetings, etc.).

Student Survey Results

About the students

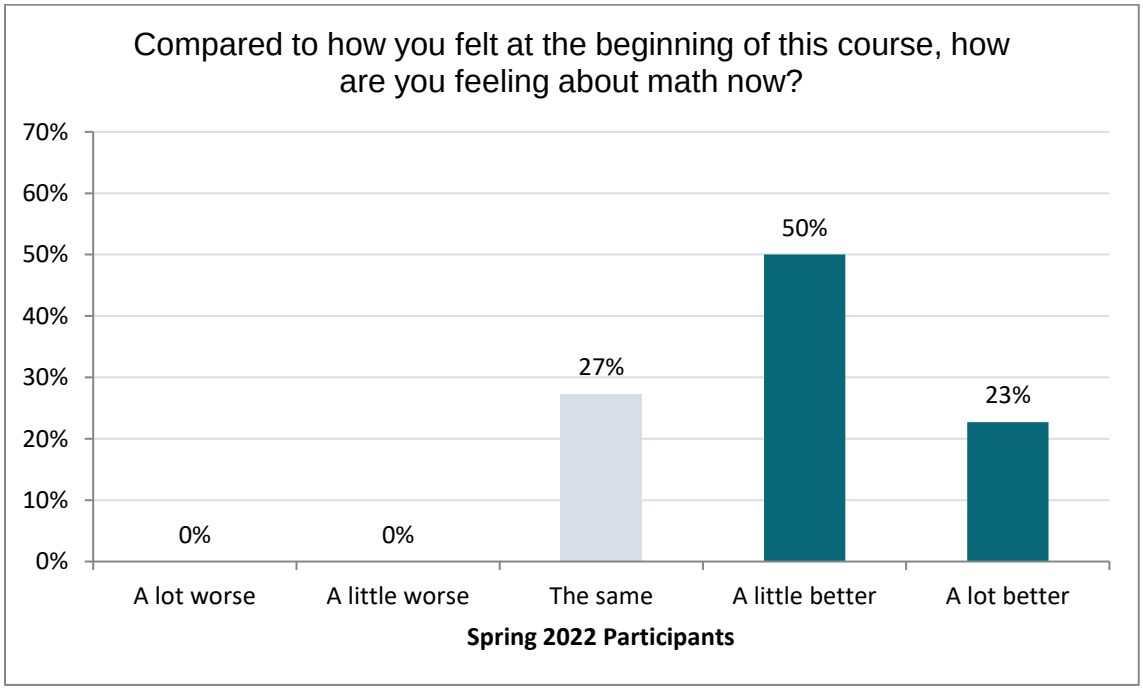
Across the seven schools, 59 students were enrolled in the course when the survey was administered. Five of the schools (total enrollment of 29 students) administered the student survey. Across those schools, 22 students responded for a survey participation rate of 76%. Among participating students:

- 64% of participating students were seniors; the rest were juniors.
- 82% had taken Algebra 2 or equivalent and 14% had taken Pre-Calculus.
- 59% were male, 41% were female.
- 41% said at least one parent/guardian had formal education or training after high school, 45% said their parents/guardians did not have any formal education/training after high school, and 14% did not know.

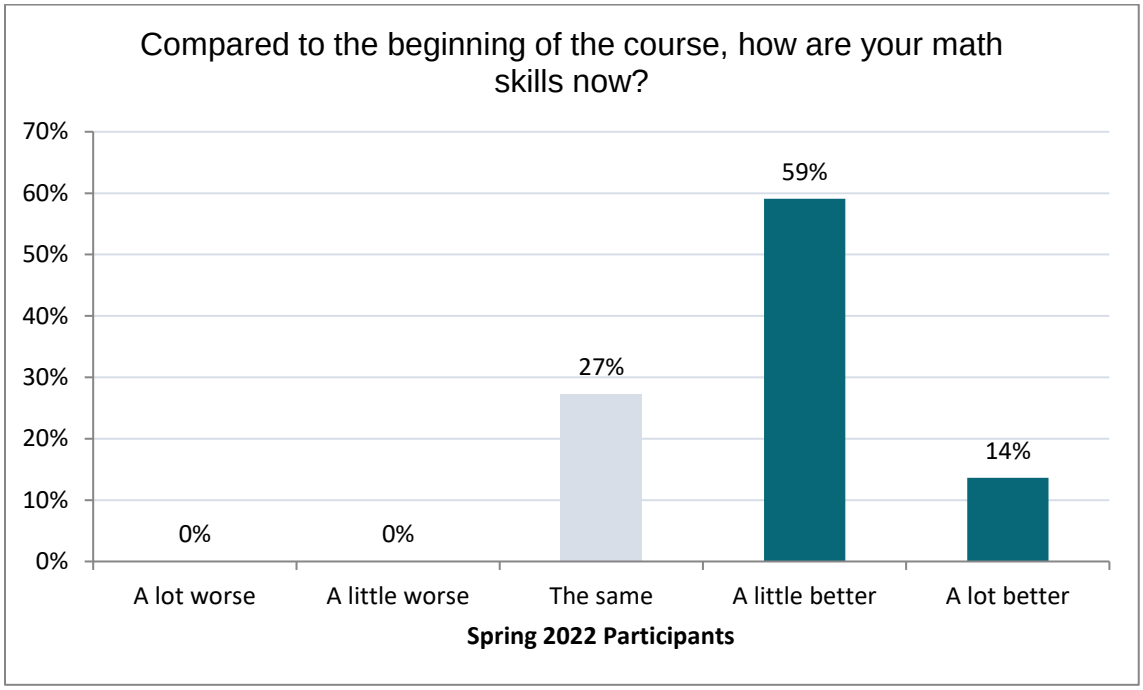
Student-reported outcomes after taking EMC^2

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

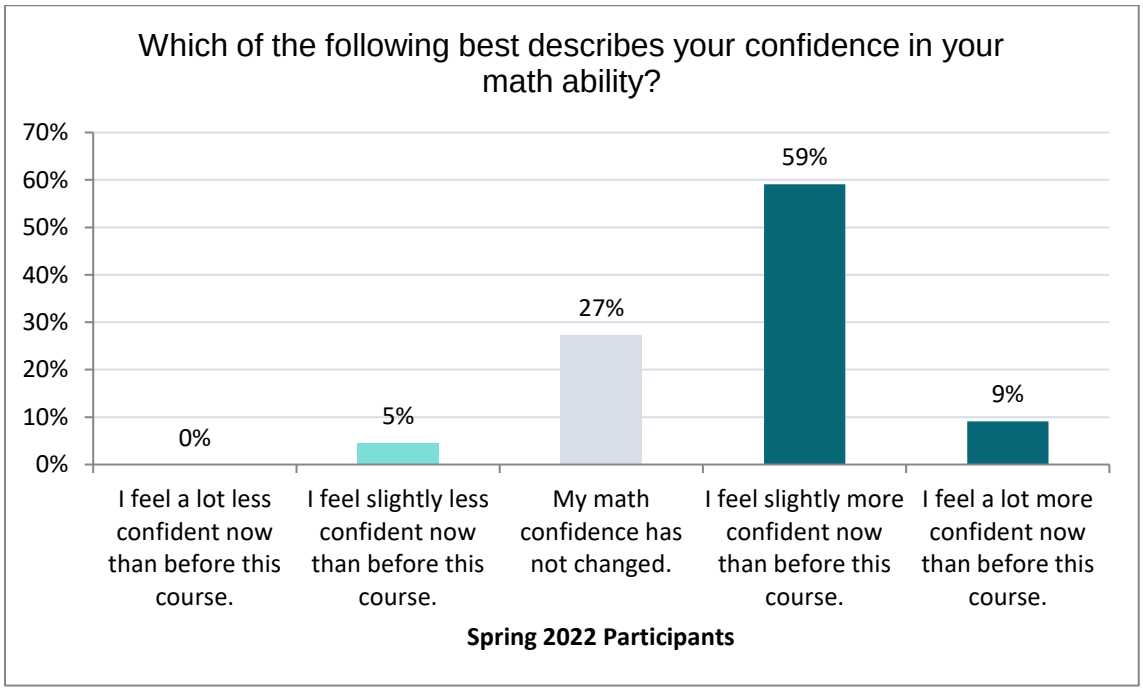
- 73% of students reported improved attitudes toward math (73% in 2021; 60% in 2020):



- 73% believe their math skills improved (75% in 2021; 73% in 2020):



- 68% reported increased confidence in their math ability (62% in 2021; 45% in 2020):

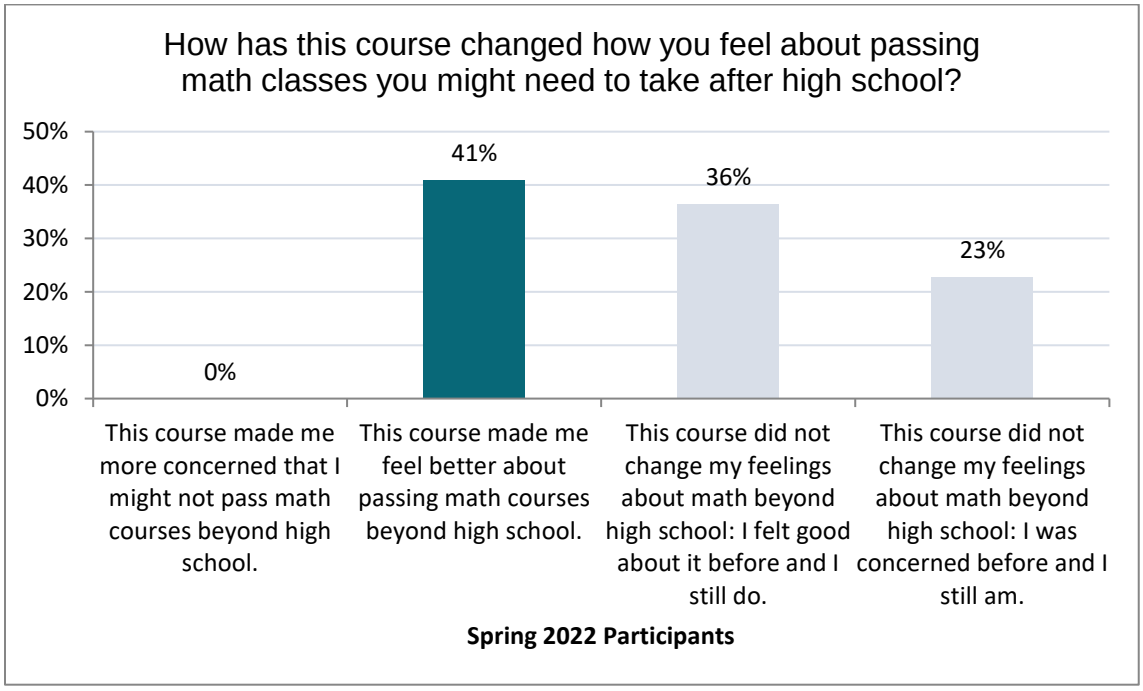


Impact of EMC^2 on students' futures

The majority of students reported having plans to pursue postsecondary education or training. 45% planned to attend a college or university, 9% planned to attend trade school, an apprenticeship, or some other training program, and 9% planned to enter the military. An additional 9% planned to pursue careers that require postsecondary education but did mention any specific plans for obtaining the required education.

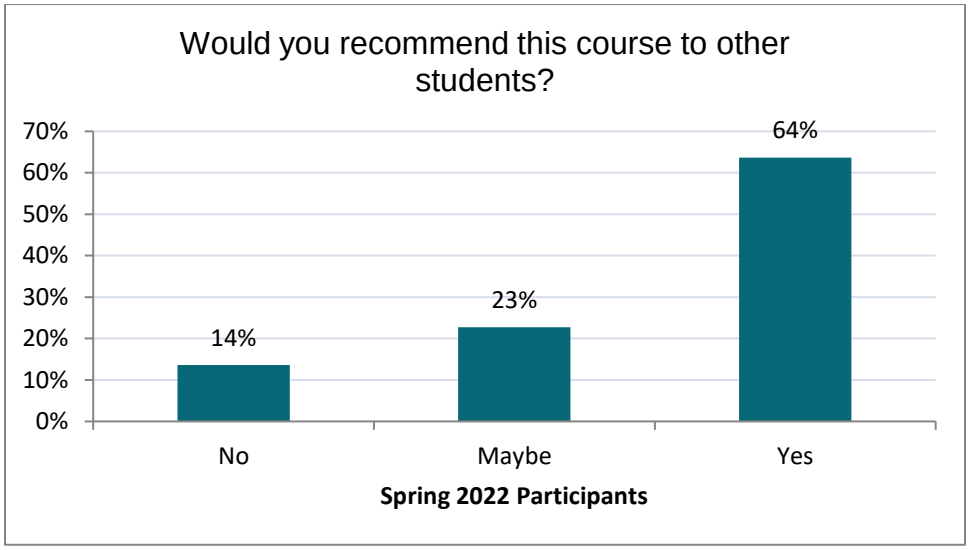
Survey responses indicated that although the course did not cause students to change their postsecondary plans, the course positively impacted students' confidence and helped students prepare for their plans.

- When asked how the EMC^2 course changed or influenced their plans for the future, 62% of students said the course didn't impact their plans. However, 24% said the course taught and/or reviewed math content that would be helpful for their existing plans and 14% said they learned things that would be useful in the real world (e.g., concepts that would help them with finances).
- 41% said EMC^2 made them feel better about passing postsecondary math courses (48% in 2021; 33% in 2020) and none said it made them feel worse:



Student feedback about who should take EMC^2

Student responses indicated strong support for the EMC^2 course. 64% of students said they would recommend the course to other students, whereas only 14% (three students) would not recommend the course. The remaining 23% 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:

- 50% of 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, made me feel a bit more confident about math again."
- 17% of students said the course helped them meet proficiency requirements for graduation. One said, "It's the only reason I am on track to graduate right now."
- 25% of students based their recommendation on their enjoyment of the course, describing it as "easy" or "good."
- 8% (one student) recommended the course due to the teacher.

Among the five students who answered "Maybe," three shared their reasoning:

- One student said it "depends heavily on the teacher."
- 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".

Among the 3 students who would not recommend the course:

- One said the course was "boring."
- 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.

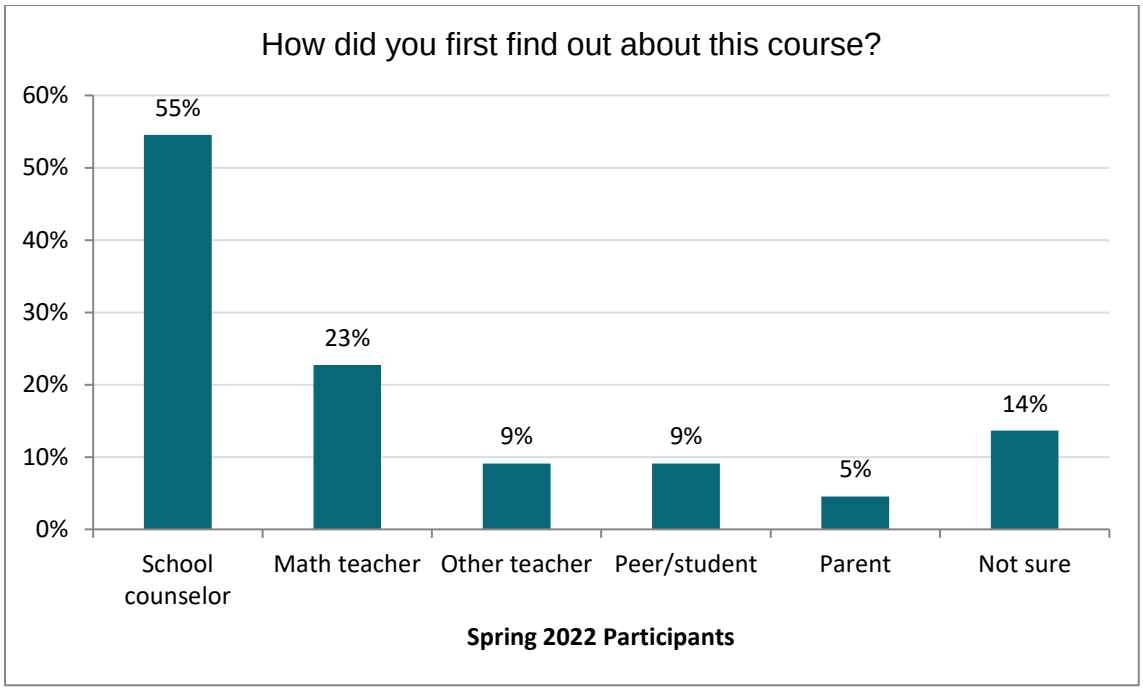
Students also gave feedback about what type of student is a good fit for the course. Common topics included the following:

- Students who struggle with math or dislike math (18% of responses)
- College-going students (14%)
- Students who want to review math concepts (14%)
- Students who are interested in the unique content or style of the course (14%), such as "learners who prefer to know why we use math for different things."
- Students who are willing to put in hard work (9%)
- Students who are smart or good at math (5%)
- 14% of students said "any kind of student" would be a good fit for this course.

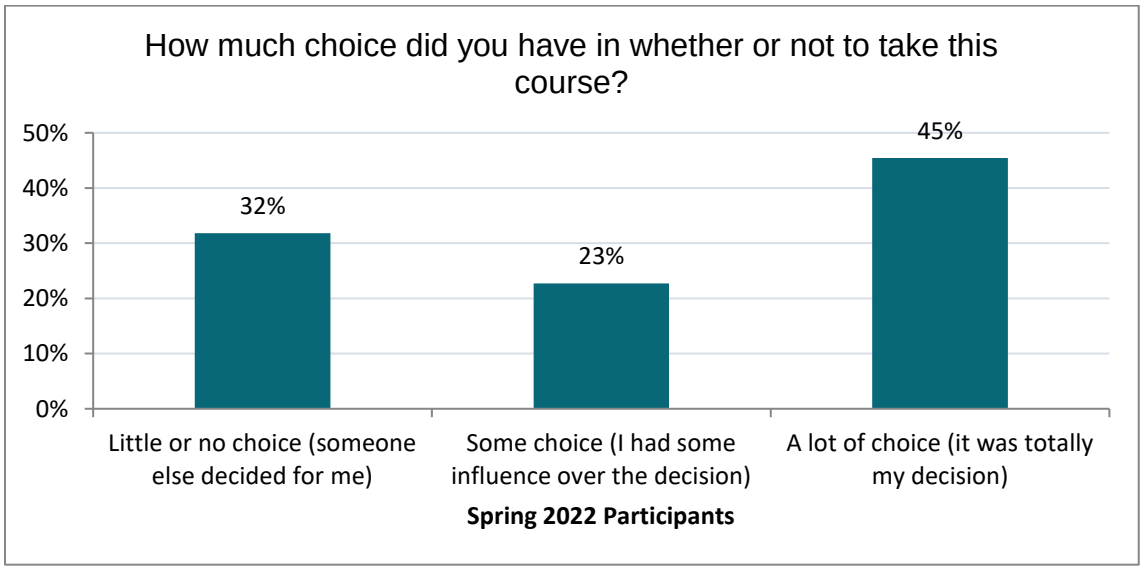
Student perceptions of the course recruitment process

To gain a better understanding of how students were recruited into EMC^2, 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 EMC^2 from their school counselors (55%) and/or math teachers (23%). Smaller proportions reported hearing about the course from other teachers (9%), students (9%), and parents (5%). 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 (68%) believed they had at least some influence over the decision. The remaining 32% of respondents (7 students) felt they had "little or no choice" in whether to take the course. We did not observe any evidence that the amount of choice students felt in taking the course impacted their answers on other questions, including whether they would recommend the course to others, how their math confidence or math skills had changed, etc.



Student feedback about the course overall

The survey included two open-answer questions requesting feedback 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 95% 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 (33% of students)
- 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" (24%)
- Aspects of the classroom environment such as "being able to ask questions," "engaging the class and getting a laugh," and "keep it fun" (19%)
- Pace or ease of the course (10%)
- 14% of the students provided answers that didn't fit into any of the above categories, such as "nothing," "math," and "I can't remember"

When asked what did not go well or needs improvement, 8 students (40%) used the space to say they could not think of anything to improve. The remaining responses focused on the following:

- 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" (20%)
- Specifics related to the course format, such as the group work, one on one time, and pacing (20%)
- Two students simply said "graphs" (10%)
- 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" (10%)

Differing responses observed between students who did and did not take Algebra 2

After the 2019-2020 pilot year, notable differences were observed between students who had taken Algebra 2 and those who had not. Since then we have seen fewer students taking EMC^2 without having already taken Algebra 2, and differences between them and Algebra 2 takers have been less pronounced. Among the students who completed the survey this year, only 4 had not taken Algebra 2. Among these, a larger proportion (75%) felt they had little or no choice in whether to take the course, compared to only 22% among students who had taken Algebra 2. No other differences in response patterns were observed.

Conclusions from the student survey

As in previous years, the detailed quality of students' individual comments were notable, especially for a voluntary student survey about a math course. Although not every school participated in the student survey this year, 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. These findings were similar to those observed on surveys completed in prior years. Importantly, there was 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 even the negative feedback students gave was remarkably constructive in nature.

Teacher Survey Results

About the teachers and their courses

Six of the seven EMC^2 teachers participated in the end-of-year survey in spring 2022. All were highly experienced, with one having taught math for more than 4 years and the rest for 10 or more years.

EMC^2 was taught during the full year at four of the schools and during the spring semester only at two schools. All teachers reported completing Units 1-3 of the EMC^2 course, and two completed all 8 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.* During the pilot year, seven of the eight teachers thought the course met or partially met its goal. During the 2020-2021 year, the teachers were evenly split: One thought the course met its goal, one thought the course partially met its goal, and one thought the course did not meet its goal. This past school year half of the teachers thought the course met its goal and the other half thought the course partially met its goal, but could meet it if refined.

Feedback about whether the course reached the intended student population

When we asked teachers what kind of students are the best fit for EMC^2, their answers included the following:

- Five focused on the preparation level of the students, with four saying they needed at least 3 years of high school math (Algebra 1, Geometry, and Algebra 2) and another saying 2 years of high school math (Algebra 1 and Geometry).
- Two said the course was good for students who struggled with some of their previous math courses or topics.
- One mentioned students who are planning to attend college but feeling underprepared mathematically
- One said students "choose to enroll with a personal goal to grow math skills and knowledge."

We also asked if the course reached the intended students. Half of the teachers said yes. One said some fit the description, but some did not. The remaining two described issues due to students being placed into the course for misguided reasons (e.g., due to counselors not understanding the requirements or due to the students' missing graduation requirements).

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:

- Three teachers praised the materials and sequence of the course as things that went well, and another mentioned the choice and breadth of topics covered.
- Two teachers cited the return to in-person instruction as very helpful.
- In terms of areas of improvement, two teachers had suggestions about how to improve the instructions or materials, and three cited challenges that were related to how their school scheduled the course (timing, number of students) rather than anything about the course itself.

Conclusions from the teacher survey

During the pilot year (2019-2020), responses on the teacher survey were largely positive but included many suggestions for improvement, particularly in terms of course materials. In spring 2021 the varied nature of teacher feedback could be explained at least in part by differences in how each school was impacted by COVID. In this most recent year, teacher responses suggest the course materials have continued to improve but teachers were still struggling with challenges related to how the course is filled and scheduled in some schools.