

Pathway2Careers Math: Student-Centered Personalized Learning

Evaluation of the Effectiveness of the
State Educational Agency (SEA) Grant
to New Mexico

April 2023

Executive Summary

The U.S. Department of Education sought to spark innovation in meeting students' unique learning needs and improving student outcomes with the announcement of the Expanding Access to Well-Rounded Courses Demonstration Grants to State Education Agencies (SEA). New Mexico was one of six states receiving a \$5 million in grant funding to advance its project: New Mexico Career Ready and Equitable CTE.

Specific goals for the project aligned to the stated goals of the department, including:

- Academic Content Mastery
- Educator Quality and Professional Learning
- Educational Leadership
- Multi-Layered Systems of Support for Students
- Complementing the state's work on Profile of a New Mexico Graduate, Career and Technical Education Pathways, and College Pathways

Pathway2Careers Math Curriculum (Pre-Algebra, Algebra I and II, and Geometry) is the result of this grant. It is the first career-connected math curriculum in the country, initially serving to support Career and Technical Education, but simultaneously recasting instruction in these core content areas in the context of authentic career application. Based on data and evidence-based research, Pathway2Careers sought to bring careers to life beyond merely teaching math concepts, demonstrating connectivity between lessons and real-life situations and helping students to understand how the math concepts align within career pathways and destinations.

The math curriculum includes:

- More than 534 lessons introducing students to more than 650 unique occupations.
- Occupations representing high-value careers in multiple fields.
- Application lessons offering in-depth exploration of specific math concepts in the context of a spotlighted career.
- Use in a blended learning model as a core or supplemental curriculum.
- Digital curriculum integrated with numerous labor market systems.
- Alignment with common core state standards and various state-specific academic standards.

Survey results indicated all audiences surveyed (students, teachers, parents) had made positive, and in some cases significant, impacts on student learning, engagement, exploration, and outcomes.

Highlights included:

- High marks for the program design and functionality
- The majority of students saw and connected the careers from the math lessons to their future.
- Teachers noted increased student engagement and career exploration, with potential additional positive benefits on student performance.
- Parents were pleased with the curriculum and platform and the change in math attitudes that they saw in their students.

Taking the survey data as a whole, Pathway2Careers has had a positive impact on the students, teachers, and parents who are part of this innovative effort in New Mexico. Recommendations would include more professional development to help teachers fully access the full suite of functions embedded in the curriculum and platform, as well as expanding its use across the state and creating a comprehensive approach to teacher supports moving forward.

Introduction

The U.S. Department of Education sought to spark innovation in meeting students' unique learning needs and improving student outcomes with the announcement of the Expanding Access to Well-Rounded Courses Demonstration Grants to State Education Agencies (SEA) in 2016. The grant sought to increase course offerings and access to students across a range of advanced, career or technical education, or other courses. Proposed programs should also meet the needs of rural students, disadvantaged students, or students with disabilities, and contribute to preparing students to be college and career ready.

New Mexico was one of six states receiving \$5 million in grant funding to advance its project: New Mexico Career Ready and Equitable CTE through the College and Career Readiness Bureau (CCRB) of the Public Education Department.

Specific goals for the project aligned to the stated goals of the department, including:

- Academic Content Mastery
- Educator Quality and Professional Learning
- Educational Leadership
- Multi-Layered Systems of Support for Students
- Complementing the state's work on Profile of a New Mexico Graduate, Career and Technical Education Pathways, and College Pathways

Ultimately, the project proposed by New Mexico would support the vision of the CCRB that all New Mexico high school graduates would have:

- The academic skills needed to succeed in post-secondary studies
- The employability skills that are essential in any career area
- Awareness of the next steps in their career paths.

The proposed project received a perfect score (100) from U.S. Department of Education evaluators, was the only career-based model approved, earning the state \$5 million to implement and demonstrate its innovative project.

Pathway2Careers Math Curriculum (Pre-Algebra, Algebra I and II, and Geometry) is the first career-connected math curriculum in the country, initially serving to support Career and Technical Education, but simultaneously recasting instruction in these core content areas in the context of authentic career application. Based on data and evidence-based research, Pathway2Careers sought to bring careers to life beyond merely teaching math concepts,

demonstrating connectivity between lessons and real-life situations and helping students to understand how the math concepts align within career pathways and destinations.

Some of the specific expected outcomes included:

- Increased awareness of career pathways and skill requirements
- Improved employability skills
- Improved alignment with courses and regional workforce demand
- Improved mathematics skills
- Quantile assessments to math coursework to measure skills growth
- Online course accessibility increases CTE participation for students across the state, including rural and other under-served and under-represented students in college and high-demand careers
- Increased college and career readiness as more students enroll in CTE pathways

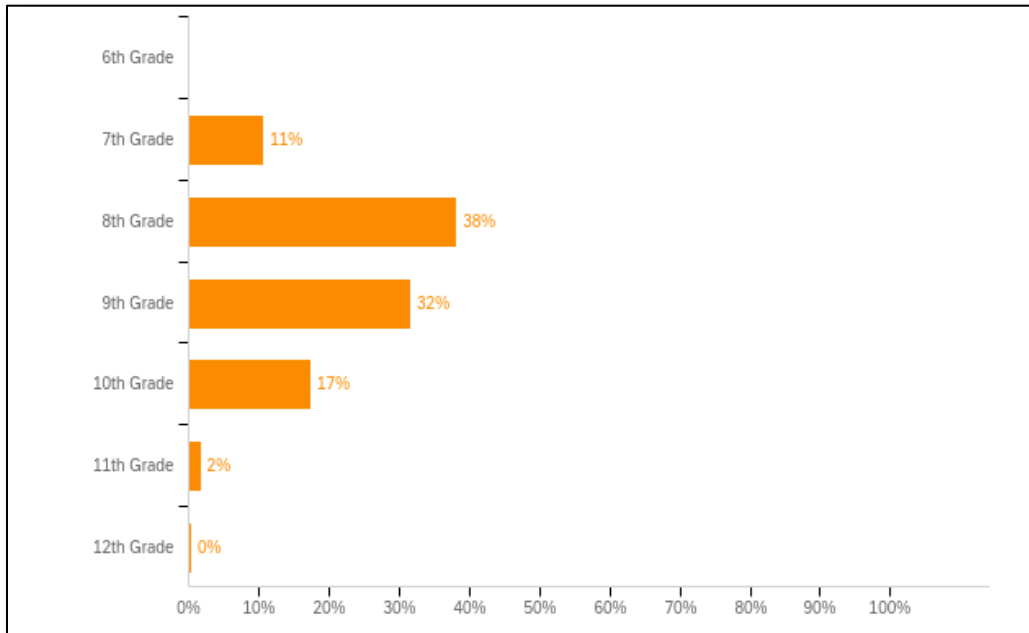
The math curriculum includes:

- More than 350 lessons introducing students to more than 650 unique occupations.
- Occupations representing high-value careers in multiple fields.
- Application lessons offering in-depth exploration of specific math concepts in the context of a spotlighted career.
- Use in a blended learning model and as a core or supplemental curriculum.
- Digital curriculum integrated with numerous labor market systems.
- Alignment with common core state standards and various state-specific academic standards.

Pathway2Careers is now in its second year of implementation. The purpose of this evaluation is to better understand the adoption, use, and outcomes of the curriculum among New Mexico's students, teachers, and parents. Following is a summary of the findings of a survey of those audiences collected between February and March 2023.

About the Survey and It's Respondents

Students: 537 students in grades 7-11 in public and charter schools from across the state participated in the survey.



Teachers: 42 teachers who are using the curriculum took the survey, comprised of two groups. One group is in an ongoing evaluative relationship with the College and Career Readiness Bureau (Group A), and one is not (Group B).

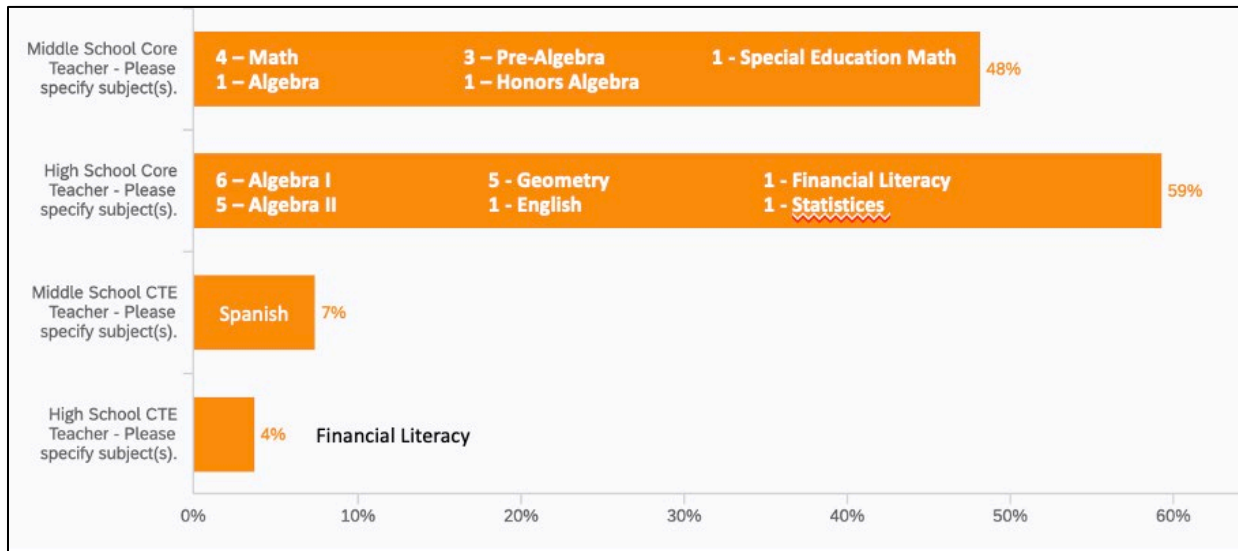


Figure 1 - Teacher Group A

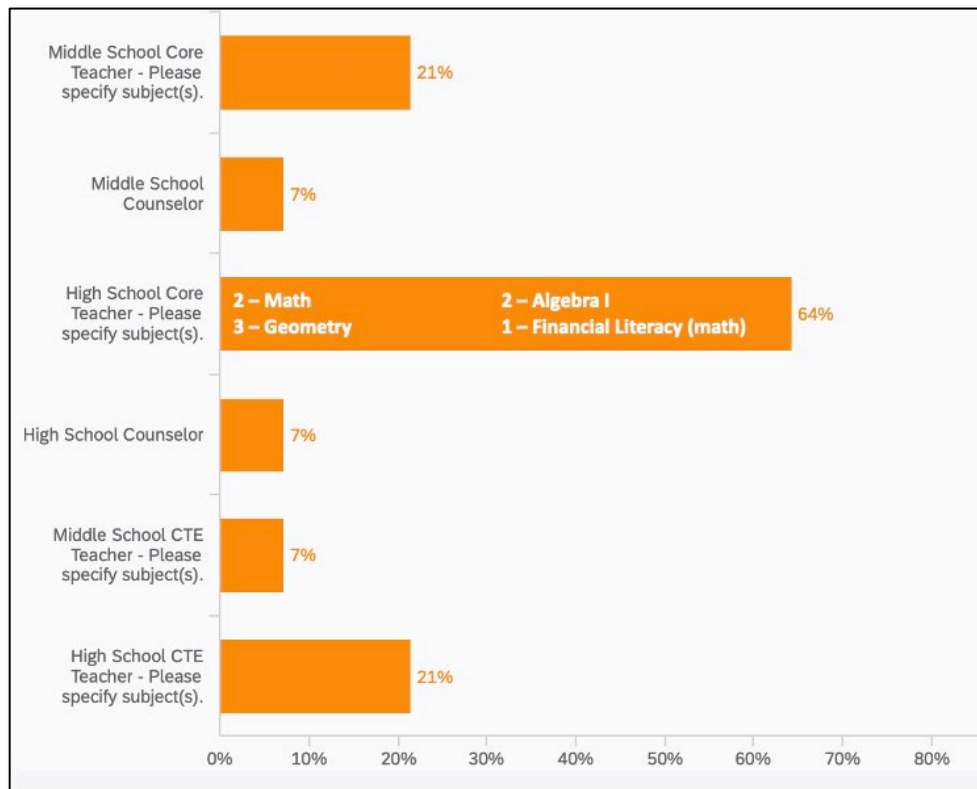
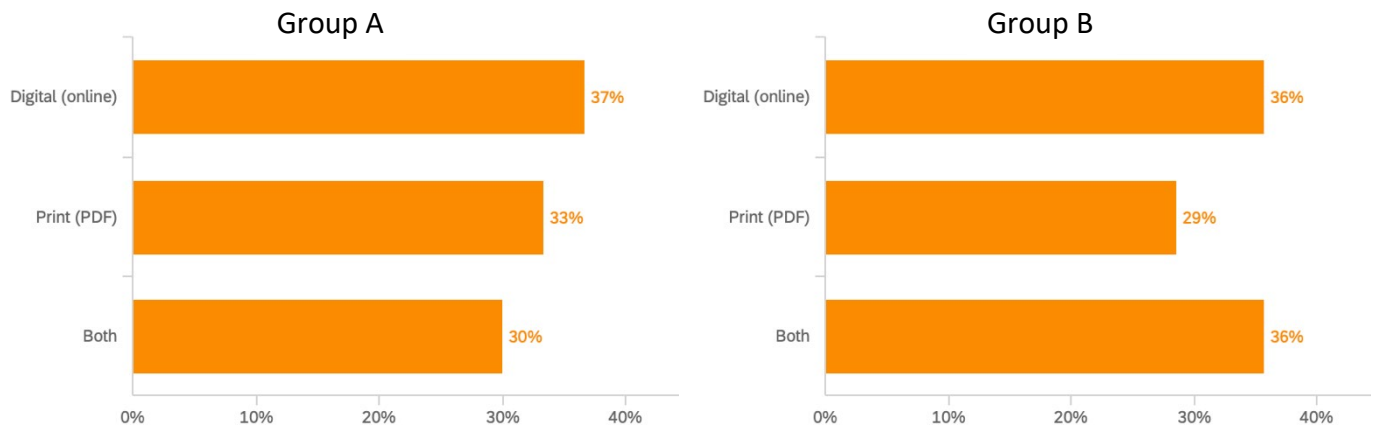


Figure 2 - Teacher Group B

Teachers reported using P2C as both supplemental (25 teachers) and core (7 teachers) curricula.

Pathway2Careers as an Instructional Tool

P2C is intended to support teachers in their instruction, not replace them. As such, the curriculum is presented in an on-line platform that allows flexibility for the teacher to use it fully online or as printed materials in PDF form. Reported usage is below.



Educators and students in the pilot group also had access to first guided, scaffolded career exploration curriculum for grades 6-12 funded by a separate U.S. Department of Education Fund for the Improvement of Post-Secondary Education (FIPSE) grant awarded to New Mexico. Some teachers included these lessons in their instruction.

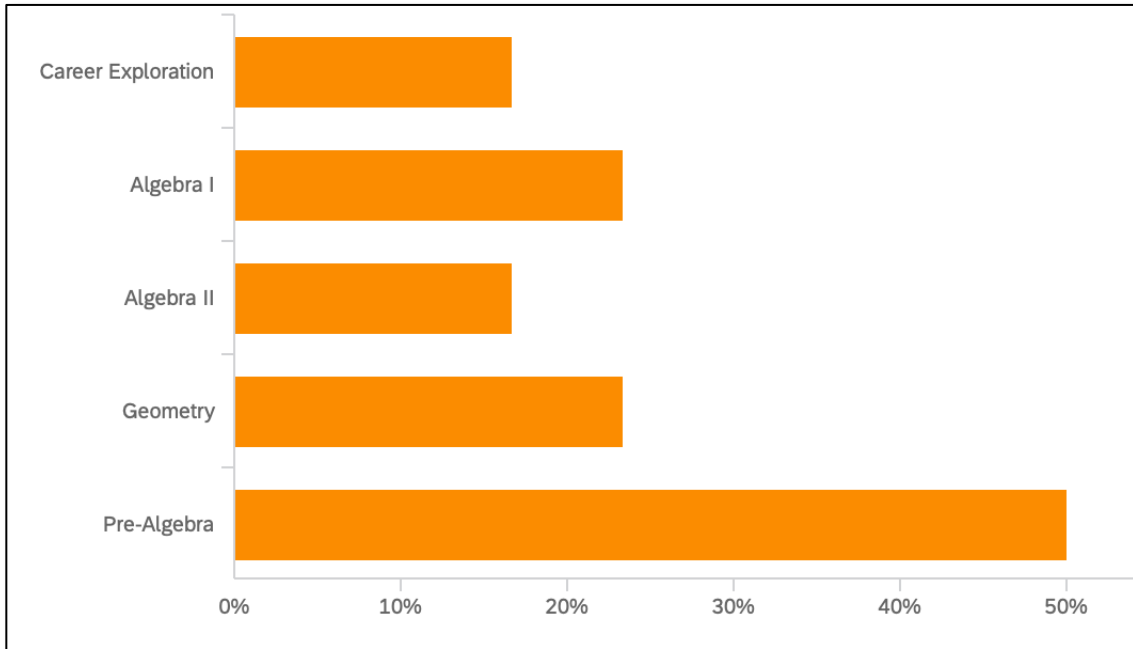


Figure 3 - Group A

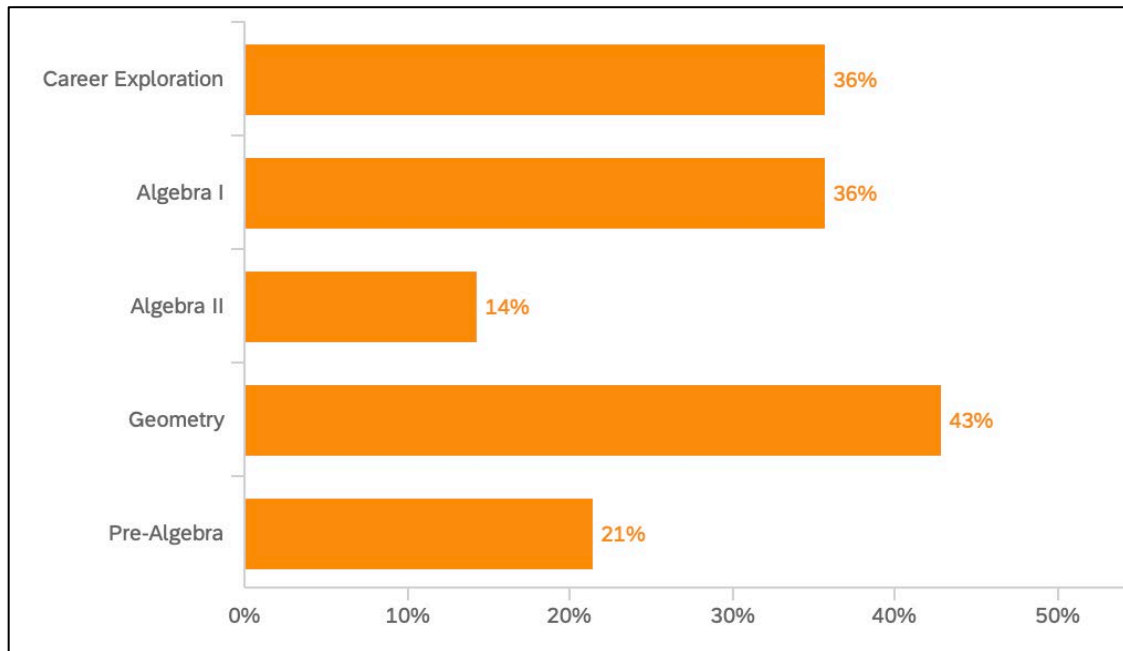


Figure 4 - Teachers Group B

With heavy usage as a supplemental curriculum, the majority of teachers in Group A reported daily and weekly use, but Group B was more evenly split among all timeframe options.

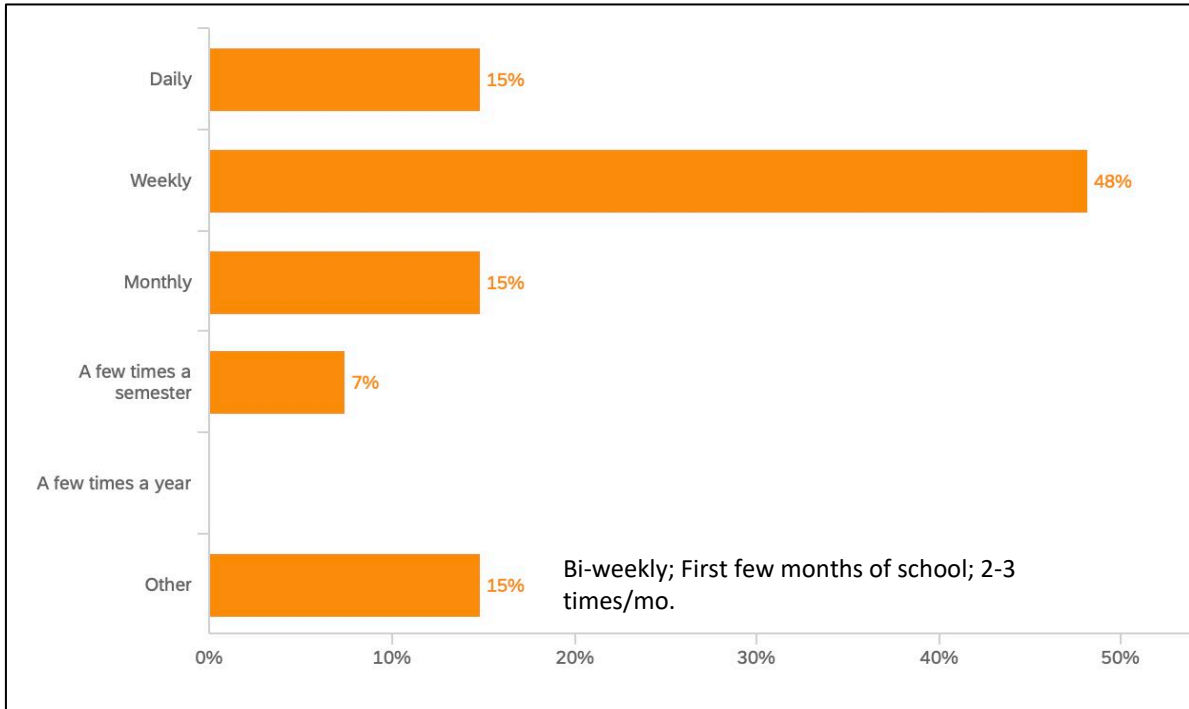


Figure 5 – Teachers Group A

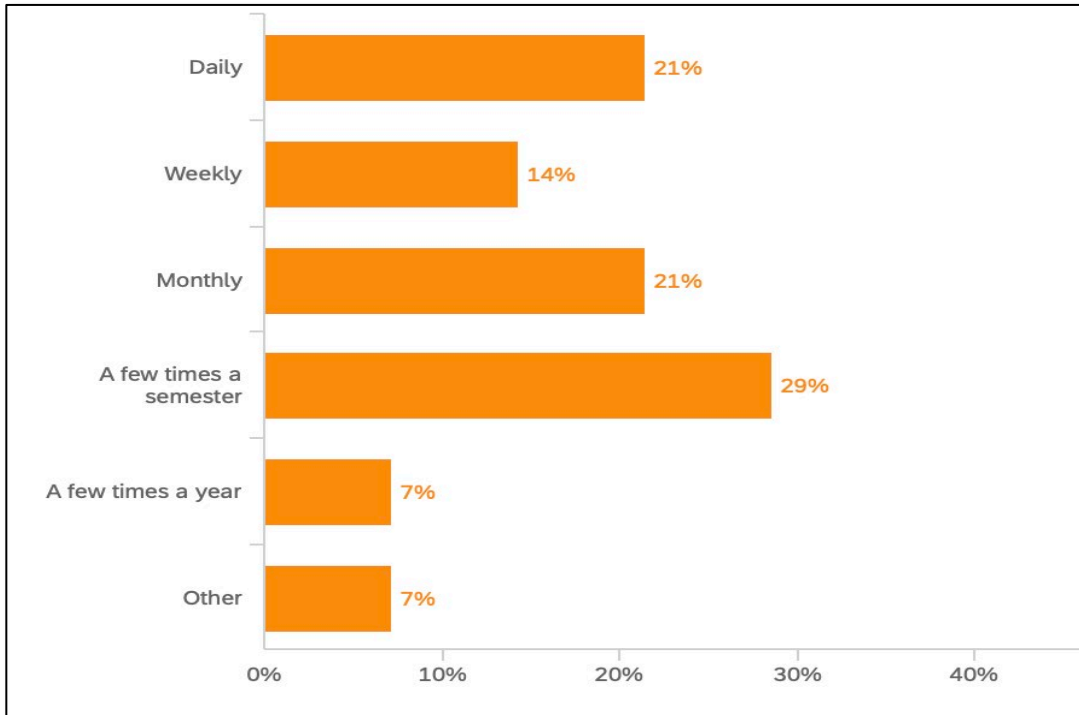


Figure 6 – Teachers Group B

In seeking to enter into a process of continuous improvement of the platform, students and teachers were asked about ease of use and all gave high marks to Pathway2Careers.

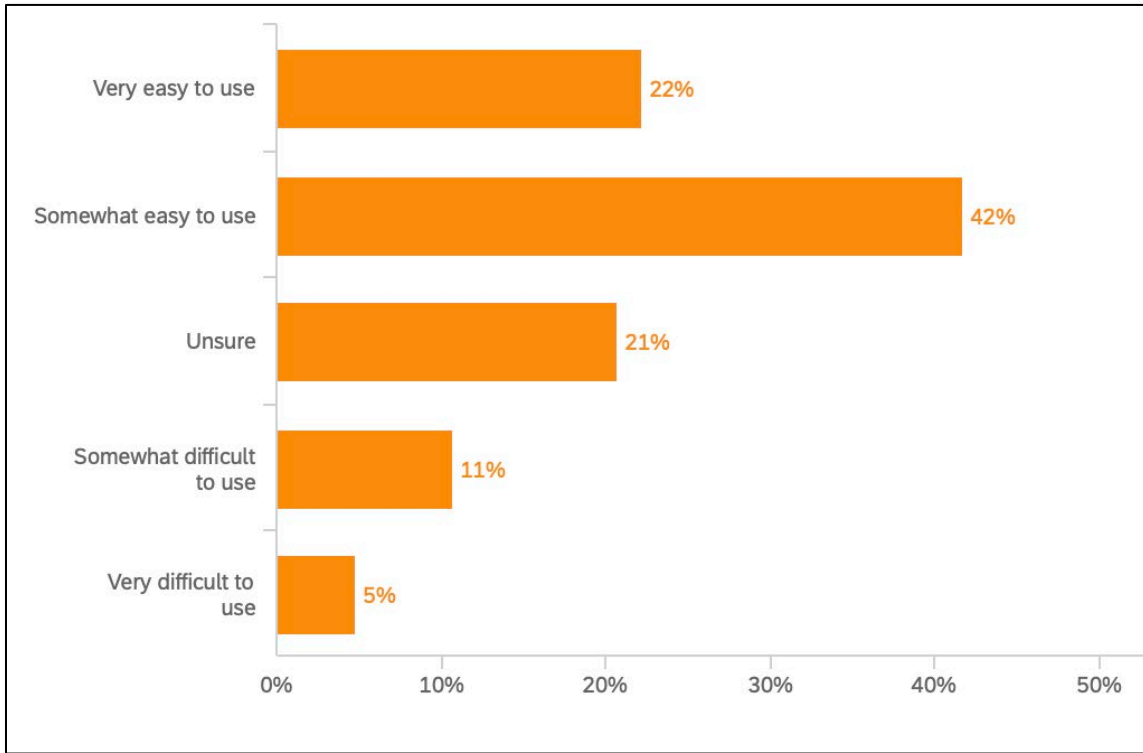


Figure 7 - Students

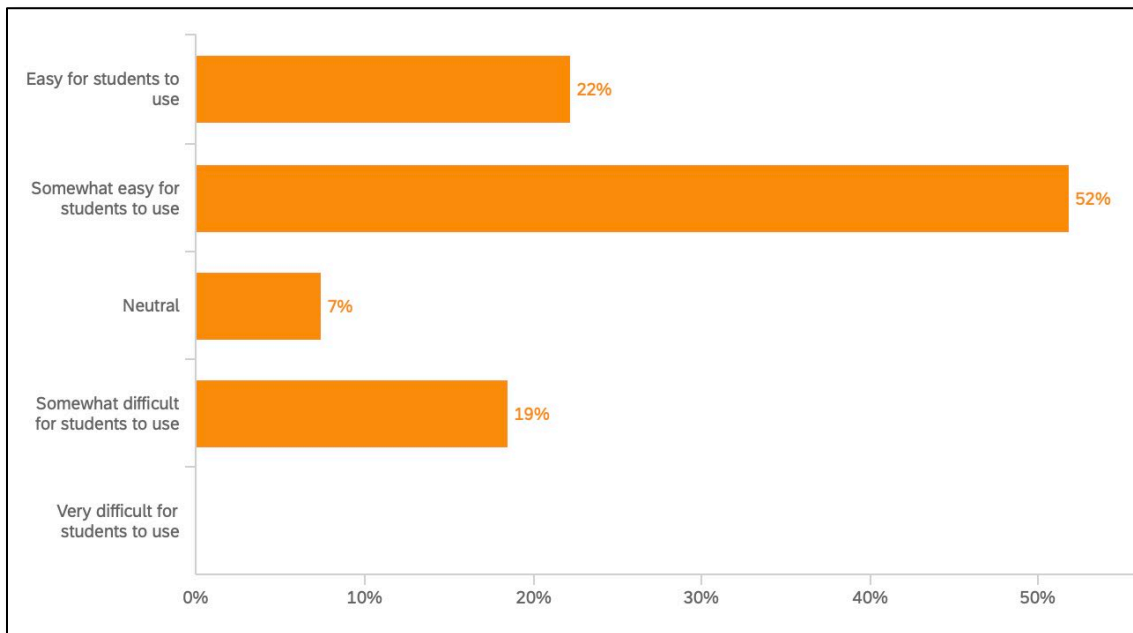


Figure 8 - Teacher Group A

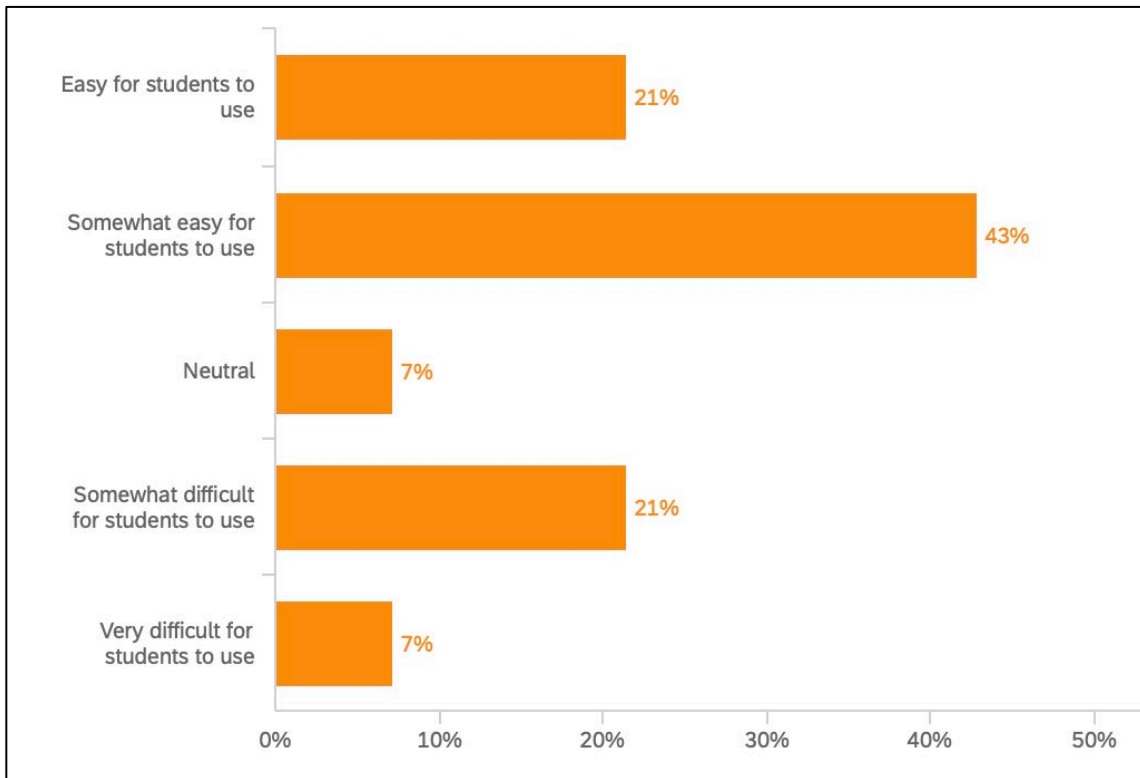


Figure 9 - Teacher Group B

Some specific comments from the teachers indicated positive benefits:

- *I had doubts at first but knowing that this will be my students' real-world connection, I am utilizing the tool.*
- *The platform is easy to navigate and create assignments for classes. Adding students is also very easy as well as grading assignments and viewing scores. The students' ability to skip the lesson and go straight to the questions is a challenge but I don't know if there is anyway to redirect the students to the lesson.*
- *It helps me a lot in discussing the lesson. The material is a big help as supplement to the lessons I discuss.*
- *It is very useful to be able to give students the notes that are correct instead of relying on them to copy the notes correctly and on a timely basis.*
- *Using the digital lesson helps incorporate technology into the math classroom.*
- *I enjoy the curriculum and will keep using it.*
- *Students readily try the problems - especially the multiple-choice problems that accompany the lessons I chose. Often bookwork is "boring" or "I'll do it later" but the length, appropriateness, and engaging enough students seemed to want to do them.*

- *The topics are presented very well. It has examples and illustrations that students can learn even without the help of a teacher. Students can relate the lessons in real life.*

However, they also expressed areas that were challenging for themselves or the students:

- *The platform is easy to navigate and create assignments for classes. Adding students is also very easy as well as grading assignments and viewing scores. The students' ability to skip the lesson and go straight to the questions is a challenge, but I don't know if there is any way to redirect the students to the lesson.*
- *Grading the individual questions, time consuming*
- *I like how the lessons are chopped based on experience, but my students were challenge when it comes to construction/drawing.*
- *The navigation of the digital platform was clunky for my students. I did not experience the same result, but I have more experience with digital platforms than they. The scoring for assignments was difficult to use, because it was hard to follow.*
- *It is hard for me to get around the platform, probably for the students as well.*

The same mixed perceptions were reflected in the students' answers. As a group, positive comments outweighed comments that were negative, reflected challenges, or commented on functionality (172 positive vs. 114 negative). Many answers were unclear on whether they were positive or negative and were not included in the count.

Positive perceptions included:

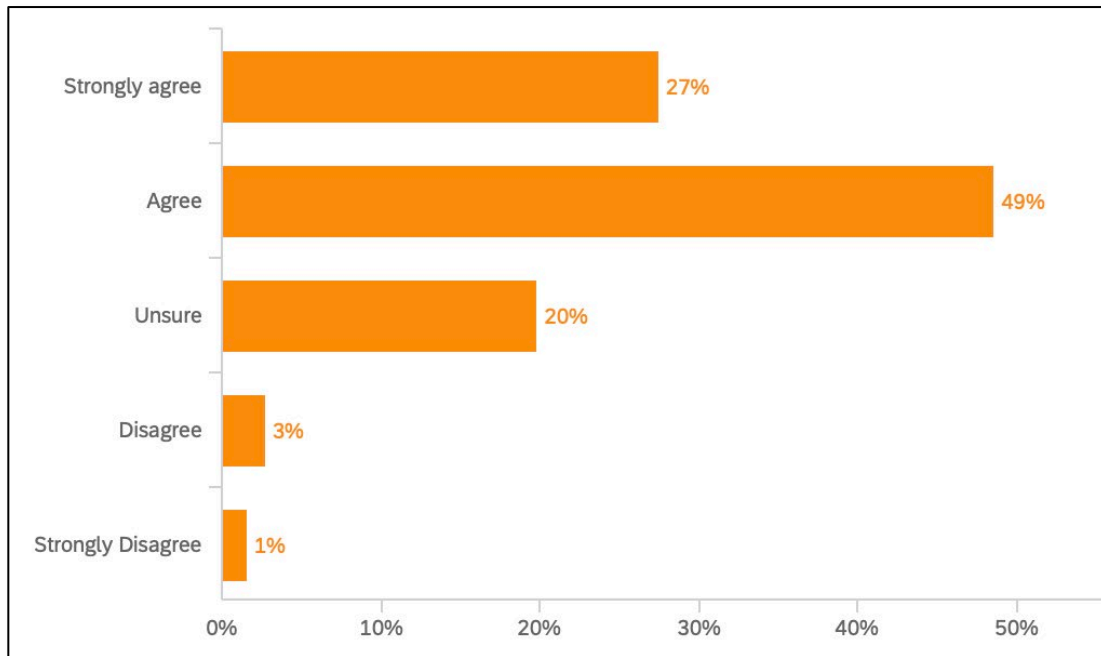
- *I liked the way we have practice after learning about the lesson and on the job lesson.*
- *It made work easier and helped give more step-to-step instructions.*
- *I liked how it was easy to get around.*
- *I liked that it had many different jobs, jobs that I haven't heard of.*
- *How it can help us get going with life.*

Others commented on the challenges:

- *Some of the equations where very complicated.*
- *It's hard to understand the assignment that we work on and how they tie in with lessons we learn outside of Pathway2Careers.*
- *I found how it worked challenging at first but then I got used to it after a while.*

However, the students did indicate they saw this instructional tool as part of the teacher's instruction, not as a replacement for it, which was a specific goal of Pathway2Careers design.

I received support from my teacher(s) to help me learn more math skills in the context of careers.



All respondents were given the opportunity to recommend changes that would improve the use, functionality, or effectiveness of Pathway2Careers. Some specific student recommendations included:

- *Show what assignment was posted most recently, or separate overdue assignments from assignments not yet due.*
- *Allow a check button to know if I'm wrong in the checkpoint.*
- *Something that I would like to see improved with Pathway2Careers is I often finding it not saving my progress and I think it should save after every input that you do.*
- *I would like if you could add more questions about careers that require creativity to open more career paths.*
- *Grades like (you) can track your improvement.*

Teachers' recommendations included:

- *Immediate feedback for students. Smoother online grading system.*
- *Make it where the graphs can graph decimals.*
- *Perhaps a lesson completion check so that students can't skip the lesson and go straight to the questions.*

- *Break down initial assessments into categories with number correct instead of mysterious single number scores. Streamline gradebook.*

How Did Pathway2Careers Impact Students' Motivation for Learning Math?

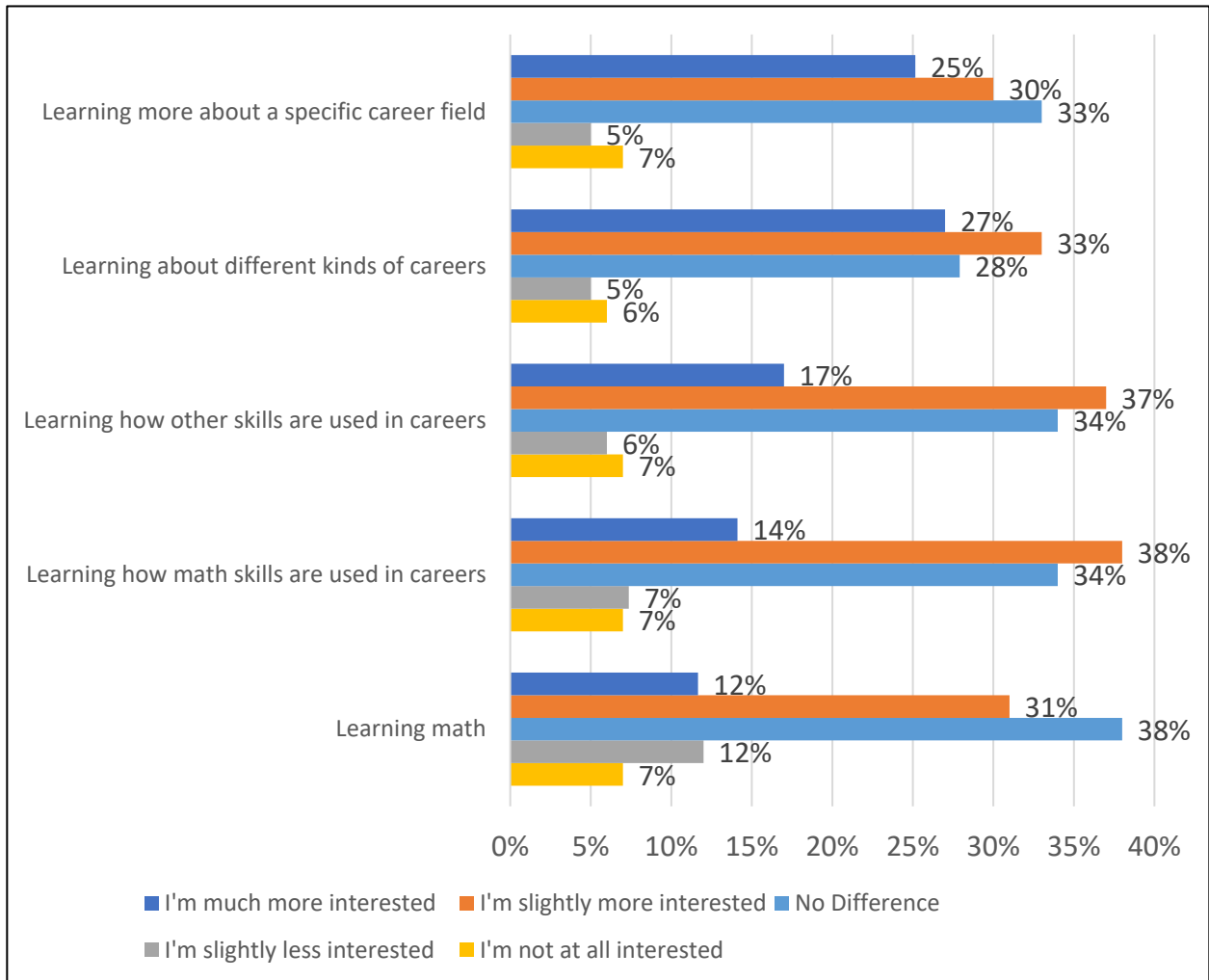
The foundational premise in the development of Pathway2Careers was decades of research that demonstrates when students see value in learning what's being taught, they are far more likely to be engaged. They need to understand the *why* behind the *what*. In addressing the decades-long stagnation of low math proficiencies of students, the curriculum sought to address the underlying problem of changing the behavior the students have towards math and engage students differently about mathematics.

At the same time, Pathway2Careers brings purpose to learning by showing clearly how math is used in future careers. By bridging the gap between textbook theory and real-life applications, the curriculum seeks to improve student success, economic growth, and equitable solutions for all students. It also connects learning with high-value and high-growth careers in their regions and states. The potential for this new approach to math instruction is that when students connect math lessons to high-value careers, it could change the future for students, both academically and economically, and help break cycles of poverty.

Students were asked how did Pathway2Careers affected the way they felt about:

- Learning more about a specific career field
- Learning about different kinds of careers
- Learning how other skills are used in careers
- Learning how math skills are used in careers
- Learning math

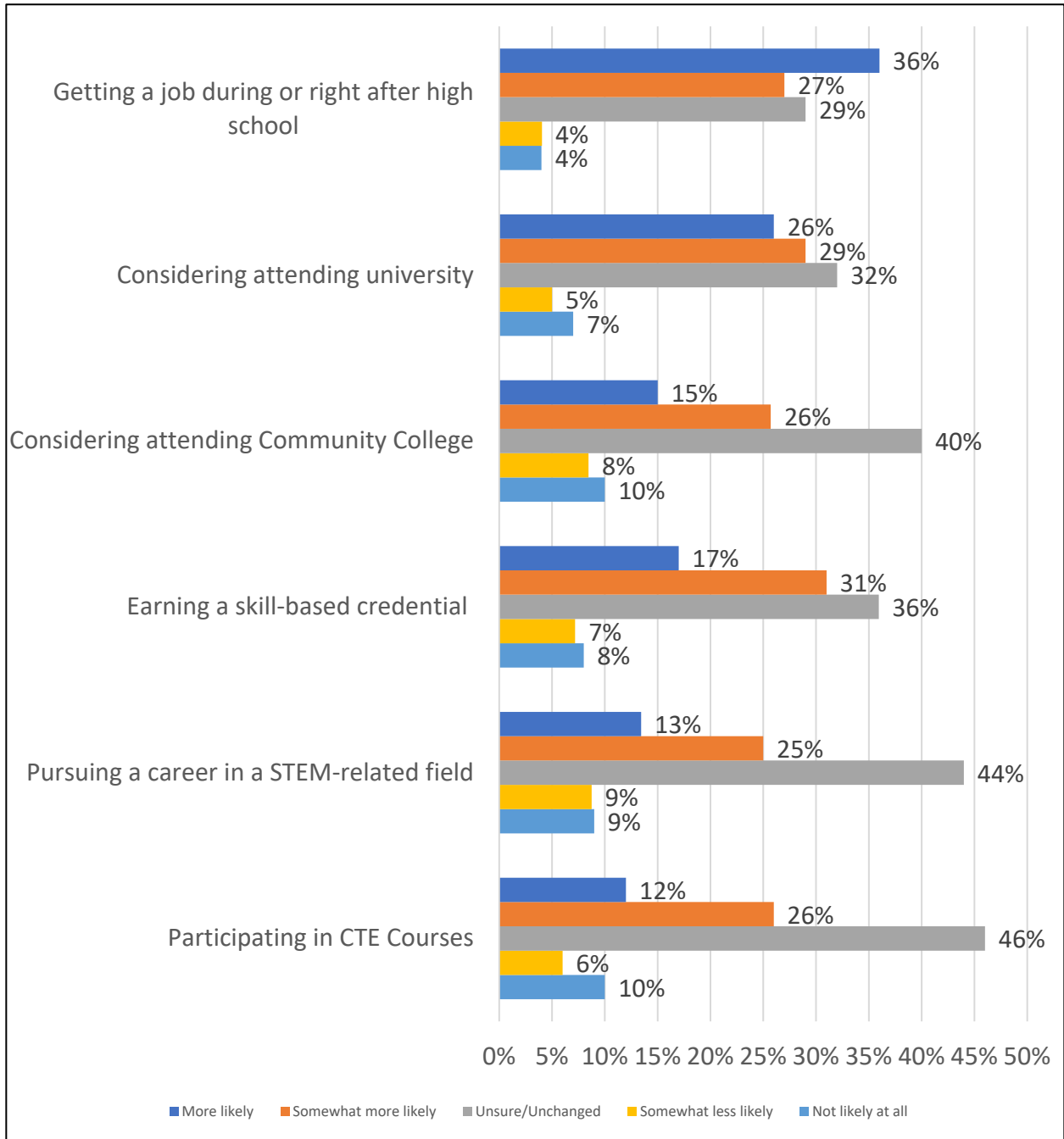
Using a Likert scale, they were also able to assess level of interest. Following is a chart showing their responses:



What’s clear from the data is that the majority of student responses expressed increased interest in learning across every field with “much more” or “slightly more” interest, including in math. There is a persistence in approximately 1 in 3 students who indicated no difference, and only 1 in five or less expressing less interest. Learning about careers and the use of skills in careers is clearly of interest to the majority of students (55%, 60%, 54%, and 52% respectively). The question about “learning math” did show the smallest positive affect at 43%, but still outpaced “no difference” and either “less interest” metric.

Students were also able to share what impact Pathway2Careers had on their decisions for the future on:

- Getting a job during or right after high school
- Considering attending university
- Considering attending community college
- Earning a skill-based credential
- Pursuing a career in a STEM-related field
- Participating in CTE courses



The survey results show the most positive impacts on four of the six questions:

- 63% more or somewhat more likely to get a job during or right after high school
- 54% more or somewhat more likely to attend university
- 41% more or somewhat more likely to attend community college
- 48% more or somewhat more likely to earn a skill-based credential

The “Unsure/Unchanged” answers were the highest ranked for future decisions to pursue a career in a STEM-related field (46%) and participating in a CTE courses (46%). With 49% of students in the survey being in 7th and 8th grades, the second answer may reflect the lack of exposure to, and understanding of, high school CTE career pathways for middle school students. The former, 46% unsure of STEM-related fields, is consistent with a prior study of Pathway2Careers Career Exploration curriculum.

However, when students were asked about what kinds of careers were most interesting to them, nearly 50% listed careers in which STEM skills were central:

- Medical (87)
- Engineering (54)
- STEM-Specific (36)
- IT-Related (25)
- Construction (18)
- Veterinary (17)
- Aerospace (6)
- Finance (5)
- Military (4)
- Meteorologist
- Manufacturing
- 3D Manufacturer

With these careers being essential to the New Mexico economy, the survey also showed the curriculum successfully building visibility and awareness for high value careers (high-wage, high-demand, and growing) in the state.

The teachers in the survey groups were even more positive about their observations of the impact of Pathway2Careers on student learning.

How effective was the curriculum in positively affecting:

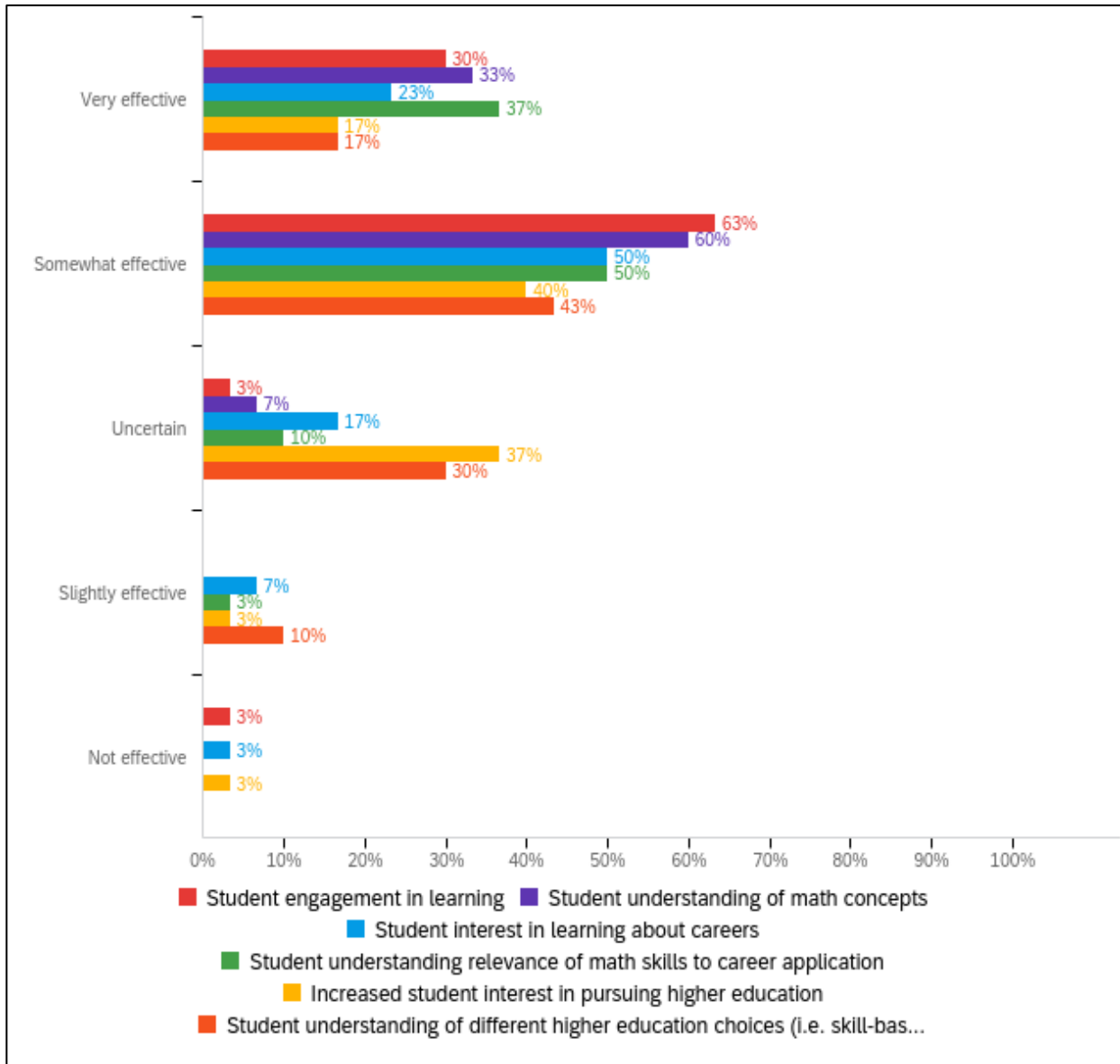


Figure 10 - Teacher Group A

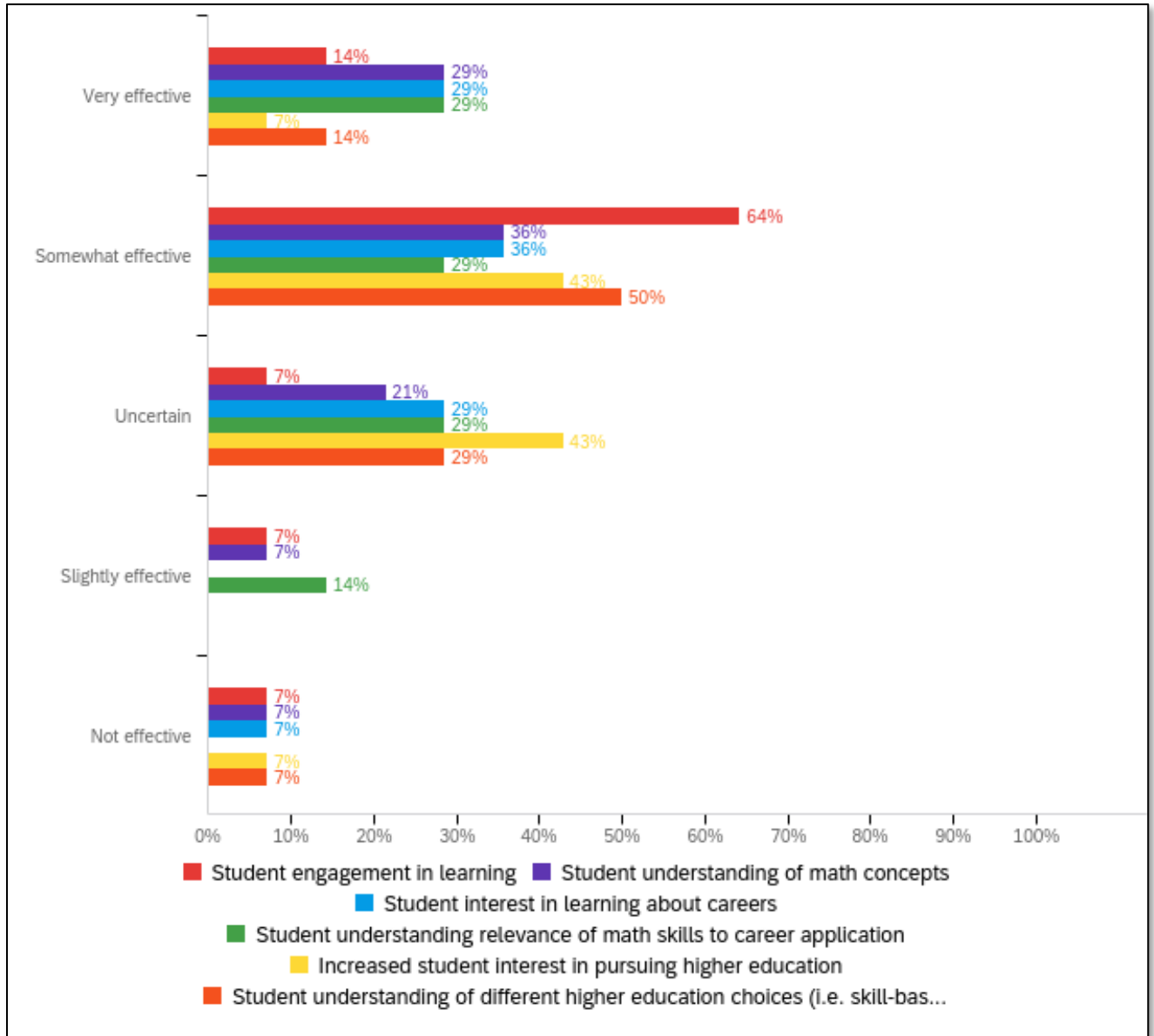


Figure 11 - Teacher Group B

In both groups, the overwhelming majority of teachers rated the curriculum as “very effective” or “somewhat effective:”

- Student engagement in learning (93% and 78%)
- Student understanding of math concepts (93% and 65%)
- Student interest in learning about careers (73% and 65%)

- Student understanding the relevance of math skills to career application (87% and 58%)
- Increased student interest in pursuing higher education (57% and 50%)
- Student understanding of different higher education choices (i.e. skill-based certificates, associate degrees, bachelor degrees, etc.) (60% and 64%)

It was significant to note the small percentages of either unsure or not effective responses, indicating that as an instructional tool, the curriculum is performing well.

Perspectives on the Platform/Curriculum

Teachers were asked to evaluate Pathway2Careers as an innovative approach for teaching math. Using a Likert scale, they were asked how much they agreed or disagreed with a series of statements.

Pathway2Careers made math concepts easier to teach by making the concepts relevant to students' lives and futures.

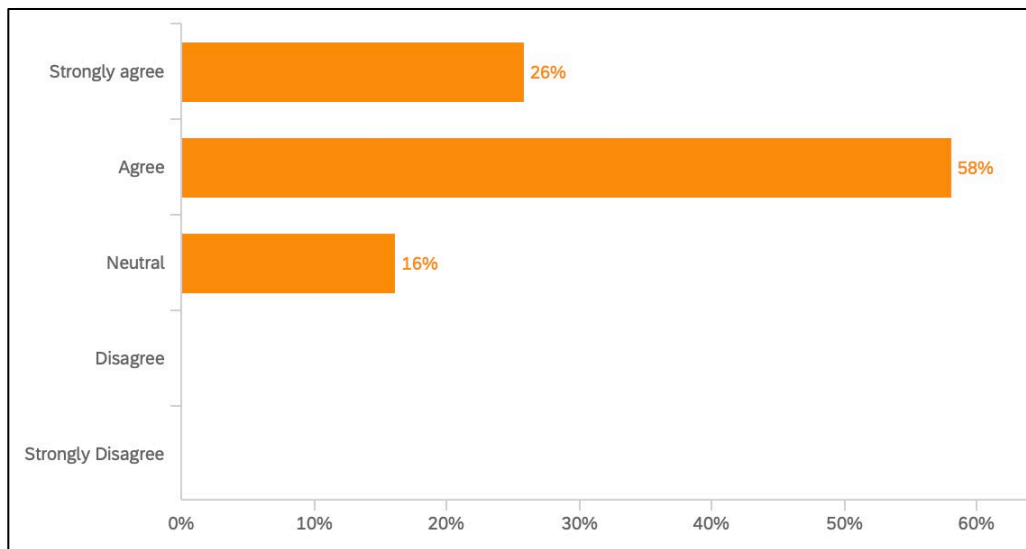


Figure 12 - Teacher Group A

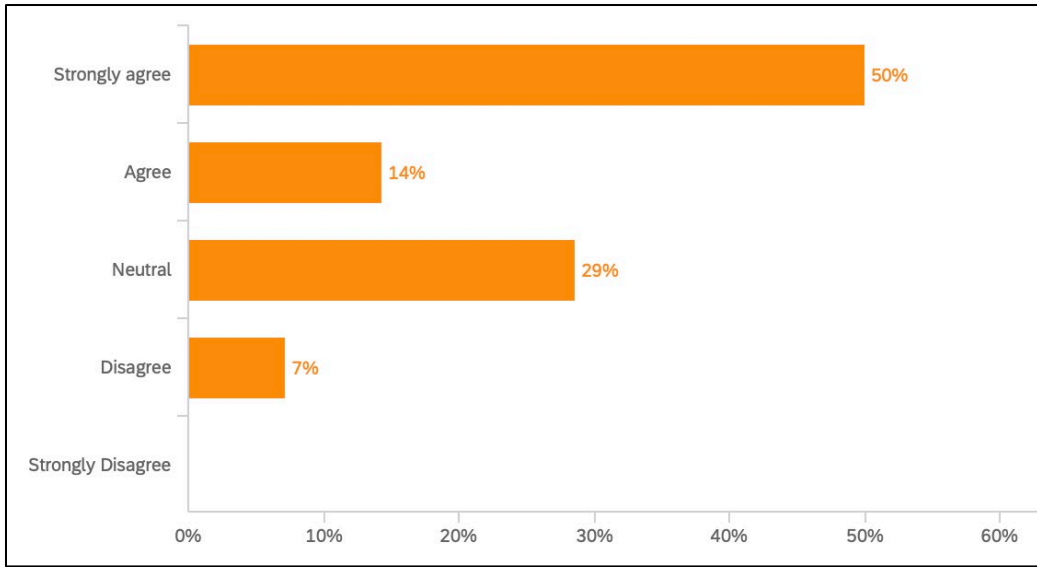


Figure 13 - Teacher Group B

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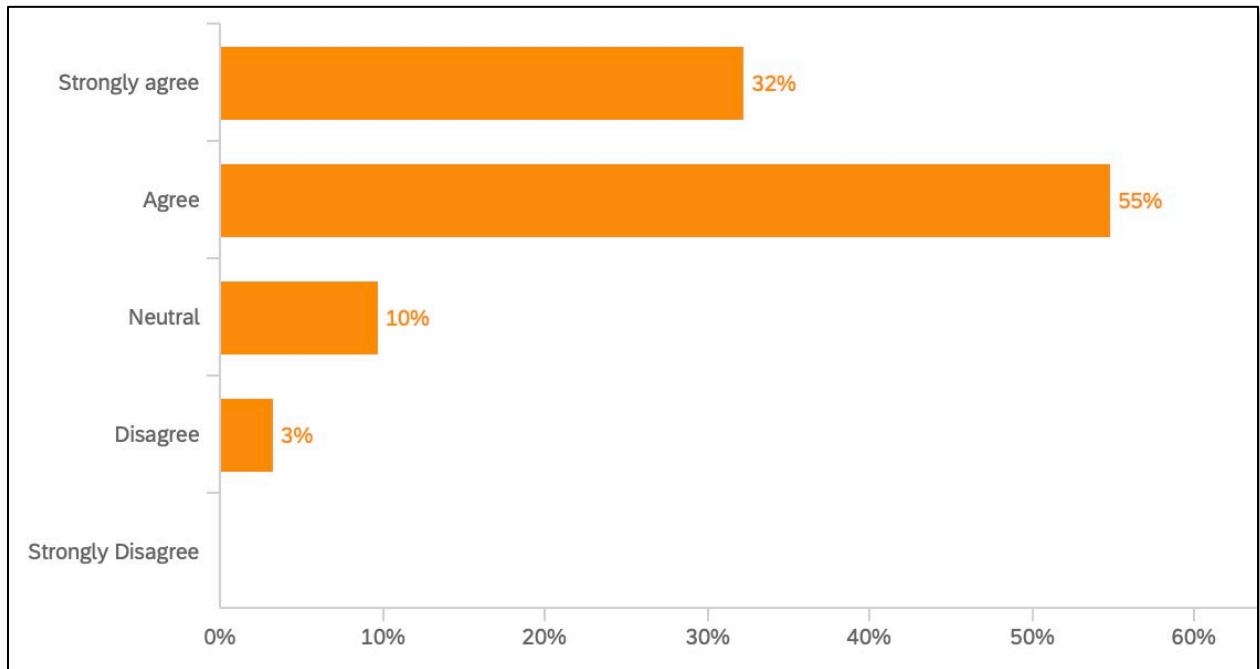


Figure 14 - Teacher Group A

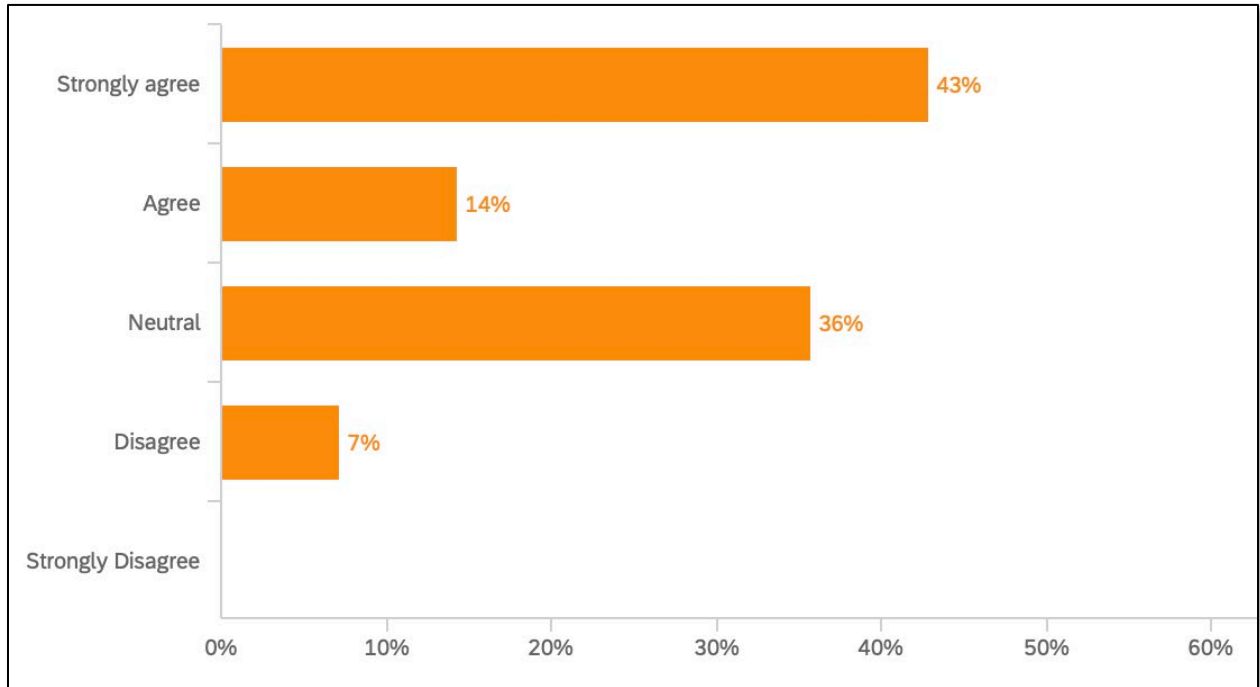


Figure 15 - Teacher Group B

Pathway2Careers math problem sets helped students practice math concepts.

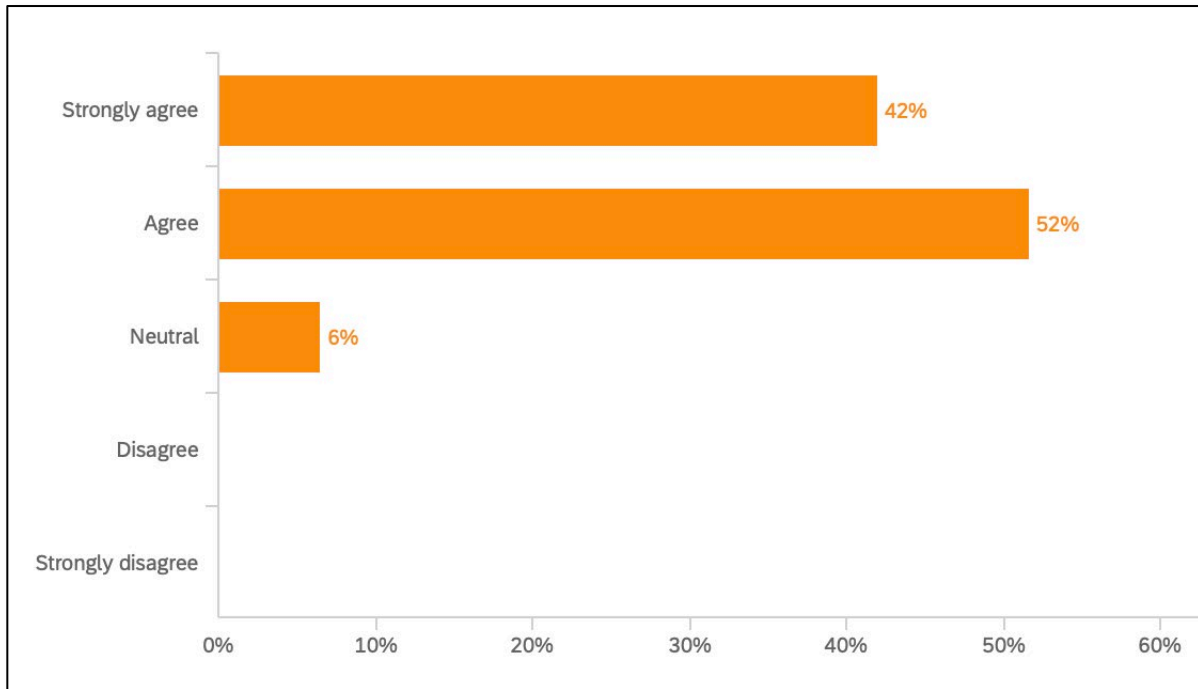


Figure 16 - Group A

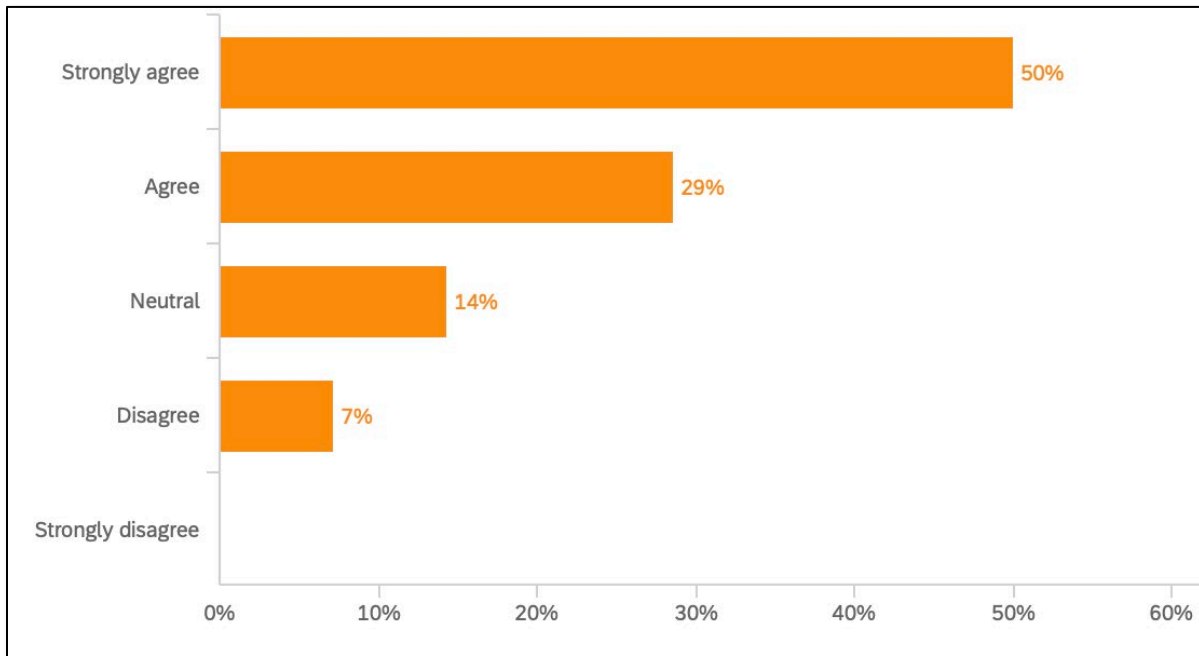


Figure 17 - Group B

Some specific comments from the teachers indicated positive perceptions and experiences for students:

- *The topics are presented very well. It has examples and illustrations that students can learn even without the help of a teacher. Students can relate the lessons in real life.*
- *The students really benefited on the flow the lesson was presented. It was simple, clear and can easily be understand. Another is its application to real life/careers which makes the lesson more interesting and catchy to students.*
- *The lessons break down the problems well and help with organizing student thinking and applying critical thinking skills.*
- *Students enjoyed seeing the various jobs on their screens. I believe they were more aware of all the different fields that they didn't even consider before P2C.*
- *I like that the platform is flexible and offers both paper and digital options. Students preferences vary between the two and having both options is a great feature. The digital tools were helpful but some students that have limited computer skills needed a little coaching.*
- *It's fun and engaging to see student's interaction on career exploration and career check for understanding.*

- *Students readily try the problems - especially the multiple choice problems that accompany the lessons I chose. Often bookwork is "boring" or "I'll do it later" but the length, appropriateness, and engaging enough students seemed to want to do them.*

However, other students faced challenges based on their levels of proficiency going into the curriculum:

- *Students were able to do some problems by themselves but some of them, they struggled.*
- *Since I use P2C for intervention and students are coming in and out throughout the semester, it is hard to gauge their comprehension. Some students have high levels of proficiency and others are still low because they do not put full effort.*
- *I'd like to see more lessons available at lower levels to make it more accessible to my students. Honestly, Special Education students have a real need to focus on a career pathway as some of them are already talking about by-passing college and getting to work right away out of high school. If we can make this program more accessible/easier/user-friendly for them, then it could spark some real hope and encouragement as they begin to narrow down their search for a career and the direction they need to go to get there.*

Other teachers did share comments about the functionality of the online platform, shedding some light on some of the answers in the previous graphs:

- *Make the system easier to use. Provide easier grading for the teacher and provide unit tests and quizzes. This is not a platform that I would recommend for supplemental material because the lessons are extremely long.*
- *The lessons should be formatted in a way that is more user friendly. Some of the videos were not accessible to students due to blocked content by the district.*
- *Students had difficulty with the digital platform. It was clunky for them to navigate and follow.*
- *Well (it) is not intuitive, so if not following directions get easily lost and can't figure it out on their own.*

When asked what teachers liked about the curriculum and platform, responses included:

- *I love the career focus. Many of my students have a good idea of what they would like to be, so it is nice to be able to search those pathways, watch videos, apply the math, and get them excited about the future!*
- *The integration of the careers. Math concepts made sense to students if they know how these concepts will be applied in real life.*
- *We can access the lesson digitally, or download a pdf copy, whichever works best for us.*

- *The application in real-life situations through the career pathways.*
- *It helps me bridge between bookwork and the real-life applications that our adopted curriculum lacks.*
- *The rigor is very good, and the examples are very well explained.*
- *The pathway to career. The very essence of the program*
- *All of it.*

When asked about proficiency gains, there was a bit more uncertainty expressed than in the other questions.

Student end-of-class test scores and state-measured proficiencies in math have improved with the use of Pathway2Careers.

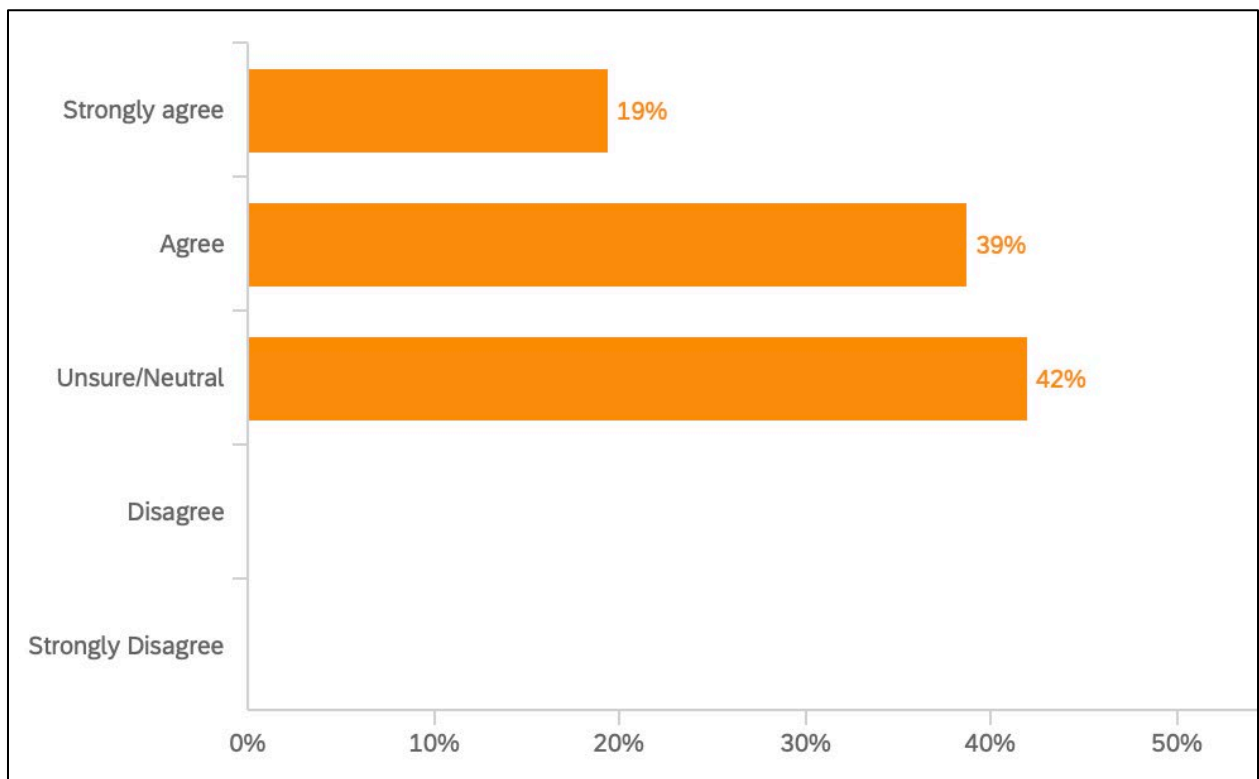


Figure 18 - Teacher Group A

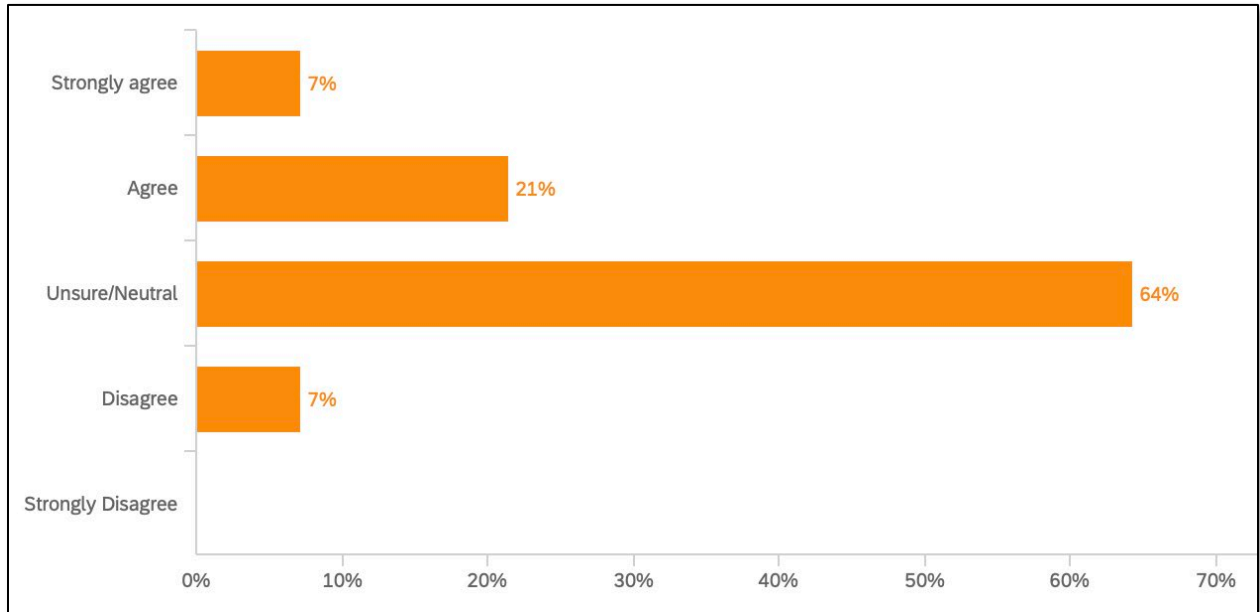
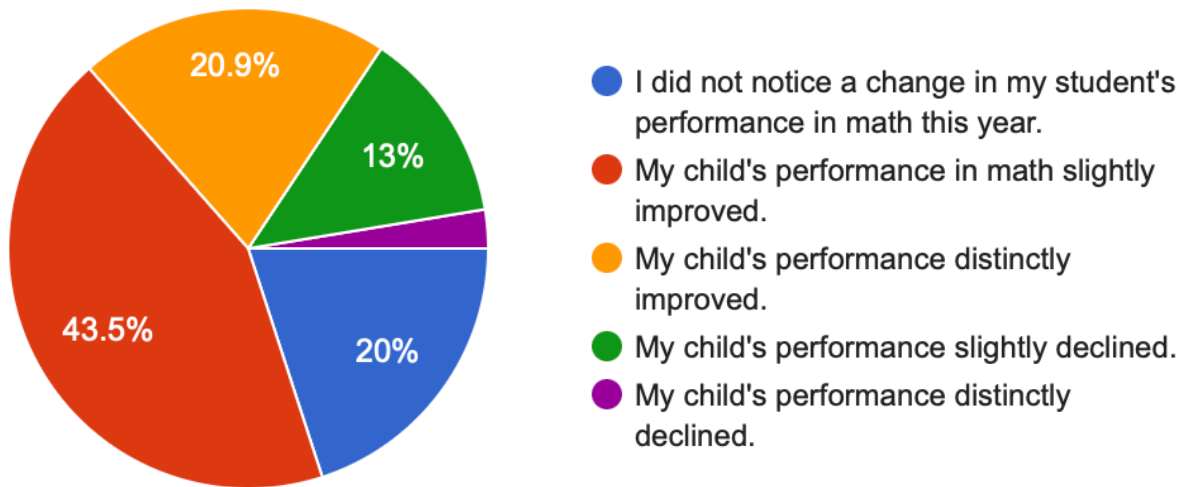
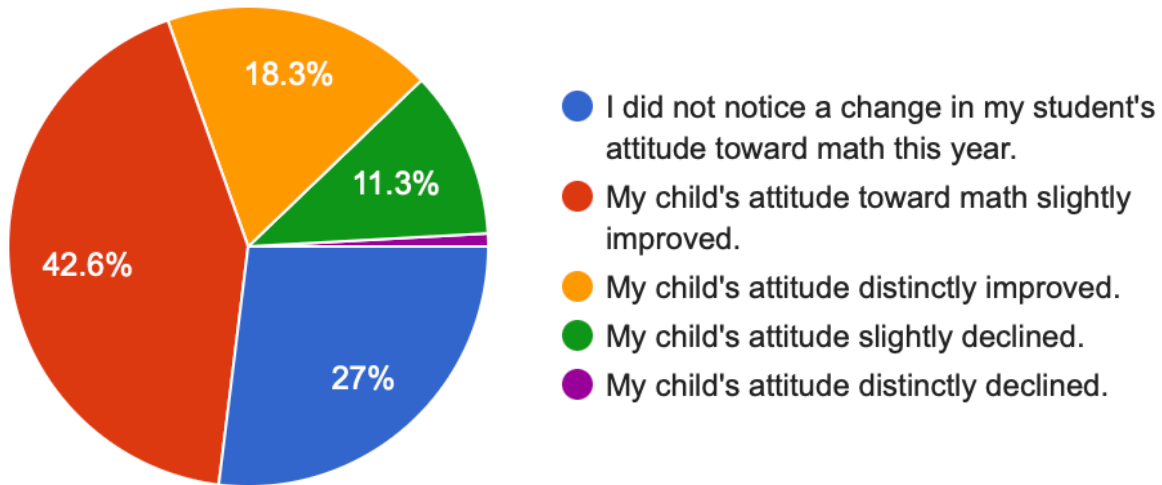


Figure 19 - Teacher Group B

Parents were asked about changes in their students' math performance after participating in Pathway2Careers, and 64% saw improvements.



Equally important, parents noticed a change in their students' *attitudes* toward math.



Teachers were also asked about the effect of Pathway2Careers on learning loss, and 1/3 to 1/2 of teachers were unsure. The majority of Group A teachers reported a positive effect, compared with 36% of Group B teachers.

Pathway2Careers helped reduce learning loss in math, as evidenced through higher test scores and proficiency measures.

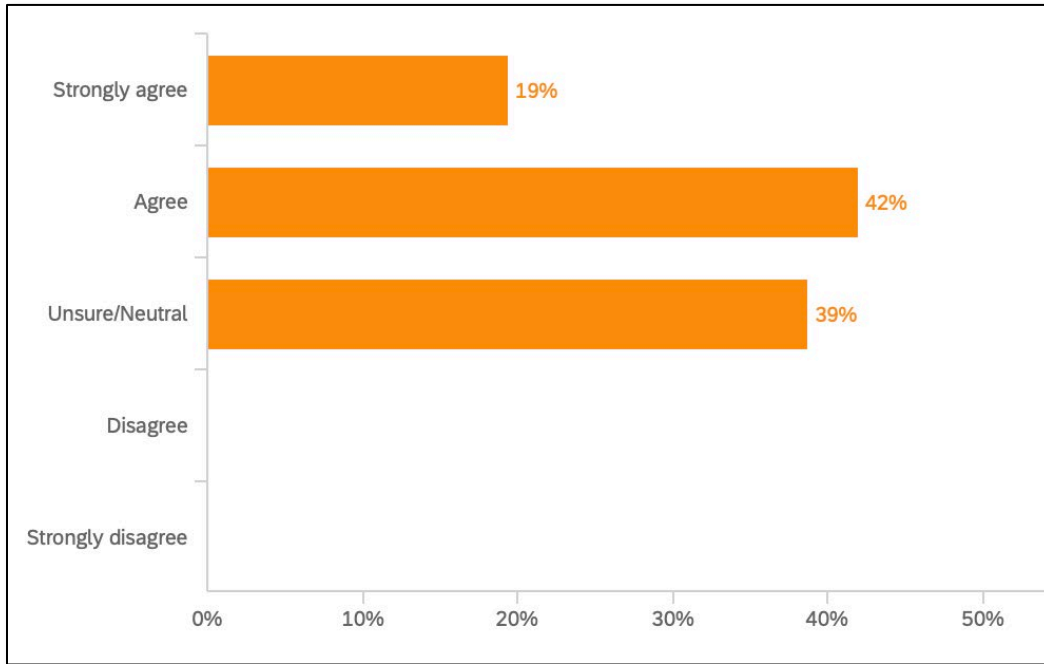


Figure 20 - Teacher Group A

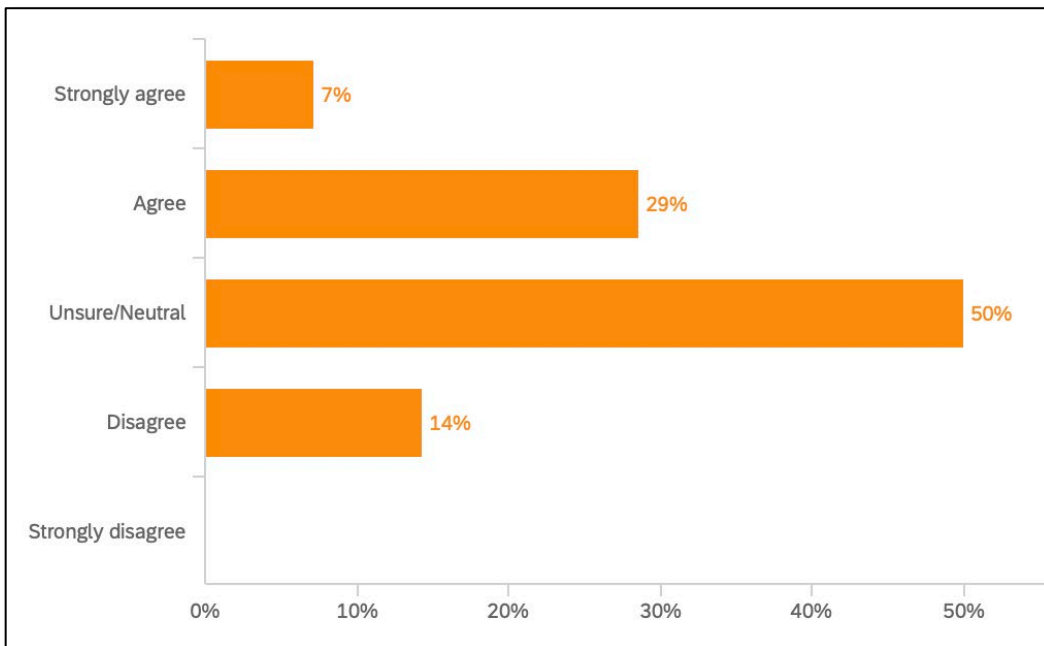
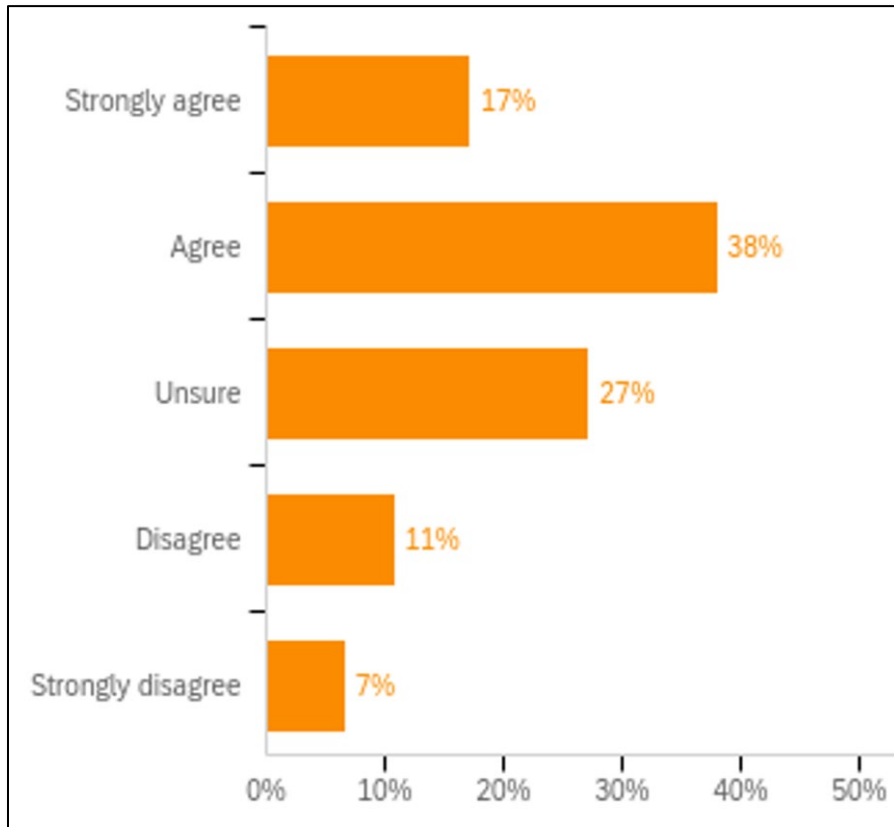


Figure 21 - Teacher Group B

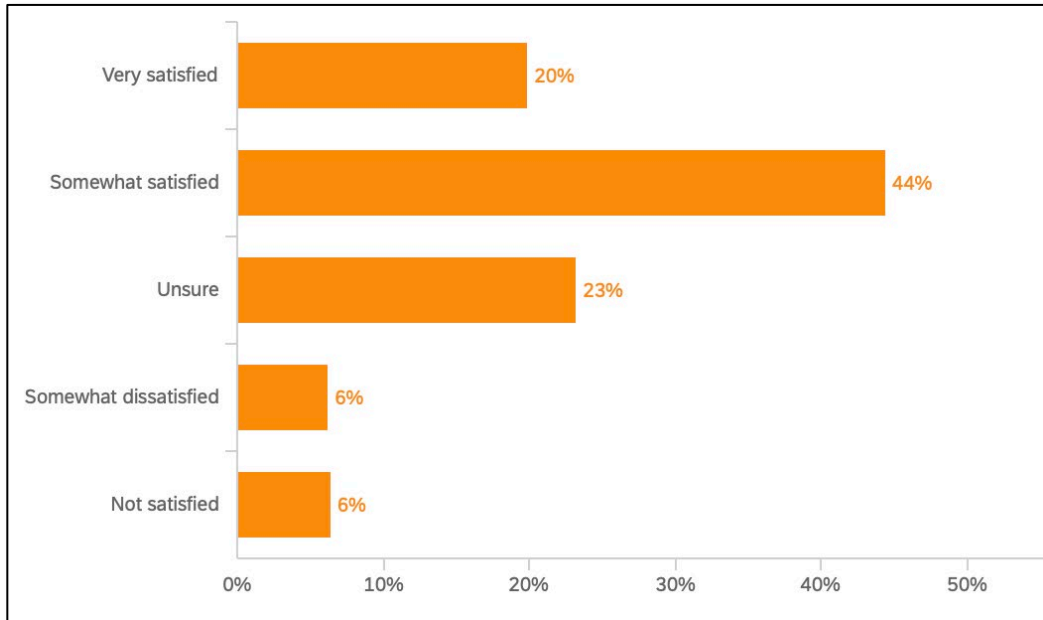
However, 55% of students agreed that it had helped reduce learning loss.

I feel like I am catching up on math skills that I had missed during the COVID-19 pandemic.

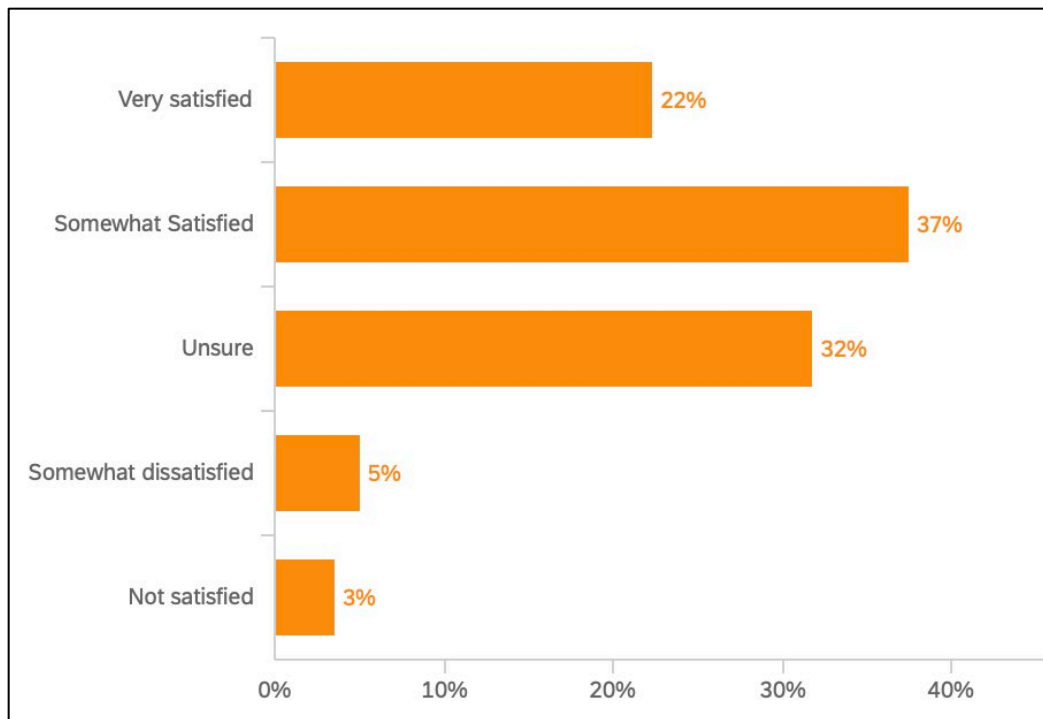


Students also reported being very satisfied with both the quality and variety of courses in Pathway2Careers.

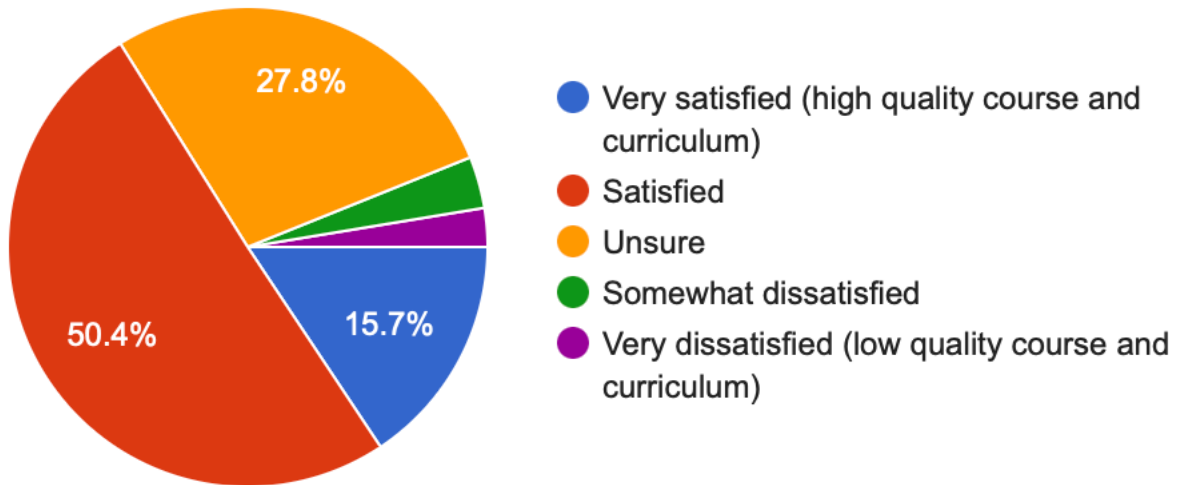
Quality:



Variety:

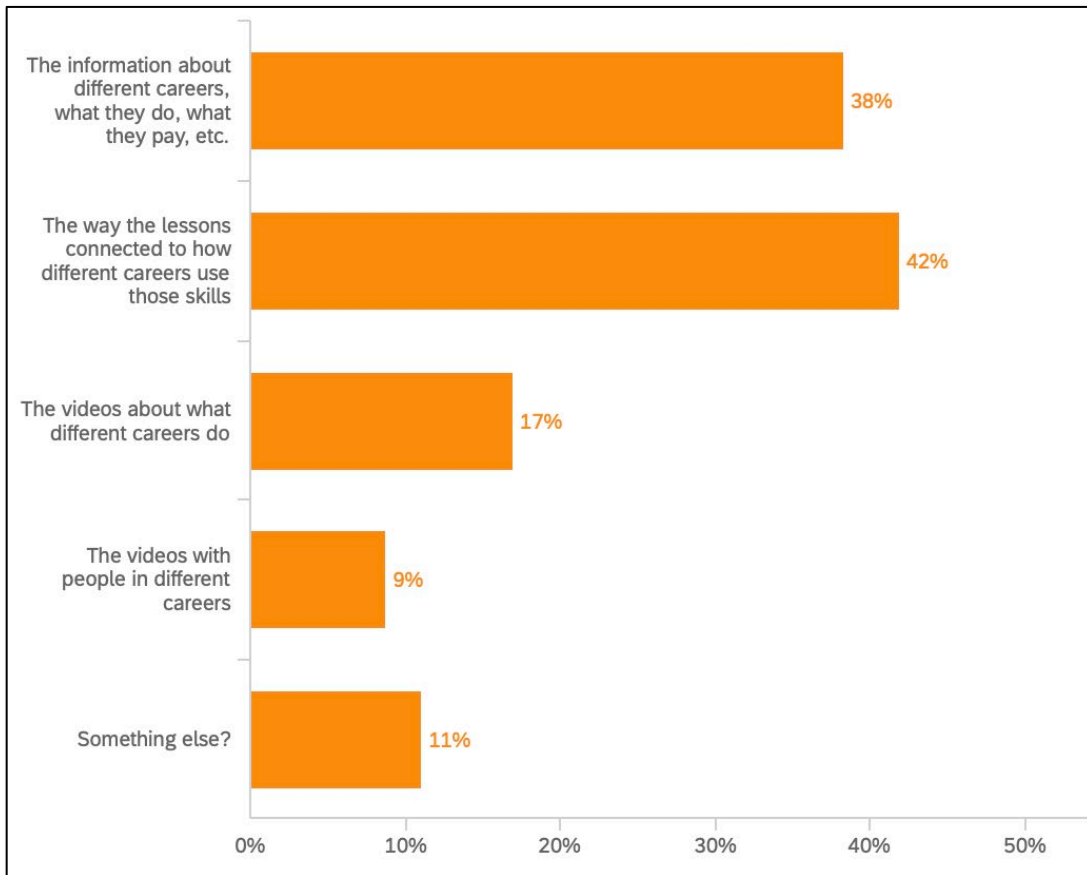


Parents also weighed in on the quality of the courses, and 66% were “very satisfied” or “satisfied.”



Students were asked what they liked most about the curriculum and platform.

What was your favorite thing or things about Pathway2Careers?



“Something else” answers included:

- *The process that shows us how it is done*
- *The fast-paced lessons*
- *That the lessons are actually similar to the quiz questions*
- *They show how to solve a problem*

Parents offered a few comments about their perceptions, as well:

- *No, I don't have anything, it has helped my child improved their math. All in all, its really good and easy to use for my child.*
- *The STEM avenue, to me, is extremely important, not only to the current students but to provide a supportive pathway for others, especially those who do not feel at ease with mathematical concepts. We remember that Albert Einstein struggled with some formative levels of math and, to that end, any program that accurately facilitates a student continuing to learn and weigh concepts are simplified for easier comprehensions, is good.*

- *This is a great way to learn about careers.*
- *This class was challenging for my son, however I feel like Math should be a challenge. So this class has met my standards. Thank you.*

Conclusion

New Mexico has embarked on a new “Math is Me” campaign as an intentional strategy for bolstering math proficiency scores, which were shown to be the lowest in the nation post-pandemic. Students using Pathway2Careers at approaching the end of their secondary school years, and this new tool shows great promise for helping these students “catch up” on their academic learning by re-engaging them as active players in their own learning.

The career-connected learning approach is having a demonstrable positive effect on student engagement in learning and impacting future planning, as conveyed by students and teachers. For teachers, this is vital. Grave concerns have emerged post-pandemic on the lack of student engagement and motivation, evidence by the undercurrent of increasing mental health concerns. Pathway2Careers bridges this gap by providing a platform for students to see themselves in a future career, able to learn hard things to be successfully in that career, and instilling a sense of hope.

Individual career choices or interest areas identified by students also reveal great potential for the future workforce, who became aware of, and interested in, a broad range of careers that align with economic development goals of the state. Starting as early as seventh grade, these students will be more informed on their academic decisions moving forward toward these career destinations and the post-secondary options available to them.

For teachers, the curriculum and platform are overwhelmingly viewed as positive tools in their math instruction toolbox, whether as supplemental or core curriculum. The ease of use for teachers and students, as well as the fact that students felt they were getting support from their teachers in instruction, confirmed the design principle of the curriculum to not replace teachers but rather to give them a tool that could improve the quality of instruction.

For parents, Pathway2Careers also seems to be well-received. As national parent surveys consistently show that their top goal for education is to prepare students for careers, the survey results indicate the majority of those surveyed saw this curriculum and platform as a benefit to their students.

There were challenges indicated by teachers and students, which require thoughtful response. From a functionality perspective, NS4ed, the developers of Pathway2Careers, has taken the feedback expressed and is in process of addressing some of the concerns or recommendations in an effort of continuous improvement. When student proficiency or technology skill levels were at issue, there may need to be an intentional complementary strategy for how to assist those students who need extra instruction or support. NS4ed and the College and Career Readiness Bureau should take this on together.

The differing answers between the two teacher groups A and B indicate that those who are in an ongoing professional development relationship with the College and Career Readiness Bureau are perhaps more equipped to fully take advantage of Pathway2Careers as an instructional tool. Teachers using the platform statewide would benefit from more professional development. Additional instruction on how to use the Quantile measures in evaluating learning gains and career assessment would bring more meaning to the value of the student experience.

Taking the survey data as a whole, Pathway2Careers has had a positive impact on the students, teachers, and parents who are part of this innovative effort in New Mexico. Recommendations would include expanding its use across the state and creating a comprehensive approach to teacher supports moving forward.

Future evaluation recommendations would be to establish a longitudinal study of these students to chart their trajectory over time, through high school, post-secondary, and into career. Perhaps future grant funding would support such an effort, leveraging the state's current efforts to build a longitudinal data system.

In summary, if Pathway2Careers is having a net positive impact on students, and is a net positive benefit to teachers, the U.S. Department of Education should include adoption of Pathway2Careers as a recommendation to any state seeking to advance career-connected learning and address the decades-long stagnation in math proficiencies.

