# WHAT THE RESEARCH SAYS ABOUT MATH TALENT DEVELOPMENT

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There are decades of research on how to develop math talent for students with advanced learning needs (e.g., Assouline & Lupkowski-Shoplik, 2010), but children and adolescents can encounter barriers in their local schools that prevent them from accelerating or accessing advanced coursework (e.g., Guilbault & Meyer, 2024; Lupkowski-Shoplik et al., 2018; Tyner, 2024). This situation is even more pronounced for students from culturally, linguistically, economically, and geographically diverse backgrounds (Coffey & Tyner, 2023). Although gifted and advanced education researchers have focused on improving equity and access in recent years (e.g., Dixson et al., 2020; Plucker & Peters, 2016), the underrepresentation of students of color and from economically vulnerable communities persists (Gentry et al., 2019). Underrepresentation (i.e., when the demographic makeup of gifted and advanced academic programs does not mirror the school's demographics) is far too common in advanced math.

There are talented students in classrooms across the country who are ready for more academic challenge in math and other subjects. One study (Peters et al., 2017) showed that in a sample of Texas fourth graders who took the Measures of Academic Progress (MAP), 29% scored at least one year above grade level in math. This suggests that unless regular grade-level instruction is differentiated for individual student needs, many children can spend an entire academic year waiting to learn something new. The Study of Mathematically Precocious Youth (SMPY; Bernstein et al., 2019; Kell et al., 2013; Lubinski et al., 2023; Makel et al., 2016) has followed the trajectories of individuals identified by out-of-level testing in talent search

programs since 1971. Decades of SMPY research demonstrate that students with mathematic ability and potential who have opportunities to develop their talents can make outstanding contributions to their communities, professions, and society.

Emerging policies across the country and in Texas support math talent development. Texas (S.B. 2124) and several other states (e.g., Colorado, Illinois, Nevada, North Carolina, Washington) have implemented auto-enrollment policies to increase opportunities for students from all cultural, linguistic, economic, and geographic backgrounds to engage in advanced math coursework. These policies, sometimes called opt-out programs, make advanced math pathways the default for middle school students who demonstrate potential on state math assessments. Under S.B. 2124 ("Advanced mathematics instruction," 2023), Texas fifth-grade students who score in the top 40% on the math State of Texas Assessments of Academic Readiness (STAAR) are automatically placed in an advanced sixth-grade math course. Students do not have to be identified for gifted services to participate and can opt out of these placements, but the goal of auto-enrollment is to prepare students across the state to take Algebra I by eighth grade. This universal screening process starts Texas middle school students with math potential on an advanced course-taking trajectory that prepares them to enter postsecondary college and career pathways in high-demand STEM fields.

This article reviews several studies on math talent development for K-12 students. We selected eight recent studies from journals that publish research on advanced education, including Gifted Child Quarterly, Journal for the Education of the Gifted, Journal of Advanced Academics, and AERA Open. We reviewed these articles to provide descriptions of the studies, summaries of the results and findings, and implications for policy and practice. Here's what the research says about evidence-based practices for developing math talent.

Most Mathematics Classrooms Contain Wide-Ranging Achievement Levels (Pedersen et al., 2023)

This study, published in Gifted Child Quarterly, highlights the fact that education policy is often based on one-size-fits-all approaches to instruction that overlook students'

individual needs. The article emphasizes that having a broad spectrum of student achievement in a single classroom places a heavy burden on teachers as they work to differentiate instruction for students who are ready for grade-level instruction, students who need intervention to meet grade-level standards, students who have already demonstrated grade-level proficiency, and students who are ready for more challenge. Differentiation can be challenging in practice and educators frequently try to reach the most students by teaching to the average ability range. The authors note that when educators tailor instruction for the average ability level in a classroom, many students are asked to work outside their Zone of Proximal Development (ZPD; Vygotsky, 1978, 1997). This study examined Trends in International Mathematics and Science Study (TIMSS) test data for United States fourth and eighth-grade students to (a) quantify the range of student ability levels in this sample of math classrooms and (b) give a sense of the differentiation required by the educators who teach these students.

The 2019 TIMSS data used in the analysis for fourth grade included 8,765 student observations across 504 classrooms and 286 schools. The 2019 TIMSS data used in the analysis for eighth grade included 8,683 students across 529 classrooms and 269 schools. TIMSS data are reported using four benchmarks of mathematics achievement, including low, intermediate, high, and advanced. The first study hypothesis was that half of fourth-grade classrooms and a third of eighth-grade classrooms in the sample would contain all four benchmark categories. The results indicated that 69.3% of fourth-grade classrooms and 35.3% of eighth-grade classrooms had students in all four benchmark categories. The second study hypothesis was that most of the variability in achievement (more than 60% for fourth grade; more than 40% for eighth grade) would be found within classrooms. The results noted that 68% of the variance in math achievement for fourth grade and 37% of the variance in math achievement for eighth grade was within classrooms rather than across classrooms or schools. These results indicate that in a large percentage of the elementary and middle school

classrooms in this sample, teachers had to differentiate instruction for vastly different math achievement levels.

The authors identified implications for advanced academic programming and classroom teaching practice. This study found that many students in classrooms across the country could benefit from accelerated or advanced coursework options in math. Prior research (e.g., Assouline et al., 2015a, 2015b; Plucker & Peters, 2016) has identified evidence-based strategies to increase the likelihood that students' advanced learning needs are addressed, including acceleration (e.g., whole grade, single subject, curriculum compacting) and instructional strategies (e.g., frontloading, flexible ability grouping). These strategies are largely effective because they decrease the range of ability levels educators must address in a single classroom. Classroom teachers can implement many of these strategies (e.g., frontloading, flexible ability grouping) without additional funding or changes to program models. The authors also suggest that education policies move beyond approaches that assume age is the strongest indicator of academic need and toward approaches (e.g., acceleration) that use data to individualize student instruction.

Teachers' Perceptions of Differentiation Following a Math Curriculum Implementation Study (Hayden et al., 2024)

This study, published in the Journal for the Education of the Gifted, investigates teachers' perceptions of differentiation following the implementation of a pre-differentiated, tiered, and enriched mathematics curriculum for Grade 3 students. The research provided targeted professional learning and curriculum materials designed to enhance teachers' understanding and application of differentiation strategies. The curriculum ("If Aliens Taught Algebra: Multiplication and Division Would Be Out of This World!") was implemented in 17 schools across five states and involved 57 teachers in rural and urban settings. Data were collected through pre- and post-surveys, classroom observations, teacher logs, and post-implementation interviews to gain insights into the teachers' experiences with and perceptions of the differentiation process.

The qualitative analysis of teacher interviews revealed several key findings. Teachers reported a significant increase in their understanding of differentiation and its importance for student engagement and performance. Several teachers observed that the pre-differentiated, tiered activities allowed them to effectively challenge students at various readiness levels, leading to noticeable improvements in student motivation and participation. For example, teachers highlighted how grouping students based on pre-assessment data and providing tiered activities tailored to their needs resulted in better student outcomes and performance. However, despite the positive perceptions of the pre-differentiated curriculum, teachers also identified persistent barriers, including insufficient time and a need for more resources to implement differentiation strategies consistently across all subjects.

Well-designed, differentiated math curriculum materials can be a powerful professional learning tool that supports teachers' understanding and application of differentiation strategies. The findings suggest that teachers with well-designed, pre-differentiated curriculum materials and professional development support are more likely to implement effective differentiation practices that can improve student engagement and performance. However, for these practices to be sustainable, school districts and educational leaders must address known barriers by providing adequate time, resources, and ongoing professional development opportunities. This approach enables educators to address the diverse needs of gifted and talented students more effectively and ensure equitable access to challenging and enriching learning experiences in math.

How Teachers Make Decisions in Response to Professional Learning: A Study on Grade 3 Differentiation in Mathematics (Cody et al., 2024)

This study investigates how third-grade teachers make decisions about differentiating instruction in mathematics following professional learning experiences. The research explores the factors related to teachers' choices, including their understanding of differentiation, what they believe their students need, and the available resources. The study shows the challenges teachers face in implementing differentiated instruction through a mixed-methods approach

that included surveys, interviews, and classroom observations. It highlights the importance of ongoing support and targeted professional development to help teachers effectively tailor their teaching strategies to meet diverse student needs.

The findings reveal that while professional learning is positively related to teachers' understanding and implementation of differentiated mathematics instruction, several challenges remain prevalent. Teachers reported increased confidence and competence in using various differentiation strategies. However, they also reported significant issues such as limited time, insufficient resources, and varying levels of student ability. The study found that teachers who received consistent support and access to collaborative professional communities were more successful in sustaining differentiation practices. Moreover, the research emphasized the need for professional development programs that address specific classroom contexts and provide practical tools for managing diverse learning needs. Overall, the findings suggest that effective differentiation in mathematics requires a holistic approach that includes ongoing professional development with structured support.

This research emphasizes the need for organized support systems to enhance the effectiveness of differentiated mathematics instruction. Schools and districts can prioritize sustained, context-specific professional development programs that provide teachers with practical strategies and tools customized to their classroom environments. Additionally, creating collaborative professional learning communities can provide teachers with continuous peer support and shared resources, reinforcing their ability to differentiate instruction. Administrators can also address issues, such as limited time and resources, by providing adequate planning periods and access to instructional materials. By adopting a holistic approach that includes continuous professional learning with systemic support, educational leaders can help teachers meet the diverse needs of their students and improve overall mathematics outcomes.

Teacher Use of an Online Platform to Support Independent Practice in Middle School Mathematics During COVID-19 Disruptions (Witherspoon et al., 2024)

This research examines how teachers utilized the ASSISTments educational technology platform during the COVID-19 pandemic, from fall 2019 to spring 2021. It explores the relationships between coaching, teaching experience, and instructional modes (online versus in-person) and how these factors were related to mathematics teachers' use of educational technology. The findings suggest that pre-established, technology-supported routines can facilitate smoother transitions to online learning when face-to-face instruction is disrupted. The research underscores the significance of coaching during this transition and emphasizes the need to understand and support experienced teachers who may be hesitant to embrace new technologies. By increasing the use of educational technology platforms such as ASSISTments, teachers are better equipped to differentiate instruction and provide advanced content to high-achieving students, thereby enhancing math talent development. Understanding these dynamics is crucial for fostering math talent development and ensuring that all students receive effective math instruction regardless of their learning environment.

The sample included 58 seventh-grade math teachers from the treatment group of a larger study who continued using the ASSISTments platform during the study period. The number of teachers contributing data varied each semester, ranging from 26 teachers in the fall of 2019 to 34 in the spring of 2021. Data were collected from the ASSISTments platform on the number of assignments created and how often teachers viewed student reports. Usage metrics included total platform use per semester, number of weeks with usage, times used per week, and average days per week with usage. The final sample after data cleaning included 5,062 total assignments and 3,787 report views.

The results show that platform usage was higher in the 2020-2021 school year compared to 2019-2020. Despite an initial decline in usage when transitioning to remote learning, there was a steady increase in usage during 2020-2021, from 7.7 weeks in fall 2020 to 9.6 weeks in spring 2021. The weekly frequency of teachers' usage of the platform followed a similar pattern, with a slight decrease and then an increase in fall 2020 to 34.5% and peaked at 44.1% in spring 2021. More specifically, teachers who received more coaching sessions used

the platform significantly more than those with little or no coaching. Less experienced teachers were more likely to use the platform compared to their more experienced colleagues. These insights can help inform strategies for math talent development by ensuring that students receive consistent and effective math instruction supported by technology and teacher engagement, regardless of their teachers' experience levels.

The study's findings have implications for math talent development. The effective use of educational technology can enhance individualized instruction and provide advanced learners with more challenging content tailored to their abilities. This technology can support educators as they create environments where all students, including those with advanced mathematical abilities, can access high-quality, technology-enhanced instruction. By understanding how teachers use these tools, developers can create features that specifically support the identification and development of mathematical talent. As online instruction becomes more prevalent, researchers and platform designers must analyze how these tools are used in various contexts, including advanced education. This information can guide the development of more user-friendly platforms that better support teachers' needs and enhance learning outcomes for advanced learners beyond the pandemic. These findings suggest that technology can help educators nurture mathematical talent and appropriately challenge gifted students in in-person and online settings.

The Where and Why of Accelerated Middle-School Mathematics (Peters & Carter, 2023)

In this study published in Gifted Child Quarterly, Peters & Carter (2023) merged several national datasets to determine the availability of seventh-grade algebra and eighth-grade geometry across the nation to examine what correlates of access might be found. Their dependent variables were access to seventh-grade algebra and eighth-grade geometry and the proportion of each school's eligible students enrolled in either one of the courses. They then controlled for district and school achievement and demographics to see what else might contribute to enrollment.

They found that the district and school students attended mattered more than the state where they resided. The state seemed to matter only a little, leading researchers to the conclusion that individual districts and schools have a great deal of leeway in determining access to advanced mathematics. Schools in districts with greater levels of in-district free or reduced-price lunch segregation were more likely to offer accelerated math courses for seventh and eighth graders, as were schools with a greater proportion of parents with a college or professional degree. The most important factor overall was the proportion of college-educated parents. Even after controlling for school and district achievement, which was also predictive of access, a greater proportion of college-educated parents still predicted greater access to advanced middle school mathematics.

One surprising finding was that the proportion of school-free and reduced-price lunch eligibility was positively correlated with enrollment in advanced math, suggesting that in the schools that do offer advanced math courses, students from families with lower incomes are accessing them. Because this research suggests that the primary barrier to advanced math coursework is simply not having the courses available, the researchers suggest that universal access to advanced middle school math and auto-enrollment practices for eligible students should be considered. They also suggest that closing the achievement gap may come from frontloading early math learning opportunities for students. Overall, the authors suggest that the lack of math achievement is more due to a lack of exposure across the nation than a lack of ability amongst the nation's children.

Do Great Minds Think Alike? Gifted Male and Female Students' Perceptions of Mathematics (Calabrese et al., 2024)

This study investigated factors related to math performance in high-ability students, specifically focusing on gender differences. The authors note that the historical perception that males outperform females in mathematics has created an ever-widening disparity in success in math courses, pursuing math-related postsecondary studies, and future STEM careers. These gender gaps exist across international lines, and research has focused primarily

on standardized testing benchmarks, including assessments such as the Programme for International Student Assessment (PISA), the Trends in International Mathematics and Science Study (TIMSS), the SAT, and the ACT to explore the phenomenon quantitatively. Calabrese et al. (2024) qualitatively explored why gender differences in math performance might be an ongoing concern. They identified psychosocial characteristics (e.g., self-perception, self-concept, self-efficacy) and explored students' descriptions of the relationship between math self-beliefs and math achievement.

This qualitative study was conducted at a 10-day academic summer camp for high-ability students. The camp uses a rigorous application and assessment process; only students within the top 16% of scores were admitted. The authors interviewed 11th and 12th-grade camp participants who were high school students in the United States and had previously taken trigonometry or precalculus (n = 12, female = 5, male = 7). Six themes emerged from the study: perseverance, performance, self-efficacy, enjoyment of content, social component, and life relevance. An additional theme of adult influence emerged for female students.

For the perseverance theme, every student detailed the arduous process of completing an advanced-level mathematics course. For the performance theme, students explained how solving the puzzle of a mathematics course was immensely fulfilling. For the self-efficacy theme, the authors noted that student achievement was strongly tied to how students felt about their past performance. For the enjoyment of content theme, many students reported their genuine interest in advanced math, even when it was a required course. For the social aspect theme, students identified how collaboration and peer tutoring increased their motivation and supported achievement. For the relevance theme, most students expressed their desire to work in STEM-related fields and could articulate how math will play a role in their future. Finally, for the adult influence theme, female students in the sample noted that genuine expressions of support from teachers, parents, and other adults motivated them to continue their math pursuits.

The authors highlighted that male and female students responded similarly when asked about their perceptions of math ability and achievement. Both male and female students felt that math self-efficacy and understanding the relevance of math to their future careers contributed to their success in advanced math courses. Male students noted that their perseverance and performance led to their success, but female students identified positive reinforcement from other students and adults as integral to their success. These insights reinforce the need for positive educators who use encouraging instructional strategies to support students in developing mathematical talent.

The Effect of Student-Teacher Relationships on Students' Math Motivation Across EU Countries (Desmet et al., 2023)

This study investigated the association between students' perceptions of their relationships with teachers and students' attitudes toward mathematics in a large sample of 15-year-old students in 24 European Union countries who participated in PISA 2012. High- and low-achieving mathematics students were compared, accounting for individual and school characteristics that could influence the strength of the relationship between student-teacher relationships and math attitudes. Multilevel modeling was conducted, including potential moderators such as student sex, economic, social, and cultural status (ESCS), ability grouping, class size, and teacher intentions to promote social development, mathematics skills, and achievement. The authors were particularly interested in exploring any differences between high- and low-achievers in math as related to their perceptions of student-teacher relationships and the prevalence of ability grouping in their schools.

The analysis of this data showed that as student-teacher relationships became more positive, so did math attitudes. Math attitudes were significantly higher for male students than for females. As ESCS increased, math attitudes did as well. High-achieving students had higher math motivation and attitudes, and low-achieving students had less motivation or less positive attitudes toward math. Class size, ability grouping, and teacher intentions to promote mathematics did not significantly affect math attitudes. The relationship between student-

teacher relationships and math attitudes was not significantly strengthened or weakened by any moderators (e.g., sex, ESCS, high/low achieving).

This study reinforces the consensus that students' positive perceptions of their student-teacher relationships are associated with more positive attitudes about mathematics in general. These relationships were more important than school-level factors such as ability grouping and class size. In practice, schools and teachers can focus on building positive relationships with students. Professional development could provide strategies for developing a positive classroom climate, such as clear expectations, stable routines, and expressing care for students. Schools can also provide training and information to help teachers get to know their students as individuals through communication skills, specific praise, and supporting emotions (Desmet et al., 2023; Kincade et al., 2020).

The Past, Present, and Future of Research on Mathematical Giftedness: A Bibliometric Analysis (Ozdemir et al., 2024)

In this Gifted Child Quarterly article, Ozdemir et al. (2024) report the findings from a bibliometric analysis of studies of mathematical giftedness from 1960 to 2023. The authors begin with a discussion of definitions and terminology related to high potential in math and the historical progression of research on the development of mathematical talent. For this analysis, the authors used search terms that included mathematically gifted, mathematically talented, mathematically precocious, mathematically promising, and several others detailed in the article. The authors used Scopus databases to identify journals, articles, countries, institutions, authors, and research networks that published research on mathematical giftedness. They also identified key topics discussed in these articles and described the evolution of this body of work across three time periods (1960 to 1979, 1980 to 2011, 2012 to 2023).

There were 276 studies on mathematical giftedness from 1960-2023. The production peaked in 2011 with 16 articles, but the authors noted a marked decline in the number of articles beginning in 2015. The most prolific authors on this topic include Benbow, Lubinski,

and Stanley, who were all connected to the Study of Mathematically Precocious Youth (SMPY). Much of the research on math talent development came out of Johns Hopkins University and Vanderbilt University, which were both connected to SMPY. The research on mathematical giftedness has been published across journals in gifted education (e.g., Roeper Review, Gifted Child Quarterly, High-Ability Studies), but also educational psychology (e.g., Journal of Educational Psychology, Intelligence) and math education (e.g., ZDM Mathematics Education, Educational Studies in Mathematics) journals. The most common topic in articles from 1960-1979 was the educational needs of students with mathematical gifts and talents. That focus shifted from 1980-2011 when studies focused on specific ability clusters that support the development of math talent. The final period, 2012-2023, showed another shift to articles that examined ways to create supportive learning environments for the development of math talent.

There are several implications related to the findings of this study. This analysis identified key terms that have been more and less researched. These terms can provide scholars with future research directions that include building on more researched topics (e.g., gender differences, parent support, instructional strategies) and starting lines of inquiry on less researched topics (e.g., racial gaps, the role of technology). In addition, this analysis identified the need to examine math talent development for students who are twice-exceptional (e.g., learning difficulties, neurocognitive characteristics) and to view math talent development from a holistic perspective (e.g., academic achievement, psychological well-being). This article presents a high-level overview of literature across seven decades to offer historical context for current discussions of math talent development.

## Conclusion

The articles in this review all focus on developing math talent, but each one provides a different way to think about this complex process. Many math classrooms have a wide range of student abilities, so differentiating can be challenging for teachers (Pederson et al., 2023). However, tailoring instruction to student needs can be much more manageable when

educators have a math curriculum that includes pre-differentiated, tiered lessons (Hayden et al., 2024). Beyond the curriculum, educators can also benefit from content-specific professional learning opportunities that include ongoing implementation support (Cody et al., 2024). In addition, educators can use technology (e.g., learning management systems, educational technology platforms) to make data-informed decisions about differentiating math instruction and accelerating advanced learners (Witherspoon et al., 2024).

School leaders who want to support math talent development for students must also consider ways to support educators through professional learning that includes instructional and relational strategies. Districts and schools have the opportunity to expand access to advanced math coursework through universal screening and automatic enrollment policies (Peters & Carter, 2023). However, in the classroom, student-teacher relationships are a critical factor related to students' attitudes about math and their persistence when math content becomes more challenging (Calabrese et al., 2024; Desmet et al., 2023). Although there is a long history of research on math talent development, there are many future directions left to explore (Ozdemir et al., 2024). As educators and school leaders, knowing what the research says can help guide decision-making, policy development, and classroom practice for students with math talent and potential.

## References

Advanced Mathematics Instruction, S.B. 2124 (2023). https://capitol.texas.gov/tlodocs/88R/billtext/html/SB02124S.htm

Assouline, S. G., & Lupkowski-Shoplik, A. (2010). Developing math talent: A comprehensive guide to math education for gifted students in elementary and middle school. Prufrock Press.

Assouline S. G., Colangelo N., VanTassel-Baska J., Lupkowski-Shoplik A. (2015a). A nation empowered: Evidence trumps the excuses holding back America's brightest students (Vol. 1). The Connie Belin & Jacqueline N. Blank International Center for

Gifted Education and Talent Development, The University of Iowa. http://www.accelerationinstitute.org/nation_empowered/Order/Default.aspx

Assouline S. G., Colangelo N., VanTassel-Baska J., Lupkowski-Shoplik A. (2015b). A nation empowered: Evidence trumps the excuses holding back America's brightest students (Vol. 2). The Connie Belin & Jacqueline N. Blank International Center for Gifted Education and Talent Development, The University of Iowa. http://www.accelerationinstitute.org/nation_empowered/Order/Default.aspx

Bernstein, B. O., Lubinski, D., & Benbow, C. P. (2019). Psychological constellations assessed at age 13 predict distinct forms of eminence 35 years later. Psychological Science, 30(3), 444-454. https://doi.org/10.1177/0956797618822524

Calabrese, J. E., Edmunds, M., Sanders, M. M., & Capraro, M. M. (2024). Do great minds think alike? Gifted male and female students' perceptions of mathematics. Journal for the Education of the Gifted, 47(1), 84-105. https://doi.org/10.1177/01623532231215091

Cody, R. A., Boldt, G. T., & Gubbins, E. J. (2024). How teachers make decisions in response to professional learning: A study on grade 3 differentiation in mathematics. Journal of Advanced Academics, 35(1), 156-185. https://doi.org/10.1177/1932202X231221143

Desmet, O. A., Camargo Salamanca, S., Lee, H., & Tuzgen, A. (2023). The effect of student–teacher relationships on students' math motivation across EU countries. Journal of Advanced Academics, 34(3-4), 271-299. https://doi.org/10.1177/1932202X231218048

Coffey, M., & Tyner, A. (2023). Excellence gaps by race and socioeconomic status. Thomas B. Fordham Institute. https://fordhaminstitute.org/national/research/excellence-gaps-race-and-socioeconomic-status

Dixson, D. D., Peters, S. J., Makel, M. C., Jolly, J. L., Matthews, M. S., Miller, E. M., Rambo-Hernandez, K. E., Rinn, A. N., Robins, J. H., & Wilson, H. E. (2020). A call to reframe gifted education as maximizing learning. Phi Delta Kappan, 102(4), 22-25. https://doi.org//10.1177/0031721720978057

Gentry, M. Gray, A., Whiting, G. W., Maeda, Y., & Pereira, N. (2019). Gifted education in the United States: Law, access, equity, and missingness across the country by locale, Title I school status, and race. https://education.purdue.edu/geri/new-publications/gifted-education-in-the-united-states/

Guilbault, K. M. & Meyer, M. S. (2024). Toward equity and transparency: A content analysis of Florida elementary acceleration policies. Gifted Child Quarterly, 68(4), 316-339. https://doi.org/10.1177/00169862241265101

Hayden, S. M., Gubbins, E. J., Cody, R. A., & Boldt, G. T. (2024). Teachers' perceptions of differentiation following a math curriculum implementation study. Journal for the Education of the Gifted, 47(1), 3-29. https://doi.org/10.1177/01623532231215092

Kell, H. J., Lubinski, D., & Benbow, C. P. (2013). Who rises to the top? Early indicators. Psychological Science, 24(5), 648-659. https://doi.org/10.1177/0956797612457784

Kincade, L., Cook, C., & Goerdt, A. (2020). Meta-analysis and common practice elements of universal approaches to improving student-teacher relationships. Review of Educational Research, 90(5), 710-748. https://doi.org/10.3102/0034654320946836

Lubinski D., Benbow C. P., McCabe K. O., Bernstein B. O. (2023). Composing meaningful lives: Exceptional women and men at age 50. Gifted Child Quarterly, 67(4), 278–305. https://doi.org/10.1177/00169862231175831

Lupkowski-Shoplik A., Behrens W. A., Assouline S. G. (2018). Developing academic acceleration policies: Whole grade, early entrance, & single subject. http://www.accelerationinstitute.org/Resources/Policy_Guidelines/Developing-Academic-Acceleration-Policies.pdf

Makel, M. C., Kell, H. J., Lubinski, D., Putallaz, M., & Benbow, C. P. (2016). When lightning strikes twice: Profoundly gifted, profoundly accomplished. Psychological Science, 27(7), 1004-1018. https://doi.org/10.1177/0956797616644735

Özdemir, A., Sipahi, Y., & Bahar, A. K. (2024). The past, present, and future of research on mathematical giftedness: A bibliometric analysis. Gifted Child Quarterly, 68(3), 206-225. https://doi.org/10.1177/00169862241244717

Pedersen, B., Makel, M. C., Rambo-Hernandez, K. E., Peters, S. J., & Plucker, J. A. (2023). Most mathematics classrooms contain wide-ranging achievement levels. Gifted Child Quarterly, 67(3), 220-234. https://doi.org/10.1177/00169862231166074

Peters, S, J., & Carter, J. A. (2023). The where and why of accelerated middle-school mathematics. Gifted Child Quarterly, 67(3), 220-234. https://doi.org/10.1177/00169862231168472

Peters, S. J., Rambo-Hernandez, K., Makel, M. C., Matthews, M. S., & Plucker, J. A. (2017). Should millions of students take a gap year? Large numbers of students start the school year above grade level. Gifted Child Quarterly, 61(3), 229-238. https://doi.org/10.1177/0016986217701834

Plucker, J. A. & Peters, S. J. (2016). Excellence gaps in education: Expanding opportunities for talented students. Harvard Education Press.

Tyner, A. (2024). The broken pipeline: Advanced education policies at the local level. Thomas B. Fordham Institute. https://fordhaminstitute.org/national/research/broken-pipeline-advanced-education-policies-local-level

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes (M. Cole, V. John-Steiner, S. Scribner, & E. Souberman., Eds.; A. R. Luria, M. Lopez-Morillas, & M. Cole [with J. V. Wertsch], Trans.). Harvard University Press. (Original manuscripts [ca. 1930-1934])

Vygotsky, L. S. (1997). Educational psychology. St. Lucie Press. (Original work published in 1926)

Witherspoon, E. B., Pardo, M., Walters, K., Garrett, R., Hilbert, M., Ford, J., Hsin, L. B., Rodgers, M. A., Piriz, D. G., Burr, L., & Thornley, L. (2024). Teacher use of an online platform to

support independent practice in middle school mathematics during COVID-19 disruptions. AERA Open, 10(1), 1-19. https://doi.org/10.1177.23328584241230054