

2019

## The Nebraska Mathematics Readiness Project: Year 1 Evaluation Report

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# Nebraska Math Readiness Project

YEAR 1 EVALUATION REPORT

2018 - 2019

# EXECUTIVE SUMMARY OVERVIEW

## College Mathematics Readiness Challenge

Many college students across Nebraska struggle to successfully complete a post-secondary degree or certificate because they lack the foundation for college-level mathematics.

**60%** community college students need developmental math

**10%** of students who take developmental math courses ever end up completing a degree or program of study



### THIS IS OCCURRING IN NEBRASKA FOR MANY REASONS

- Alignment problems in the P16 education system
- Only three years of high school mathematics coursework is required in Nebraska
- Lack of an effective longitudinal data system
- Assessments that make it difficult to diagnose needed remediations
- The same material is being taught in the same way without regard to competency, engagement, individual learning styles and skill levels
- Entering freshmen are required to pay for developmental courses that don't offer college credit or count toward their degrees or certificates

$$A = \frac{1}{2}bh \quad X - y^2 =$$

$$A = \begin{pmatrix} X, 1+X^2, 1 \\ Y, 1+Y^2, 1 \\ Z, 1+Z^2, 1 \end{pmatrix}$$

### A VIABLE APPROACH

The Nebraska Math Readiness Project (NMRP) is a targeted curriculum designed for seniors who have plans of attending college, yet lack the foundational math skills needed for college-level courses. They are given a fourth-year mathematics class to help them improve their mathematical skills and prepare for required college math courses.

The project is a collaboration between community colleges across the state and high schools within the Nebraska school districts.

#### NMRP Administrators

- Math intervention for students in the 12th grade who have been identified as not ready for college level math
- Several blended learning elements to support student success:
  - Modular and online math curriculum
  - A well-trained and engaging teacher
  - Small class size of 15 or less students
  - Year-long interactive journey for mathematics learning

Pearson Education, a paid service provider, supplied MyLab Math software, an interface for high school mathematics remediation and college readiness.

#### MyLab Modular Math Curriculum

- Aligns with College Board and NE state math standards
- Utilizes Videos, Readings, Pretests, Finals
- Three "Seamless" Levels of Interactive Modules
  - Level 1 is Developmental Mathematics
  - Level 2 is Beginning Algebra
  - Level 3 is Intermediate Algebra
- Is self-paced, meeting each student's learning needs

Students move systematically through the curriculum, which is designed to accommodate students' individual post secondary education and career goals. Students must successfully complete levels 1 and 2 to be ready for "college-level" math and forgo placement exams, entering directly into college math courses. Students who successfully complete level 3 (a college level course) earn transferable college credits.

### YEAR 1 EVALUATION

An external evaluation was conducted for Year 1, which covered the first academic year of the project, as facilitated by six Nebraska Community Colleges, under the leadership of Metropolitan Community College (MCC) and Central Community College (CCC), as well as with the strong participation and, at times, co-leadership of four other state community colleges: Northeast Community College (NECC), Western Nebraska Community College (WNCC), Mid-Plains Community College (MPCC), and Southeast Community College (SCC).

The project also collaborated periodically with the University of Nebraska (NU), the Metropolitan Omaha Education Consortium, and the Nebraska Department of Education.

The external evaluation team is comprised of four well-experienced evaluators based out of the University of Nebraska at Omaha (UNO). The team's combined experience includes more than 80 years in mathematics education or STEM education, and more than 300 published articles. Collectively, they have evaluated more than 30 large educational projects.



## YEAR 1'S EVALUATION PLAN INCLUDED

### ONE

Devising, refining and operationalizing an aggressive external evaluation process

### TWO

Documenting the evolution of the evaluation process within a detailed and dynamic evaluation plan

### THREE

Producing a Year 1 mid-annual report on how the project was progressing at that time

### FOUR

Creating a Year 1 summative report regarding project outcomes and effectiveness

### FIVE

Jointly developing data collection protocols for student, teacher, school, and colleges

### SIX

Coordinating with Pearson for MyLab Math for data formats, retrievals and reporting

### SEVEN

Encouraging strong data protection protocols across all datasets for statewide partners

### EIGHT

Initiating a student ID process for dataset links with full student protections

### NINE

Learning from the data available from various pilot efforts for data protocol refinements

### TEN

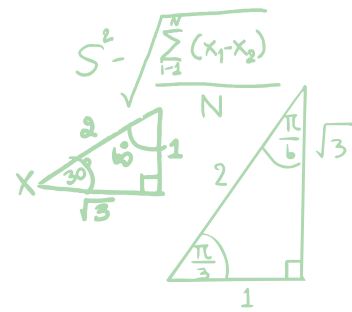
Collecting survey data on participating teachers, principals, counselors and students

### ELEVEN

Seeking insights from focus groups, documents, emails, press, and shared perspectives

### TWELVE

Examining project contexts within local and statewide efforts for mathematics education



## SETTING THE FOUNDATION

Year 1 laid the foundation for a strong, ongoing data retrieval and analysis process. Several appendices are included in the full report for further ramp-up efforts into Year 2. Additionally, a detailed six-criteria curriculum review of MyLab Math curriculum (including Year 1 modifications) was completed to determine its compatibility with the "effective curriculum" guidelines of the College Board and the National Council of Teachers of Mathematics.

## LEADERSHIP AND EVALUATION TEAMS

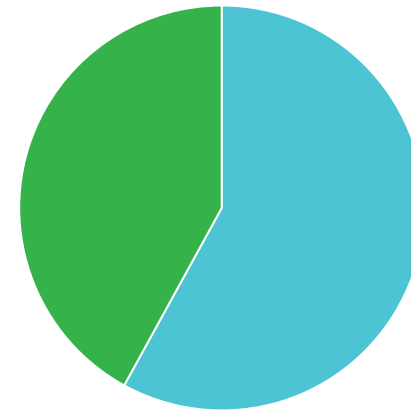
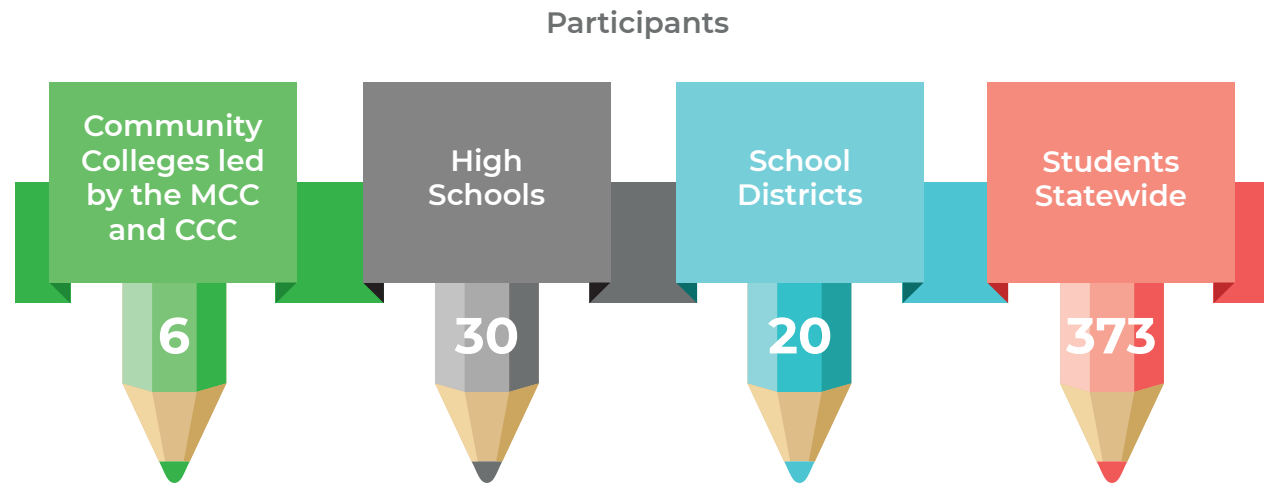
The MCC and CCC teams, the collaborating colleges and schools, and Pearson worked closely together to deliver an appropriate curriculum option for college mathematics readiness.

Every effort was made to ensure that NMRP is clearly aligned with best practices, as carefully reviewed by the evaluation team, who have frequently done such reviews at the national and state level, for organizations such as the national College Board, National Science Foundation, the Nebraska Department of Education, and the Nebraska Association for Teachers of Mathematics.

CURRICULUM REVIEW CRITERIA
SCOPE
SEQUENCE
CONTINUITY
BALANCE
ARTICULATION
SPIRALING

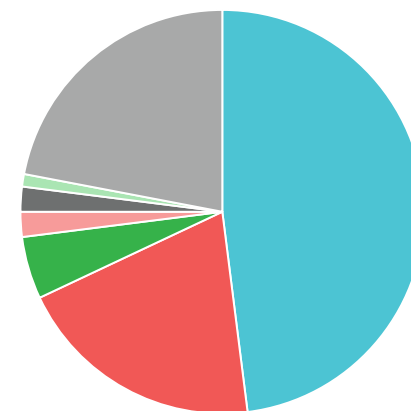
## Year 1 Breakdown

### STATEWIDE PARTICIPATION NUMBERS AND STATISTICS



### Student Gender

- 58% Males
- 42% Females



### Student Race/Ethnicity

- 48% White
- 20% Hispanic
- 5% Black
- 2% Asian
- 2% Native American
- 1% 2 or more races
- 22% left the response blank

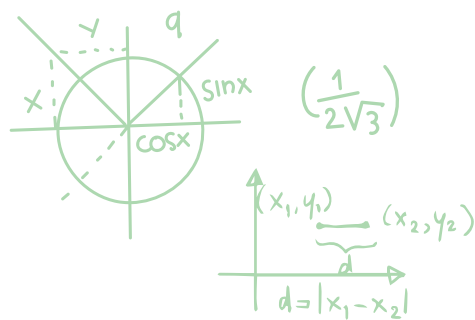
## Year 1 Breakdown

### YEAR ONE RESULTS STATEWIDE

#### NMRP Curriculum Recap

- Level 1 (Developmental Math)
- Level 2 (Beginning Algebra)
- Level 3 (Intermediate Algebra) - college level course with transferable credits

Students follow a specific curriculum track based on their goals of pursuing a 2- or 4-year degree.



HIGHEST LEVEL OF STUDENT COMPLETION	
2%	Passed Levels 1, 2, and 3
32%	Students passed both Level 1 and 2 <ul style="list-style-type: none"> <li>· 17% passed the Academic Track</li> <li>· 15% passed the Business/Trades Track</li> </ul>
42%	Students passed Level 1
24%	Completed at least some foundational modules

#### Additional benefits to students

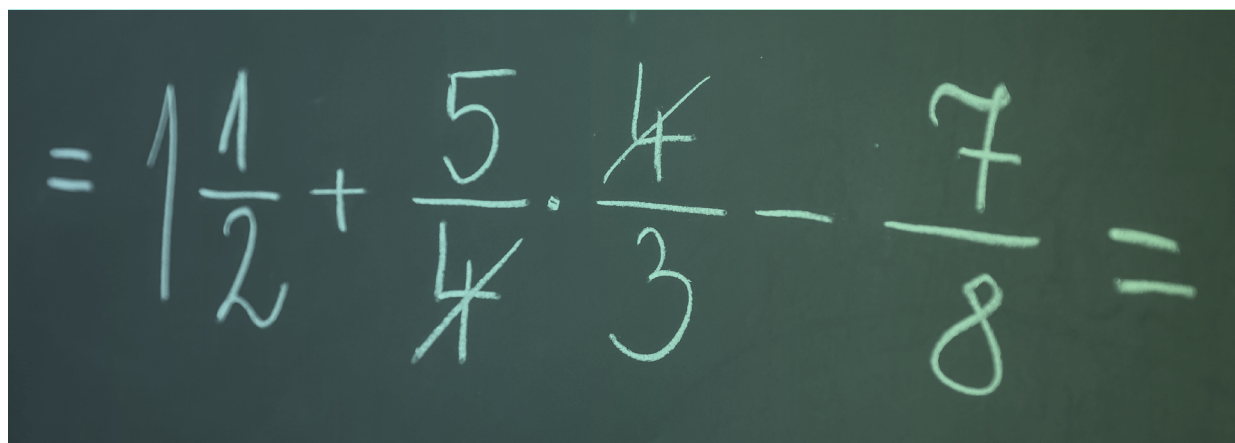
- An increased knowledge and understanding of mathematics
- Ability to move through remaining mathematics courses at a faster rate once in college
- Some will be able to minimize their time in developmental math

## Findings on where high school students struggle

CCC's team did a comprehensive study (verified by the evaluation team as representative statewide with MCC data), showing that in Level I, Developmental Mathematics, it is obvious that students particularly struggle with Fractions (5.0% passing on the pretest), along with

Ratios and Proportions (6.5% passing). In Level II, Introductory Algebra, Fractions again are a strong target area for remediation, with only 2.1% passing pretests for equations with fractions. This is also consistent with where students have spent the most time in the

modules. The modules for the sample of Level I pretest outcomes demonstrate the critical need to provide high school seniors a mathematics readiness interventions.



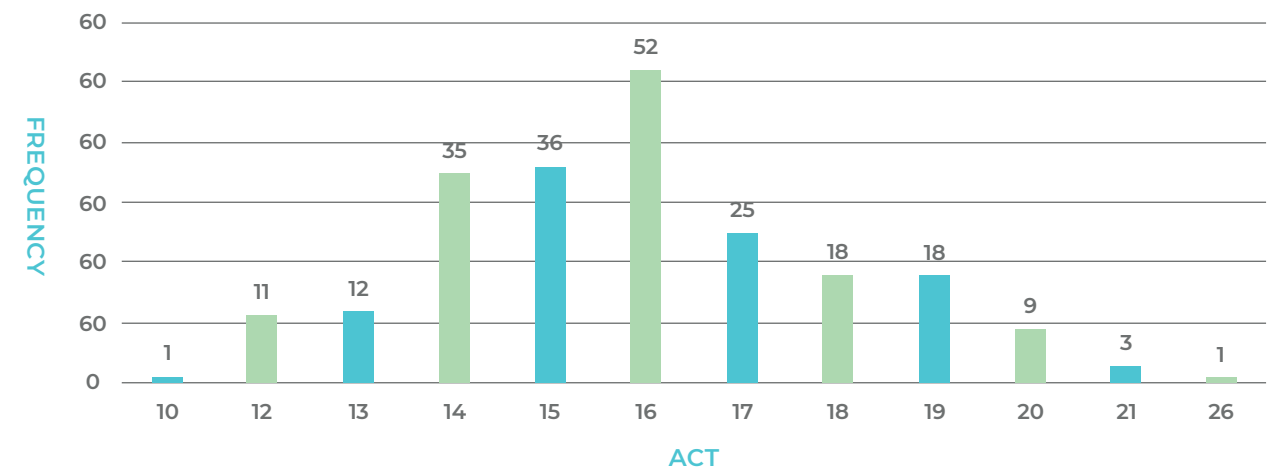
## Student Recruitment

Student recruitment represents one of the most challenging contexts for the project, and one that the leadership teams have masterfully navigated, while working very hard to achieve and to refine. The ACT and related tests such as Accuplacer, are well-known in the national mathematics education literature for significant limitations in placing students for early career mathematics readiness efforts. Even for four-year colleges, an ACT score is quite limited in its predictive capabilities. The NMRP initially used an ACT target of 13-16 and expanded to 13-18 for the Fall term. The Year 1 ACT analyses show considerable diversity in ACT scores from participating students, and schools do seem to be having participating schools do seem to be selecting students with more overall variance in ACT scores (N = 221) than anticipated. The leadership teams are aggressively conceptualizing alternatives to using ACT. An innovative pretest idea by the CCC team uses a refined version of the Level I comprehensive posttest. The team is also looking statistically at a variety of potential factors retrieved, with permission, from schools for a pilot review by the MCC team, which includes MAP scores, attendance, junior or senior status

(high school year), desire to attend college, and self-motivation. Measures like Accuplacer are being considered, but most likely will be de-emphasized as many participating districts are moving away from that measure. Further, the NMRP has worked closely with the schools to build recruitment, and has made great strides for Year 2, with an expectation for a more targeted process for students who can benefit from the program.



YEAR 1 ACT SCORE SAMPLE FOR STATEWIDE NMRP





## 100% of participating teachers provided feedback in Year 1

- The online package facilitated their instruction
- They would teach an online class again

### Teacher Comments

#### WHAT ASPECTS WORKED WELL?

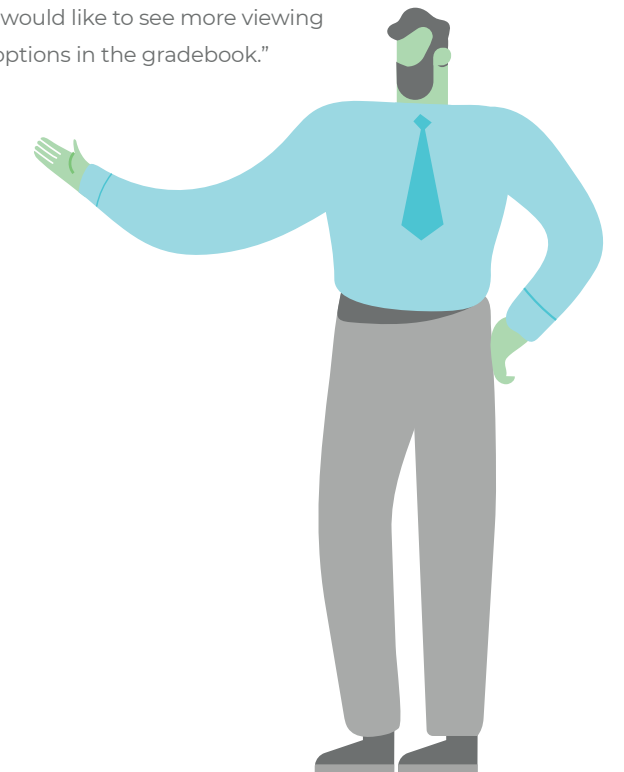
- “Students [were] telling ME what they need to learn, instead of the other way around. It gave the students more “ownership” of their learning.”
- “I liked being able to work with students on the topics about which they needed additional help based on their pre-test results rather than assuming that all the students needed the same instruction.”
- “It was great that the modules allowed the students to work at their own pace. Some motivation was built-in that way. I liked having the ability to move around the room, working with students on an individual level — meeting them where they are at.”

#### WHAT ADVICE DO YOU HAVE FOR OTHER TEACHERS?

- “Be attentive. Sometimes the students get stuck and don’t ask questions right away..you have to ask them if they need help.”
- “Continually monitor student progress as they work and via the dashboard to help students make good use of their time and keep on pace to earn credit.
- “I would advise new instructors to have students set goals weekly or daily. Also, conference with students as much as possible.”

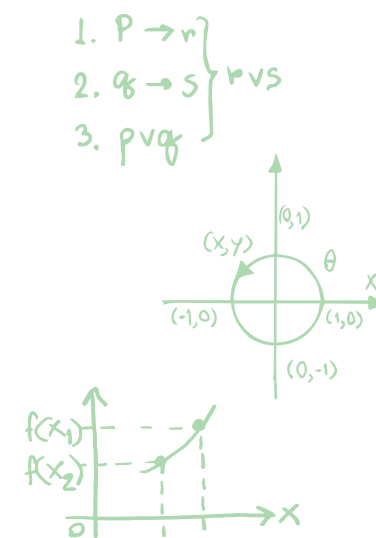
#### WHAT SUGGESTIONS DO YOU HAVE TO IMPROVE NMRP?

- “The program in general is pretty good. I have just noticed some small issues every now and then. For instance, on some of the later chapters, the program is very particular when it comes to formatting or how the answers are listed.”
- “The graphing tools are tough to use.”
- “I would like to see more viewing options in the gradebook.”



### Data Sharing

Working closely with the evaluation team, the NMRP team and collaborators have created a secure data exchange mechanism that allows math readiness data to be rigorously tracked across all six colleges and by area high schools, with full protections for student identity. Highly creative and thoughtful efforts were conceptualized by Brian McDermott at CCC, which allowed workable data sharing agreements across western Nebraska, and secure data transfer over the Internet with the appropriate encryption and protection protocols, using Box.com and other safeguards. Tracy McTavisch-Mlady and her team at MCC had their own significant innovations in data sharing and leadership, including many extensive conversations with area school districts. MCC’s Chad Haugen also created a technical workaround that allowed the NMRP to draw down MyLab Math data in a format consistent with SPSS analysis. This was a significant cost savings for the external funding of the NMRP, allowing the statewide project to decrease its reliance on Pearson for data retrieval from their system. The MyLab Math reportable data links all data from the six colleges, high schools, and the online mathematics readiness system for analysis. This secure data approach has met the highest levels of data security.



## EDUCATOR FOCUS GROUPS

One theme that emerged from the educator focus groups (as well as the surveys) was the acknowledgement by teachers of the integration of real-life situations into the online curriculum. The teachers mentioned that the curriculum's real-life situations often facilitated their in-depth discussions with students and aided in demonstrating real-life applicability of the material, which boosted the students' motivation levels. Teachers in focus groups and

surveys also acknowledged the very strong support system in place by both MCC and CCC. One request by the teachers is increasing the hands-on components in the training sessions, where they could get clarification to a particular technical element or to discuss how to approach a particular component. Teachers also thought future training might be increasingly differentiated depending on the participating teacher's experience

levels with the program, knowing that such differential options in training may be overly challenging to introduce with diverse schools participation. Counselors and administrators who participated in focus groups were also very supportive of the program. They also stated they are able to use some existing programs, such as Avenue Scholars, as a way to recruit students.



TEACHER STRENGTHS
"Stellar" Support Team
Positive Student Interaction with Software
Teachers Felt Comfortable with the Software Over Time
Variety in the way Students Demonstrate Knowledge
Curriculum Integratration of Real-life Situations

COUNSELOR/ADMINISTRATOR STRENGTHS
Great Support Team
"Right" Teachers in Classes
"Right" Students in Classes
Able to Use Existing Programs (Avenue Scholars) to Recruit

**96%** of all surveyed students took the time to provide written feedback/comments about NMRP, noting positive effect of the curriculum

**98%** of a sample of the participating students stated instructors provided good help

**79%** of the participating students stated the online course facilitated their math learning

## Student Comments

### HOW HAS YOUR MYLAB MATH ONLINE MATHEMATICS EXPERIENCE IMPACTED YOUR LEARNING?

- "I have a better understanding of basic math."
- "It has made it easier to access the textbook and faster overall learning."
- "Before, I was only used to a face-to-face learning experience, but since some colleges are online, I trained myself how to use the program as my own "face-to-face" teacher."
- "It was easier for me to get better grades."

- "It helped me relearn the important things I have forgotten."
- "The tutorials were effective and mostly easy to understand. They broke things down really well and allowed me to focus on specific things that I needed to work on."
- "It has helped me through math because I usually struggle at it. This course was way easier for me because it showed video that I could replay over and over again until I got it down or I can go back to them when I needed to. It was a lot of help being able to go back to things and it nice how we can go at own pace and be able not rush things."

”  
The tutorials were effective and mostly easy to understand. They broke things down really well and allowed me to focus on specific things that I needed to work on.





**\$155,781** estimated cost savings for NE families taking NMRP college readiness

**\$417** estimated cost savings per student statewide for the NMRP families

## Sustainability

The Nebraska Math Readiness Project merits a look into future sustainability. The project continues to be expansive, complex and evolving as it heads into Year 2. With the project covering the entire state, it is certainly one of the most complex educational projects undertaken for student support in mathematical readiness. Such a complex project is indeed challenging and many conversations happened behind the scenes. The evaluation team suggests that sustainability conversations start in Year 2, including elements like credentialing and smooth transition to the college environment when students actually graduate and enroll after high school starting in Year 2 for some of the Year 1 participating students.

All six community colleges have established a strong support network that is in place for schools, which should not be underestimated in the amount of work that took to accomplish statewide. This synergist support network has entailed an extensive field coordination program for teachers involving training, written curriculum implementation updates and tips, continuous individualized support, and follow-through conversations and support strategies for teachers

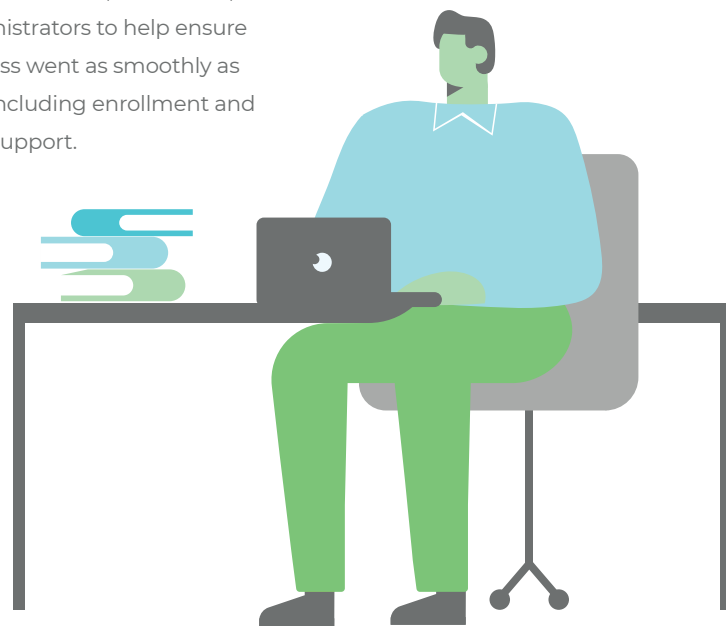
and students. It has also involved many individualized conversations with high school and district administrations, including principals and counselors. Even though this is a relatively new program, the NMRP teams were able to set up a structure for long-term success. In addition to training, the effort also included timelines and process documents for teachers and students to follow and that provided support for the school administrators and counselors. In greater Nebraska, there is an evolving process of creating a new structure at the community college level to transcript student work within the project, and in Omaha, more articulation of dual enrollment contexts. College leadership and support teams were actively out in the classrooms and frequently visited with teachers, counselors, and administrators to help ensure that process went as smoothly as possible, including enrollment and logistical support.

Teacher and administrator trainings have also been quite innovative and collaborative. NMRP created a strong training protocol that continues to be refined with the active support, wider feedback and collaboration of schools.

Another important element of sustainability is support from the high schools themselves, as individuals are clearly needed within the schools to be champions of the project. The more people that share the vision at the ground level with consistent messaging, the more the project will become increasingly strong for students in Year 2 and beyond.

$$y_{i+1} = y_i + (x_n/2)(a - y_i^2)$$

$$x_{n+1} = (x_n/2)(3 - ax_n^2)$$



“It was great that the modules allowed the students to work at their own pace. Some motivation was built-in that way.”

## Ongoing Improvements

Participating community colleges have used NMRP data and their own educational expertise, to refine the modules, enhance online curriculum scope and sequence, and build on teachers' professional development, student recruitment and student placement strategies. The consistent sharing of documents and discussions of data fuel ongoing statewide conversation. Team leaders Mike Flesch and Corey Hatt deserve significant credit for leading wider, data driven changes by examining monthly data downloads, reviewing teacher and student feedback, and developing interactive models that demonstrate student progression, possible bottlenecks, situations that need to be adjusted, and future placement strategies. As the program grows, it will be important to recognize the workload for data management and institutional research support. Additional staff within participating community colleges may be a consideration as the project grows and expands.

Data collection and sharing is an important aspect of this project, helping the various teams and stakeholders identify areas of success and areas of improvements so they can improve the initiative accordingly.



## Program Coordination and Implementation

In addition to the documents as generated by the evaluation team there has been a large number of documents produced by the program itself. These documents represent a very impressive and robust curriculum documentation for both content and delivery. Some of the key ones are represented in the table below.

### Student and Institutions Data Flow Protocols

- Data Agreements, Secure Data Transfer Protocol
- Secure Data Storage Environment, Flow Diagrams

### Student and Teacher Enrollment Instructions

- Consistent ID (MCC001, CCC001, WNCC001, etc.), descriptions, faculty contacts, student reporting protocols

### Overviews and Directions for High School Staff

- Program intent, philosophy, guidelines, placement, and monthly pacing reports and suggestions

### Student Characteristics Communications

- Numerous written documents, e-mail exchanges and conversations with district leadership on student targets

### Mathematics Remediation Promotion

- Philosophical overviews and encouragement documents for mathematics readiness and the current model.

### HS School and Staff Program Information

- Documents for consistent program messaging including strategies for effective mathematics remediation

### Updates on MyLabPlus Module Contexts, Focus Areas, Success Strategies

- Identification elements for struggling students, problem set refinements, and MyMathLabs Plus trajectories

### Helpful Hints for Instructors and Community College Partners

- Program timelines and coordination approaches
- Program navigation tips for instructors
- Detailed mapping of standards
- Modification improvements for Year 2



## Final thoughts

The NMRP has been shown to be an appropriate and effective college readiness mathematics intervention program for students who struggle based upon this Year 1 statewide analysis. The developmental processes of the NMRP Year 1 efforts, including the identification of challenges and swift reactions to challenges have played a role in the program's initial success. The shared achievements (as those evolve) will be a true testimonial to the power of statewide collaboration and will help to provide insights into statewide improvement areas where needed. Future high school and community college students within Nebraska's borders and beyond, will no doubt benefit from the NMRP work, creativity, and passion to date in this effort. We look forward to being a continued close partner in Year 2 and we appreciate the continued collaboration and innovation of this excellent statewide team.

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$$\frac{a+b+c}{b^2}$$

$$(y)^2$$

$$x-y \quad z+x$$

$$A = \frac{1}{2}bh$$

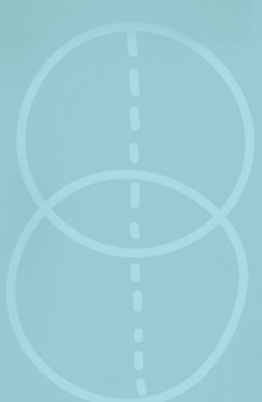
$$\left(\frac{1}{2\sqrt{3}}\right)$$

$$b^2$$

$$A = \frac{1}{2}bh \quad u^x \quad (y+b)^2$$

$$\frac{(xyz) \times}{z^2}$$

$$A = \frac{1}{2}bh$$



$$\sqrt{x}$$

$$\frac{(xyz) \times}{z^2}$$

$$\left(\frac{1}{2\sqrt{3}}\right)$$

$$(y+a+b)$$



$$(1,0) \cdot \left(\frac{1}{2\sqrt{3}}\right) \quad (a+b)$$

$$A = \begin{pmatrix} x, 1+x^2, 1 \\ y, 1+y^2, 1 \\ z, 1+z^2, 1 \end{pmatrix}$$

$$x-y$$

$$\cos p = \frac{(1,0) \cdot \left(\frac{1}{2\sqrt{3}}\right)}{\sqrt{\frac{1}{12} + \frac{1}{48}}}$$

$$b+a-y$$

$$(b \times y)$$

$$\left(\frac{1}{2\sqrt{3}}\right)$$

$$\sqrt{\frac{1}{12} + \frac{1}{48}}$$

$$x_i = \left(\frac{a+b+c}{b^2}\right)$$