Chronicle of
Rural Education
Volume 3: Issue 1

After-School STEM Programs: Fostering Academic Growth and STEM Engagement in Rural Communities

Darcy Tessman, Kerry Rhone, Robin Roberson

Keywords
After-school programs, STEM education, rural education, elementary education, positive youth development

Recommended Citation
Tessman, D., Rhone, K., & Roberson, R. (2025). After-school STEM programs: Fostering academic growth and STEM engagement in rural communities. *Chronicle of Rural Education, 3*(1).

Abstract
This study examines the impact of an after-school STEM program on rural elementary students' academic growth and STEM engagement in Oklahoma. The 12.5-week program, designed for upper elementary students, focused on developing math skills and fostering interest in STEM careers. Using a mixed-methods approach, the study assessed 20 participants' progress through pre- and post-tests of multiplication skills and STEM attitudes. Results showed significant improvements in multiplication abilities, with a mean increase of 23.53% in correct answers. Students also demonstrated increased interest in STEM careers (12.11%), science attitudes (14.16%), and science interest (14.82%). The program's outcomes are analyzed through the 5 C's Model of Positive Youth Development, highlighting gains in competence, nuanced changes in confidence, and stronger connections to STEM fields. While limitations include a small sample size and short duration, the study provides valuable insights into the potential of targeted after-school interventions to support rural students' STEM development and address educational disparities.

Introduction

Academic concerns about student performance persist, particularly in mathematics, following the disruptions caused by the COVID-19 pandemic. National assessment data reveal significant declines in math proficiency across grade levels, highlighting the urgent need for targeted interventions (National Center for Education Statistics, 2023). In response to these challenges, after-school STEM (Science, Technology, Engineering, and Math) programs have emerged as a promising approach to support academic growth and foster interest in STEM fields.

This study examines the implementation and outcomes of an after-school STEM program designed for upper elementary students in a rural Oklahoma setting. The program, which ran for 12.5 weeks, focused on developing math skills, promoting STEM engagement, and cultivating interest in STEM careers. By integrating hands-on activities, personalized tutoring, and diverse STEM experiences, the program aimed to address the academic needs of participants while nurturing their curiosity and enthusiasm for STEM subjects.

Literature Review

According to USA Facts (2022), post-pandemic statistics demonstrate that eighth-grade math scores suffered the greatest decline since 1973. Oklahoma's eighth-grade students, roughly 83% of math, and 70% of science students performed at or below basic levels; basic status implies students may not be on track for college or career success (OK State Department of Education, 2022). Math scores in the eighth grade are a gateway to more advanced math necessary for college entrance exams and critical STEM careers. Average ACT scores for Oklahoma graduates report only 16% meet the math benchmark of a score of 22, and only 19% meet the science benchmark of 23 (ACT.org, 2023). Oklahoma's chancellor for the Oklahoma State System of Higher Education, Allison D. Garrett, expressed concern to the Senate budget hearing over students not entering higher education prepared to study STEM fields (Nearly 19 of 20 Oklahoma high school graduates unprepared in STEM, 2022). According to the Bureau of Labor Statistics (Employment in STEM Occupations, 2024), employment in STEM occupations increased nationally 10.5 percent between May 2009 and May 2015, but Oklahoma experienced a 24.4 percent increase in the same period. The Bureau of Labor Statistics projects another 10 percent increase in STEM career opportunities through 2033, unfortunately Oklahoma colleges report a minimal STEM graduation increase of only 1.6 percent between 2018 and 2021(Nearly 19 of 20 Oklahoma high school graduates unprepared in STEM, 2022). Lack of student proficiency in math and science at the high school level translates to a smaller pool of potential STEM majors in college, leading to fewer graduates in a ripe career field of opportunities.

Oklahoma's educational challenges are heavily influenced by funding. The National Education Association (2022) reports the national average per-student expenditure for the 2020-2021 school year of $14,360 compared to Oklahoma's average of $9,395, a shortfall of around 34%. Additionally, in Oklahoma, roughly 60% of rural students experience economic disadvantages that result in free or reduced lunch at school. Rural poverty outpaces urban locations as Parette (2016) claims poverty prevails at nearly 17% in rural counties compared to around 12% in urban Oklahoma. Individual/familial poverty compounds economic inequities in rural schools as Oklahoma's spending per pupil ranks 46th in the nation, and last in the geographic region leaving an increase of over $1 billion annually necessary to average a similar investment per student in surrounding states (Watson, 2022). That means that both rural families and schools in Oklahoma are challenged financially to provide educational materials that support learning. Hence, the materials and supplies by after-school programs allow for educational opportunities typically unavailable.

After-school STEM programs have been identified as effective interventions to address academic gaps and promote STEM engagement. Research by Wieselmann et al. (2018) demonstrated that well-designed after-school STEM programs can lead to improvements in math achievement, increased interest in STEM subjects, and enhanced problem-solving skills. These programs offer a unique opportunity to provide targeted support and enrichment outside of regular school hours, allowing for more personalized and engaging learning experiences.

The integration of math supports within STEM activities has been shown to be particularly effective in improving students' mathematical understanding and proficiency. A study by Margot and Kettler (2019) found that after-school programs that embedded mathematical concepts within hands-on STEM projects led to significant gains in math competency and confidence by reducing math anxiety among participants. This approach allows students to see the real-world applications of mathematical concepts, making the subject more relevant and engaging.

In rural settings, after-school STEM programs can play a crucial role in addressing educational disparities and expanding opportunities for students. Saw and Agger (2021) highlighted the unique challenges faced by rural students in accessing high-quality STEM education and emphasized the potential of after-school programs to bridge this gap. By providing exposure to diverse STEM experiences and career pathways, these programs can help rural students develop the skills and interests necessary for success in an increasingly technology-driven world.

Blotnicky, et al., (2018) report positive attitudes towards STEM subjects and careers as another important outcome of after-school STEM programs for middle school students. Research by Roberts et al. (2023) demonstrated that early exposure to STEM activities and role models can significantly influence students' career aspirations and self-efficacy in STEM fields. After-school programs that incorporate career exploration and connections to real-world STEM professionals can help students envision themselves in STEM careers and motivate them to pursue advanced coursework in these areas.

While the benefits of after-school STEM programs are well-established, implementing and sustaining these programs in rural areas presents unique challenges. Factors such as limited funding, transportation issues, and a shortage of qualified instructors are common barriers to program success (Saw & Agger, 2021). However, innovative approaches, such as partnerships with local institutions and leveraging community resources, have shown promise in overcoming these obstacles and creating sustainable programs.

Theoretical Framework

This study employs the 5 C's Model of Positive Youth Development (PYD) as its theoretical framework. The 5 C's—Competence, Confidence, Connection, Character, and Caring—provide a comprehensive lens to examine the multifaceted impacts of after-school STEM programs on rural elementary students (Lerner et al., 2018). *Competence* refers to the development of academic, social, and vocational skills. In the context of this study, competence is primarily measured through improvements in math skills and STEM knowledge. *Confidence* encompasses self-efficacy and positive self-worth. The program aims to boost students' confidence in their ability to succeed in STEM subjects and pursue STEM careers. *Connection* involves positive bonds with people and institutions. The after-school program aimed to foster connections between students, their peers, mentors, and the broader STEM community. *Character* relates to integrity, moral commitment, and respect for societal and cultural norms. . *Caring* involves sympathy and empathy for others as well as understanding the perceptions of others may not be the same as one's own. Connection, character and caring contribute to the overarching framework of the 5C Model of Positive Youth Development, but evaluative constructs in the assessment did not measure these tenants. Only competence and confidence are discussed in the results. Framing the after-school STEM program within the 5 C Model assists in understanding how such interventions contribute to holistic youth development, particularly in rural settings where STEM opportunities may be limited.

Methods

The study implemented an extracurricular after-school STEM education program for elementary students during the spring semester of 2024, focusing on math skills development. Participants were predominantly 5th and 6th-grade students who self-selected the after-school program with parental permission, but as the program progressed, additional participants from private school and homeschool environments joined. A total of 21 diverse students attended. The program was funded through a micro-grant from the Oklahoma State Regents for Higher Education. Three faculty members at the regional university co-authored the grant and divided the administration, training, implementation, and evaluation. Four undergraduate student STEM Mentors were employed to work one-on-one or in small groups with elementary students. The STEM Mentors met weekly on Mondays for two hours of training in math content, methods to assist students with math challenges, and the hands-on STEM activities to be implemented with students that week.

The weekly after-school program was designed to provide students with a dynamic and structured educational experience that balanced academic support and STEM enrichment. Running for 12.5 weeks, the program convened Tuesday and Thursday afternoons immediately after school for two-hour sessions at a regional university within walking distance of the local upper elementary. STEM Mentors met students at their elementary school and escorted students to the program site. Each session began with snacks and homework assistance, followed by engaging math challenges aligned with Oklahoma Academic Standards for fifth and sixth grade. Students needing extra help were paired with mentors for personalized tutoring or completing homework, while others tackled advanced mathematical activities like graphing, recipe conversions, and math scavenger hunts. The second hour was devoted to hands-on STEM activities, including building squishy circuits, wind cars, and Lego Robotics, as well as exploring agricultural concepts through planting vegetables and crafting projects like kite building, fabric art and cooking experiments. These activities aimed to foster curiosity and excitement about STEM fields by connecting them to real-world applications and career paths.

The program emphasized interactive learning through personalized instruction and collaborative projects. Students explored STEM concepts such as environmental science, coding, robotics engineering, and culinary arts while being introduced to professional role models from East Central University who shared their career journeys. The after-school program was designed to research the following questions:

Research Question #1: How do after-school STEM programs impact rural elementary students' academic performance in mathematics, particularly multiplication skills, as measured by pre- and post-test assessments?

Research Question #2: What changes in STEM attitudes and career interests are observed among rural elementary students participating in a structured after-school STEM program, and how do these changes align with the 5 C's Model of Positive Youth Development?

To assess the program's impact, researchers utilized two assessments. The program's focus on developing multiplication skills utilized pre- and post-test assessments of a timed, two-minute multiplication fact assessment of 100 problems at the beginning and end of the program (See Appendix A for multiplication assessment). This assessment directly correlates to research question one as declining statistics of post-pandemic national math scores drove the inception of the after-school program's multiplication fact emphasis.

The second assessment consisted of a Likert scale survey created by one of the authors. This assessment used items from published inventories and measured eight constructs: mindset, math interest, math self-efficacy, math anxiety, math attitude, science attitude, science interest and STEM career interest. Student responses were collected from the pre- and post-test survey administered at the beginning and end of the program (See Appendix B for grant survey).

Results

The after-school program demonstrated positive outcomes in several key areas. Specifically, students showed significant improvement in multiplication skills and accuracy through the timed multiplication pre- and post-test assessments. Additionally, the Likert scale survey found significant positive change in student attitudes towards science (14.15%), interest in science (14.82 %) and an increase (12.11%) of interest in STEM careers. Fascinatingly, decreases in the constructs of math anxiety (-8.00%), math interest (-8.00%), and math self-efficacy (-10.53%) may be more complicated to unpack holistically and may require comparison with other results such as mindset (-0.42%).

Multiplication Skills: Students exhibited marked progress in their multiplication abilities from pre-test to post-test. The improvement in the percentage of items attempted ranged from -2.86% to 144%, with a mean improvement of 22.12%. Similarly, the improvement in the percentage of items correct ranged from -6.06% to 161%, with a mean improvement of 23.53%. This improvement measure quantifies research question one, as the impact on multiplication skills by the rural after-school program resulted in significant improvement in both student abilities and accuracy.

STEM Survey Results: A survey measuring eight constructs relevant to academic growth in STEM revealed interesting changes in students' attitudes and perceptions. Positive percentage change values indicate an increase in agreement or alignment with the survey item, while negative values reflect a decrease. The following table (see Figure 1) summarizes the mean pre- and post-scores for each subscale.

Figure 1

Construct	Pre-Score	Post-Score	% Change
Mindset	**4.75**	**4.73**	**-0.42%**
Math Attitude	**4.63**	**4.69**	**1.30%**
Math Anxiety	**3.13**	**2.88**	**-8.00%**
Math Interest	**4.75**	**4.38**	**-7.79%**
Math Self-Efficacy	**4.75**	**4.25**	**-10.53%**
Science Attitude	**4.38**	**5.00**	**14.16%**
Science Interest	**4.25**	**4.88**	**14.82%**
STEM Career Interest	**4.13**	**4.63**	**12.11%**

To analyze percentage change in responses from the six-point Likert scale survey (1 = "Disagree a lot" to 6 = "Agree a lot"), the methodology involved calculating shifts in mean scores between pre- and post-intervention assessments. For each survey item, individual responses were aggregated, and mean scores were computed for both time points. The percentage of change was determined using Glass and Hopkins's (1996) formula: post-intervention mean score minus the pre-intervention mean score, divided by the pre-intervention mean score, and then multiplied by 100. This formula is expressed as: ((Post-Mean - Pre-Mean) / Pre-Mean) × 100. The resulting value represents the relative change in participant responses between the two time points, expressed as a percentage. This method provides a straightforward way to quantify changes in attitudes or perceptions over time. This approach quantifies directional shifts in participant attitudes or perceptions while accounting for the scale's ordinal nature. While Likert data is ordinal, mean-based percentage change aligns with educational research practices for evaluating program impact, provided results are interpreted as trends rather than absolute intervals.

Discussion

The after-school program's emphasis on multiplication facts clearly demonstrated promising results in enhancing students' STEM skills and interest, particularly in mathematics and science. Despite challenges in recruitment and managing behavioral issues, the program cultivated a supportive learning environment where students could build relationships with peers, STEM Mentors, and faculty. The program's outcomes are discerned through the constructs and then expressed through the lens of the 5 C's Model of Positive Youth Development.

Competence: The significant improvement in multiplication skills from the pre-to post-test assessment, with a mean increase of 23.53% in correct answers highlights the program's success in developing students' mathematical competence and answer research question one's query of the impact of math skills in a rural after-school program. This improvement is particularly noteworthy given the short duration of the program (12.5 weeks) and the limited contact time (4-

5 hours per week). The success in this area underscores the importance of dedicated practice and personalized instruction in developing fundamental math skills.

Confidence: The Likert scale survey measured eight constructs which are discussed under the 5 C Model framework of confidence because the survey constructs measured student perceptions on topics of subject content and career interests, attitudes, anxiety and their mindset. The first subject content area of math revealed positive results.

Math: During the two months focused on math, students developed a more realistic understanding of their abilities, which revealed that their math skills were not at grade level. The decrease in math self-efficacy (-10.53%) presents an interesting challenge to the confidence aspect of the 5 C's model. However, this outcome may reflect a response shift bias (Hill, 2020) which accounts for a more realistic self-assessment by students of their math concerns after they confronted challenging mathematical concepts compared to concerns measured prior to completing computations. Consequently, their interest in math also declined (-7.79%), reflecting a common psychological response where individuals are less motivated to engage in tasks they perceive themselves to be poor at. However, the program emphasized growth as a core tenet, encouraging students to believe that improvement is possible with consistent effort and practice. Interestingly, students experienced a reduction in math anxiety (-8.00%) despite lowered self-efficacy, which suggests that the program successfully created a supportive environment where students felt comfortable acknowledging and addressing their mathematical weaknesses. This nuanced change in confidence may actually represent a truthful form of self-assurance. This counterintuitive finding may be attributed to the process of demystification, wherein students identified specific aspects of math that caused their anxiety and learned strategies to address these challenges. Additionally, the support created by the program likely contributed to this outcome, as students realized they were not alone in their struggles and that it is acceptable to face difficulties as long as they persist in trying. These factors align with the modest increase in math attitude (+1.30%), suggesting that while confidence in their abilities was shaken, students began to develop healthier perspectives on learning math and overcoming obstacles.

Science: Both attitude (+14.16%) and interest (+14.82%) toward science increased significantly during the program, reflecting the impact of engaging, hands-on activities. After snacking and playing math games, students transitioned into science and engineering tasks that ranged from snap circuits and owl pellet dissections to cooking and textile-based projects. Many of these activities incorporated math components, helping students recognize the pervasive presence of math in everyday life. The consistent exposure to interactive science tasks likely contributed to the positive shifts in attitude and interest, as students experienced science beyond textbooks and traditional classroom settings. By creating items they could eat or take home, the program reinforced the idea that science is tangible, practical, and enjoyable.

This increase in confidence toward science aligns with the program's emphasis on experiential learning and real-world applications. Students discovered that science is accessible and relevant to their lives, which may have demystified the subject and made it more appealing. STEM mentors and faculty worked side-by-side with participants, creating rich opportunities for relationship building and routine discussions about the real-world application of math and science. The opportunity to actively participate in creating and experimenting fostered a sense of accomplishment and curiosity, encouraging students to view science as a dynamic field worth exploring further. These results suggest that integrating hands-on activities with relatable outcomes can effectively enhance students' confidence and enthusiasm for STEM subjects.

Limitations and Future Directions

Several limitations should be considered when interpreting these results. The small sample size of only 20 participants limits the generalizability of the findings, while the relatively short duration of 12.5 weeks may not be sufficient to produce long-lasting changes in attitudes and skills. Self-selection bias is another concern, as Huang et al. (2017) find that after-school programs emphasize voluntary participation. Students who chose to participate may have had a pre-existing interest in STEM, family encouragement to attend, or may have been motivated differently, which could potentially inflate the positive outcomes. Additionally, student participation was influenced by other extra-curricular events offered such as sports, and theater production, meaning that students not involved in other activities may have attended the after-school program as a convenience for parents. The lack of a control group makes it difficult to attribute changes solely to the program, and the absence of long-term follow-up leaves questions about the durability of the observed changes. To address these limitations, future research should implement larger-scale studies with control groups and longitudinal follow-ups.

Conclusion

The after-school STEM program demonstrates the potential of targeted interventions to support rural elementary students' academic growth and STEM engagement. By addressing multiple aspects of the 5 C's Model, the program fostered competence in math skills, nuanced changes in confidence, stronger connections to STEM fields, and potential growth in character and caring.
The significant improvements in multiplication skills and increased interest in STEM careers highlight the program's success in developing both academic mathematical competence and broader engagement with STEM subjects. While some aspects of math perception showed declines, these changes may reflect a more realistic understanding of the challenges associated with STEM subjects, potentially leading to confidence increases in the long term.

The program's ability to maintain student enthusiasm while being transparent about the mathematical demands of STEM fields is particularly noteworthy. This approach may contribute to the development of an increased interest in STEM by better understanding of the field's challenges and rewards.

For rural communities seeking to enhance STEM education opportunities, the studied after-school model offers several promising strategies; 1) partnering with local regional universities for access to expertise and undergraduate STEM Mentors, 2) adapting STEM activities to reflect local concerns, 3) addressing transportation challenges, which can be significant in rural areas, and 4) developing strategies to recruit and retain students, given the competition with other extracurricular activities.

While further research is needed to fully assess the long-term impact and potential for widespread implementation, the after-school program provides a valuable model for supporting rural students' STEM development. By addressing multiple facets of positive youth development, such programs can play a crucial role in preparing the next generation for the challenges and opportunities of an increasingly STEM-driven world.

References

ACT.org. (2023, October 10). *Fewer high school seniors ready for college as ACT scores continue to decline.* ACT. https://leadershipblog.act.org/2023/10/act-scores-decline.html

Blotnicky, K. A., Franz-Odendaal, T., French, F., & Joy, P. (2018). A study of the correlation between STEM career knowledge, mathematics self-efficacy, career interests, and career activities on the likelihood of pursuing a STEM career among middle school students. *International Journal of STEM Education*, *5*(1), 22. https://doi.org/10.1186/s40594-018-0118-3

Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research*. SAGE Publications.

Bureau of Labor and Statistics. (2024, August 29). *Employment in STEM occupations*. BLS. https://www.bls.gov/emp/tables/stem-employment.htm

Glass, G. V., & Hopkins, K. D. (1996). *Statistical methods in education and psychology* (3rd ed.). Allyn & Bacon.

Hill, L. G. (2020). Back to the future: Considerations in use and reporting of the retrospective pretest. *International Journal of Behavioral Development*, 44(2), 184-191. https://doi.org/10.1177/0165025419870245

Huang, D., Leon, S., & La Torre, D. (2017). Using entropy balancing to reduce the effects of selection bias in after-school program research. *International Journal for Research on Extended Education*, 5(1), 6–24. https://doi.org/10.25656/01:22140

Lerner, R. M., Lerner, J. V., Geldhof, G. J., Gestsdóttir, S., King, P. E., Sim, A. T., & Dowling, E. (2018). Studying positive youth development. In R. M. Lerner & J. V. Lerner (Eds.), *Handbook of adolescent development research and its impact on global policy* (pp. 68–82). Routledge

Margot, K. C., & Kettler, T. (2019). Teachers' perception of STEM integration and education: A systematic literature review. *International Journal of STEM Education*, 6(2), 1-26.

National Center for Education Statistics. (2023). *NAEP long-term trend assessment results: reading and mathematics*. U.S. Department of Education.

National Education Association. (2022). *Rankings of the States 2021 and Estimates of School Statistics 2022*. https://www.nea.org/resource-library/rankings-and-estimates-report-2021

Carter, R. (2022, December 21). *Nearly 19 of 20 Oklahoma high-school graduates unprepared in STEM*. Oklahoma Council of Public Affairs. https://ocpathink.org/post/independent-journalism/nearly-19-of-20-oklahoma-high-school-graduates-unprepared-in-stem

OK State Department of Education. (2022). *State Testing Resources.* https://sde.ok.gov/state-testing-resources

Parette, T. (2016, August 7). *Rural poverty: "A way of life" for numerous Oklahomans (Tulsa World).* Oklahoma Policy Institute. https://okpolicy.org/rural-poverty-way-life-numerous-oklahomans-tulsa-world/

Perplexity. (2025, January 28). *Conversation about rural after-school STEM programs* [AI conversation]. https://www.perplexity.ai/

Roberts, T., Jackson, C., Mohr-Schroeder, M. J., Bush, S. B., Maiorca, C., Cavalcanti, M., & Cremeans, C. (2023). Students' perceptions of STEM learning after participating in a summer informal learning experience. *International Journal of STEM Education*, 5(35), 1-14.

Saw, G. K., & Agger, C. A. (2021). STEM pathways of rural and small-town students: Opportunities to learn, aspirations, preparation, and college enrollment. *Educational Researcher*, 50(9), 595-606. https://doi.org/10.3102/0013189X211027528

Watson, C. (2022, August 21). *Oklahoma education facts*. Oklahoma State School Boards Association. https://www.ossba.org/advocacy/oklahoma-education-facts/

Wieselmann, J. R., Dare, E. A., Ring-Whalen, E. A., & Roehrig, G. H. (2018). "I just do what the boys tell me": Exploring small group student interactions in an integrated STEM unit. *Journal of Research in Science Teaching*, 57(1), 112-144.

USAFacts. (2022). *Reading and math scores dropped during pandemic, rolling back years of progress*. USAFacts. https://usafacts.org/articles/reading-and-math-scores-plummet-during-pandemic-erasing-years-of-progress/

Appendix A
Pre/Post-Test for Multiplication

Multiplication Facts to 144 (A)

Name: ____________ Date: ____________ Score: _____ /100

Calculate each product.

7×9	3×11	4×12	8×11	5×11	12×10	6×4	12×2	2×2	10×9
6×8	4×7	10×4	5×10	6×12	3×10	10×6	9×11	6×2	5×4
2×9	2×8	9×9	3×3	6×7	4×8	8×8	5×8	2×11	6×11
6×3	2×4	5×12	2×3	7×7	9×12	11×10	9×3	11×11	8×10
6×6	5×7	10×2	8×3	4×11	4×9	6×9	12×8	11×12	3×4
8×7	12×12	7×11	6×5	8×9	3×12	10×7	4×4	5×3	7×2
9×5	3×7	5×5	7×12	2×5	10×10	8×5	3×4	10×12	9×6
8×8	6×5	3×9	10×6	2×12	9×4	11×11	2×5	2×9	6×3
12×9	11×9	4×5	5×12	8×6	3×12	7×2	2×3	5×5	9×9
9×5	7×8	3×11	10×5	12×7	10×3	11×12	4×7	3×3	7×9

Appendix B
Grant Survey

Tiger Academy Pre-Survey **Name** ______________________ **Date** _______

For each statement, circle the number that best describes how well the statement describes you.

Disagree a lot = 1	Disagree = 2	Disagree a little = 3	Agree a little = 4	Agree = 5	Agree a lot = 6			
Statements	Survey Cmpnt							Score
1. I like work best when it makes me think hard.	MdSt	1	2	3	4	5	6	
2. I think watching a video where someone explains a complex math problem would be interesting.	MtIn	1	2	3	4	5	6	
3. I can make sense of most new math ideas quickly.	MtSE	1	2	3	4	5	6	
4. I avoid doing math homework because it is confusing.	MtAx	1	2	3	4	5	6	R
5. I am really good at math.	MtAt	1	2	3	4	5	6	
6. The harder I work at something, the better I will be.	MdSt	1	2	3	4	5	6	
7. Science is my least favorite subject.	ScAt	1	2	3	4	5	6	R
8. I am interested in taking extra math classes before I graduate.	MtIn	1	2	3	4	5	6	
9. I like work that I'll learn from even if I make a lot of mistakes.	MdSt	1	2	3	4	5	6	
10. I doubt I will ever use math out in the real world.	MtAt	1	2	3	4	5	6	R
11. I look forward to learning about science.	ScAt	1	2	3	4	5	6	
12. I worry that I will make a bad grade in math.	MtAx	1	2	3	4	5	6	R
13. I look forward to the challenges I may face in a STEM career.	CrIn	1	2	3	4	5	6	
14. I like work best when I can do it perfectly without any mistakes.	MdSt	1	2	3	4	5	6	R
15. I will need a good understanding of math for my future career.	CrIn	1	2	3	4	5	6	
16. I search for and watch scientific videos because I like them.	ScIn	1	2	3	4	5	6	
17. Math is my worst subject.	MtAt	1	2	3	4	5	6	R
18. When work is difficult, it just makes me try harder.	MdSt	1	2	3	4	5	6	
19. I *cannot* solve math problems without outside help (fingers, mnemonic, song, fact sheet, calculator, another person).	MtSE	1	2	3	4	5	6	R
20. I would consider a career in science.	CrIn	1	2	3	4	5	6	
21. I worry the teacher will call on me to answer a question in math class.	MtAx	1	2	3	4	5	6	R
22. I would like to have a STEM-related career.	CrIn	1	2	3	4	5	6	
23. When I work hard, it makes me feel as though I'm not very smart.	MdSt	1	2	3	4	5	6	R
24. I enjoy the challenge of learning something new.	MdSt	1	2	3	4	5	6	
25. I feel restless in math class.	MtAx	1	2	3	4	5	6	R

Disagree a lot = 1 Disagree = 2 Disagree a little = 3 Agree a little = 4 Agree = 5 Agree a lot = 6								
26. I know my addition facts up through the 9s.	MtSE	1	2	3	4	5	6	
27. I think a career in science would be too difficult for me.	CrIn	1	2	3	4	5	6	R
28. I can complete any math task given to me.	MtSE	1	2	3	4	5	6	
29. I often get angry when I get feedback on my work.	MdSt	1	2	3	4	5	6	R
30. I can add fractions.	MtSE	1	2	3	4	5	6	
31. I am interested in taking extra science classes before I graduate.	ScIn	1	2	3	4	5	6	
32. Doing extra math is not my idea of fun.	MtIn	1	2	3	4	5	6	R
33. I can multiply fractions.	MtSE	1	2	3	4	5	6	
34. I appreciate when I get feedback on my work.	MdSt	1	2	3	4	5	6	
35. I would never consider a career that uses math regularly.	CrIn	1	2	3	4	5	6	R
36. I can solve algebraic equations.	MtSE	1	2	3	4	5	6	
37. No matter how hard I try, I *cannot* seem to make sense of math.	MtSE	1	2	3	4	5	6	R
38. I can do basic math in my head.	MtSE	1	2	3	4	5	6	
39. Science is messy and I do not like it.	ScIn	1	2	3	4	5	6	R
40. I am good at building and fixing things.	ScAt	1	2	3	4	5	6	
41. I know my multiplication facts up to the 10s.	MtSE	1	2	3	4	5	6	
42. I like work best when I can do it really well without much effort.	MdSt	1	2	3	4	5	6	R
43. I expect to make an "A" in math this semester.	MtSE	1	2	3	4	5	6	

Key

Mindset/MdSt	1 6 9 14 18 23r 24 29r 34 42r
Math Attitude/MtAt	5 10r 17r
Science Attitude/ScAt	7r 11 40
Math Anxiety/MtAx	4r 12r 21r 25r
Math Interest/MtIn	2 8 32r
Science Interest/ScIn	16 31 39r
STEM Career Interest/CrIn	13 15 20 22 27r 35r
Math Self Efficacy/MtSE	3 19r 26 28 30 33 36 37r 38 41 43