

How Professors Can Work With Schools to Provide Tutoring for Students With Learning Disabilities

Casey Hord*
Anna F. DeJarnette
University of Cincinnati

The authors describe how professors can work with schools (teachers and/or administrators) to create and implement a tutoring program designed to promote the learning of Algebra 1 by students with learning disabilities as well as provide a learning experience for undergraduates majoring in special education. From the professors' perspective, we report on our experiences with developing trusting relationships with schools, matching our tutoring services with the needs of the schools and its students, the logistics regarding setting up trainings and tutoring sessions, and how we provide a learning experience for special education majors and students with learning disabilities.

Keywords: Teacher Preparation, Tutoring, Special Education, Undergraduates

INTRODUCTION

Standardized testing puts extreme pressure on teachers in many countries (Berliner, 2011; Klenowski & Wyatt-Smith, 2012). Similarly, in the United States, special education teachers are faced with enormous pressure to ensure that students with learning disabilities (LD) succeed in gatekeeper courses such as Algebra 1 (Katsiyannis et al., 2007). Evaluation of their teaching is linked to student performance on high-stakes tests and performance on exit exams for certain courses (Croft et al., 2016; Every Student Succeeds Act, 2015). The stakes are also high for students with LD, who can access better opportunities in life if they advance through gatekeeper courses (Yseldyke et al., 2004). Students with LD do experience difficulties in mathematics, yet teachers can meet these needs and students with LD can succeed in mathematics if they utilize research-supported teaching techniques to support these students (Andersson, 2008; Marita & Hord, 2017). Therefore, it is crucial that special education and mathematics education professors (teacher educators) prepare future teachers to effectively teach students with LD. Tutoring programs, which can benefit both students with LD and pre-service teachers, are a potential way to (at least partially) address these challenges that students and teachers are facing (e.g., Maheady et al., 2004). The purpose of this article is to present the authors' perspective on how to design and implement a tutoring program that benefits education majors and students with LD.

Techniques for Teaching Students with LD

Visual representations are a key component of teaching when working with students with LD (Marita & Hord, 2017). Diagrams that represent the relationships between parts of problems and gestures that orient students to key information in problems—as well as how this key information is related—are often essential for

*Please send correspondence to: Casey Hord, Ph.D., Teachers College 600G, University of Cincinnati, 2600 Clifton Avenue, Cincinnati, OH 45221, USA, Email: casey.hord@uc.edu.

the learning of students with LD (Hord et al., 2016; Xin et al., 2008). These visuals support the memory and processing of students with LD; memory and processing, notably working memory, can pose a challenge for students with LD (Swanson & Siegel, 2001). For example, students with LD can struggle with processing, remembering, and combining multiple pieces of information (Swanson & Beebe-Frankenberg, 2004). When these pieces of information are challenging or unfamiliar to students with LD, they are even more likely to struggle (Barrouillet et al., 2007).

In the United States, Algebra 1 is a course that presents many situations where students have to work with multiple pieces of information simultaneously, and these pieces of information are often quite challenging for students with LD (Confrey et al., 2012; Hord et al., 2018). For example, Algebra 1 involves many types of multi-step equations that often contain difficult pieces of information to process, such as fractions within equations; students with LD sometimes struggle with fractions in general and combining the difficulty of fractions with multi-step equations can create challenging situations for students with LD (Hord et al., 2020). Therefore, it is crucial that teacher educators of special education majors effectively prepare their college students to meet this challenge of teaching Algebra 1 and other mathematics courses to students with LD.

Strategies for Preparing Undergraduates to be Special Education Teachers

In response to the needs of students with LD and the challenge of teaching these students, some teacher preparation programs have developed tutoring programs to provide real-world experiences for undergraduates upon which teacher educators can build learning experiences in teacher preparation courses so that academic content is more accessible; the college students are more likely to learn when the academic content is directly related to their experiences in the field (Leko et al., 2015). In these tutoring programs, often there has been mutually beneficial relationship where stakeholders benefitted from the teacher educators working to ensure that their programs met the needs of the school and its students as well as the education majors learning how to teach (e.g., Hord & DeJarnette, 2020; Maheady et al., 1996; Maheady et al., 2004).

Special education researchers have recommended that special education majors have opportunities to practice teaching in the field and have identified tutoring programs as a way to provide this opportunity (Leko et al., 2015). Undergraduates do tend to learn a lot from their fieldwork in tutoring programs (e.g., Watt & Wasburn-Moses, 2018). Teacher educators often have built their tutoring programs on a foundation of coordinating the needs of the school with the needs of the university; for example, the work of Maheady and colleagues (1996, 2004) has demonstrated this important principle. In 1996, Maheady and colleagues designed a tutoring program to support the learning of undergraduates tutoring struggling students on reading at a local school. The undergraduates expressed that they appreciated and enjoyed their experience, the students improved at reading and said they enjoyed participating in the program and getting to interact with college students, and school personnel indicated an appreciation for the need of that program saying “they needed ‘all the help they could get’ especially with regards to meeting the needs of their lowest

performing pupils” (p. 294). The teacher educators who designed and implemented the program said the following:

One important lesson we have learned from our restructuring efforts is that there is no shortage of need for individualized instructional services in the public schools. Ironically, there is also no shortage of need for direct instructional opportunities for pre-service educators in most teacher preparation programs (p. 295).

A key takeaway from this study is that the teacher educators worked together with the school to find an approach that was beneficial for the school as well as the university.

Maheady and colleagues also designed and implemented a tutoring program in 2004 with a similar structure and purpose. With this program, they focused on tutoring elementary students in spelling. The tutors were able to successfully implement the teaching of spelling as guided by the teacher educators and the elementary students demonstrated growth in spelling. Also, with this program, the teacher educators found a way to create a “win-win” situation with the school; the elementary students benefitted and the undergraduates had a positive learning experience that supported their growth toward becoming successful teachers.

With regards to math teaching, special education researchers have found that math tutoring can improve math learning for struggling learners at the elementary and secondary school levels (Fuchs et al., 2008; Jitendra et al., 2013; Karsenty, 2010). Other researchers have focused their mathematics tutoring programs on pre-service teacher training; for example, Watt and Wasburn-Moses (2018) focused on reading and mathematics tutoring program at the elementary and middle school levels with the goal of providing education majors opportunities for growth as teachers. In this study, the undergraduates’ math content knowledge improved as well as their knowledge of teaching considerations such as “student growth, acquisition of teaching strategies and alternate ways to teach content, and students’ general need for support in the area of mathematics” (p. 315). The teacher educators in the study developed a strong collaborative relationship with the teachers in the school, which the authors described as an ongoing productive partnership.

Recently, Hord and DeJarnette (2020), piloted a tutoring program that was focused on the design, implementation, and analysis of the training of five tutors at a time and per year working in a school one-on-one with students with LD enrolled in Algebra 1. The authors’ goal was to develop and refine this program and then scale it up a whole class size and embed it in a teacher preparation course. The authors found that developing a mutually beneficial relationship with the school and matching the focus of their program with the needs of the school can provide a strong foundation for a teacher education program. In this work, the tutors improved with their teaching and the students with LD improved with Algebra 1 content in response to research-supported teaching strategies (e.g., gestures and strategic questioning) implemented by the tutors (Hord et al., 2020).

Purpose of this Article

These studies provide examples for how tutoring can be designed to meet the needs of students with LD while simultaneously providing learning experiences for undergraduates. These experiences can support college students’ growth as future

teachers and provide valuable experiences that can be utilized by teacher educators during the training and teaching of education majors. In the following sections, we will share our own experiences with a tutoring program and what we have learned with the goal that we can help teacher educators (and their collaborating teachers and administrators in local schools) who are planning to implement their own tutoring program as professional development for education majors. We will describe our steps for designing and implementing a tutoring program that provides benefits for a school and its students with LD enrolled in Algebra 1, as well as undergraduates studying to become special education teachers.

The purpose of this article is to describe how teacher educators can develop a tutoring program of their own that can be used to support students with LD in their local area as well as their own undergraduates. The principles that are demonstrated in this article about the teaching and learning of Algebra 1 can be applied to different levels of K-12 teaching and different academic subjects. There are key takeaways from this paper about how the mutually beneficial relationships between a school and university are what many would consider to be an ethical, as well as strategic, approach and about how field experience can be combined with classroom learning to support both college students (who will become teachers) and the students with LD in partnering schools.

Step 1: Finding a “Win-Win” with the School

Ideally, the first step in our programs has been to ask the school what they need and build on that information. In some cases, we have had a program in mind and asked the school if this program would be beneficial for them and then worked together to find a mutually beneficial situation. Either way, we do not proceed unless we have found a way to implement our tutoring program in a way that benefits the school. While we often rely on a former student (who is currently teaching in a school) as our point person, we never want to put any pressure on these people to accommodate us; we put the school first and that seems to put us in position to succeed.

Based on our experiences and our prior research (e.g., Hord & DeJarnette, 2020), we believe that the best learning experiences for our special education majors often will take place where the school needs us. That is often where the students are struggling the most and what the school is most concerned about. Where we are most needed is often the best place for our undergraduates to learn the most about how help someone who is really in need of support and help these struggling students to have overall learning experiences where they are also challenged to grow as critical thinkers about mathematics.

Step 2: Training Tutors

We recruit tutors from our special education and general education teacher training programs. Then we conduct tutor trainings throughout the tutoring program. Either during the school day at the school just before tutoring or at the university between students' classes, we meet with tutors, usually weekly, and train them on how to teach mathematics to students with LD. We focus on how to use visual aids—such as gestures, diagrams, or anyway that scratch paper can be beneficial—and how to question students in strategic ways that support students, but also challenge them

to think critically. We constantly connect the tutors' field experiences to the content we are teaching in the tutor training sessions. Sometimes, we analyze actual tutoring session excerpts with our undergraduates, and sometimes we ask tutors to analyze vignettes we have created to illustrate our key points. We have often analyzed patterns of questioning and we have also talked about what kind of gestures and other visual supports are helpful for students with LD especially in the context of Algebra 1. Throughout our training sessions, we strive to help undergraduates make connections between their actual experiences with their students and the teaching strategies we are trying to teach them.

We also have spent time on math anxiety; we have learned over time that we need to address this among both the tutors and the students with LD. We have also spent a lot of time on refreshing the memory of our undergraduates on Algebra 1 content; they often forget the math and tend to get stressed about it. As we learn more, we still focus on teaching strategies a lot in our trainings, but we tend to be focusing more and more on algebra content knowledge and how to manage the math anxiety of students with LD (and the anxiety of the college students as well). In general, we have noticed that unexpected issues can arise and we need to be prepared to make adjustments in our ongoing tutor trainings.

Step 3: Managing Logistics

Once we learn about the needs of the school and the students with LD at that school, we work to match tutors to the students with LD depending on the characteristics of both the tutors and the students. A real challenge is finding a way to work around undergraduates' busy schedules. We also have to be careful in selecting tutors that are responsible enough to provide effective tutoring and not be absent very often. We work with the teachers to match the tutors' schedules and availability to the times when the students with LD need to receive tutoring during the day. Usually, the teachers ask us to tutor their students during their regular math time, but we have also tutored students after school and during study halls. Our focus is on being there with well-trained, responsible, and motivated tutors when and where the students need us.

Throughout the implementation of our tutoring program, we have found that having a point person at the school is important for keeping things organized (weekly maintenance) and communicating with the tutors about the math that week. We have learned that tutors get stressed when they do not know what content they will be expected to teach that day and working with our point person weekly can help us to alleviate this anxiety. Our current point person is a former student of one of the authors and former tutor in one of our programs. We have found that having a point person with whom we already have developed a mutually beneficial and trusting relationship is often a key factor in an effective tutoring program overall and often leads to better communication between the tutors, the teachers, and the teacher educators. We have also benefitted from being present at the school for weekly trainings and sometimes to monitor tutoring sessions. We currently conduct trainings at the school and it has benefitted us to be there in case a tutor is absent or if we need to work something out with the teachers at the school.

Step 4: Checking on the Progress of Tutors and Students

Once the tutoring sessions are organized and we have established how we will communicate with school personnel, there is a need to monitor the effectiveness of our program with the students as well as to ensure that our tutors are improving in their work and learning how to be effective teachers during this process. We record our tutoring sessions with document cameras to carefully monitor how the tutors use visual representations—often with a focus on gestures and how the tutors help the students use scratch paper to show their work—and how the tutors ask questions to support the conversations they have with their students about mathematics. We continuously analyze the video of sessions to see if students with LD are learning, as well as, if our tutors are implementing the teaching strategies we are trying to teach and improving overall as tutors.

We have learned that providing weekly trainings designed to teach our undergraduates effective teaching techniques, such as how to gesture and ask questions strategically, often leads to continued learning for our tutors. Careful planning of trainings on teaching strategies, and continuous connecting between the real-world experiences of the tutors and teaching content we are trying to teach, tends to lead to the ongoing learning of the tutors. The connection to tutoring sessions with our trainings on teaching strategies seems to help our students think critically about the pedagogical considerations we are focused on.

We have also noticed that unexpected issues often arise that require adjustments to our tutor trainings. For example, during the first year of our current tutoring program, we learned that math anxiety among students with LD was a key consideration that we needed to address. The students often got stressed about the mathematics to the point that they displayed avoidance behaviors (e.g., texting with their phones) and/or had lots of difficulty focusing on the critical thinking they needed to do to succeed with the math due to focusing instead on how stressed they were. After noticing this trend, we decided to spend more time on teaching our tutors how to help students manage anxiety by reassuring them and also how to balance their questioning by asking more direct and instructive questions, or even prompts, when students were struggling and upset and asking more challenging questions when students were feeling more confident and experiencing more success. Experiencing a pattern of success, sometimes due to strategic questioning and the use of visuals, has often led to less anxiety among the students with LD.

Also, regarding questioning, we have noticed before that some tutors were working so hard to challenge students with more difficult and open-ended questions that they were not providing enough support to keep the students moving forward when they were struggling. Our enthusiasm about ensuring that our tutors asked challenging questions to provide opportunities for students to think critically may have led to tutors over-focusing on this part of teaching and not feeling as comfortable as needed with sometimes asking more instructive questions to keep students moving forward in a time of challenge and uneasiness. We adjusted our trainings accordingly to help our tutors find a better balance in their questioning.

We also learned that we needed to adjust some of the focus of our trainings to spend more time teaching Algebra 1 content to our tutors. They expressed to us that they had forgotten much of the math content since they were secondary level

students and this was creating a lot of anxiety for them. Finding out what the math content would be for the upcoming week from our point person at the school did help us with alleviating some of math anxiety of our tutors; giving them time to prepare for teaching particular content was often beneficial. And, in addition to devoting time in tutor trainings to teaching math content, we also adjusted how we talked about strategic questioning to find ways for students to “buy time” by asking more general questions that gave the student more time to think as well as the tutor. We also worked to convince the tutors that it was okay if they forgot some things and had to look things up on the internet; the tutor can frame this situation for the students as a case where they can learn the concept together. In general, we found ways to arrange our program where students could prepare on their own better and focus more time on managing their own anxiety through the use of better teaching techniques. The tutors having good strategies led to more success as a tutor which led to less anxiety for them.

In general, unexpected issues can arise that impede the progress of both tutors and students. Careful monitoring and management of these issues are important for meeting the initial goals of the program and adjusting to newfound challenges and corresponding new goals that need to be set and met by the program leaders. Overall, we have learned that carefully monitoring the progress of tutors and students and making key adjustments accordingly can lead to continuous improvement of our tutoring program.

Step 5: Looking Back and Finding Ways to Improve for the Next Year

As the school year comes to an end, there are always ways to examine what happened during the year and look for ways to improve for the next year. For example, after our first year of our current tutoring program, we learned to focus more on the learning of Algebra 1 content by our tutors and dealing with the math anxiety of both our tutors and their students. In addition to on-going analysis of video data during implementation of the tutoring program, we have learned to carefully analyze video and think retrospectively after each year about our work during tutor trainings. We also video record and analyze our tutor trainings to evaluate how effective our own teaching was during tutor trainings. For example, we have identified situations where the discussions during tutor trainings were overly focused on tutors’ experiences as a learner in secondary school and under-focused on their experiences as a tutor teaching Algebra 1 to students with LD. We made adjustments to focus more intensely on vignettes or actual events during their tutoring session and re-directed the conversation when it became less productive.

Retrospective analysis of a year working with tutors and then working with students is essential in general for continued improvement, due to key adjustments, of our tutoring programs. Our goal is to improve each year, and we have often been able to do this by carefully analyzing video of tutor trainings and tutoring sessions with students with LD. We have learned that there is no amount of planning ahead of time that makes us immune to unexpected challenges. However, we have also learned that identifying these challenges gives us opportunities to adjust and be more effective with our programs.

Key Takeaways

While our work has been on the topic of algebra and students with LD, we believe that our findings are applicable to other academic topics and to students with other disabilities and even students without disabilities who could use some extra help. While more research is needed in different subjects, the impact of tutoring has been substantial in studies of other academic subjects such as reading and spelling (Maheady et al., 1996; Maheady et al., 2004). In our work on math tutoring, we have found that a key foundation for a tutoring program is establishing a mutually beneficial relationship with a school. This approach is best for the school and the long-term success of teacher educators working with a school. This foundation is also best for the learning of tutors and students in a school; the agreed upon (by both the school and teacher educators) time and place where tutors are most needed is often where the best learning experiences are for undergraduates and also the best place to make a difference for students with LD. Then, getting the tutors in the right place at the right time and well-trained, based on this identified need, is essential for the tutoring program to make steps toward success.

Consistent and continuous monitoring, and corresponding adjustments, are essential for a tutoring program's success regarding the learning of both the tutors and the students. Expected and unexpected challenges will arise that need to be addressed. Also, on-going improvement of a tutoring program is dependent on analysis at year's end along with adjustments made for the next year of the tutoring program. In general, our work and the work of other researchers (e.g., Leko et al., 2015; Hord & DeJarnette, 2020) supports that getting education majors in the field and connecting their experiences to pedagogical concepts that faculty are trying to teach is a great way to improve a teacher preparation program. An added benefit is that these programs can make a difference for children in need of extra support, such as students with LD.

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REFERENCES

- Andersson, U. (2008). Mathematical competencies in children with different types of learning difficulties. *Journal of Educational Psychology, 100*(1), 48–66. <https://doi.org/10.1037/0022-0663.100.1.48>
- Barrouillet, P., Bernardin, S., Portrat, S., Vergauwe, E., & Camos, V. (2007). Time and cognitive load in working memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 33*(3), 570–585. <https://doi.org/10.1037/0278-7393.33.3.570>
- Berliner, D. (2011). Rational responses to high stakes testing: The case of curriculum narrowing and the harm that follows. *Cambridge Journal of Education, 41*(3), 287–302. <https://doi.org/10.1080/0305764X.2011.607151>
- Confrey, J., Nguyen, K. H., Lee, K., Panorkou, N., Corley, A. K., & Maloney, A. P. (2012). *Turn-on common core math: Learning trajectories for the common core standards for mathematics*. <http://www.turnonccmath.net>
- Croft, S. J., Roberts, M. A., & Stenhouse, V. L. (2016). The perfect storm of education reform: High-stakes testing and teacher evaluation. *Social Justice, 42*(1), 70–92.

- Every Student Succeeds Act, Pub. L. No. 114–95, Stat. 1177 (2015).
- Fuchs, L. S., Seethaler, P. M., Powell, S. R., Fuchs, D., Hamlett, C. L., & Fletcher, J. M. (2008). Effects of preventative tutoring on the mathematical problem solving of third grade students with math and reading difficulties. *Exceptional Children*, 74(2), 155–173. <https://doi.org/10.1177/001440290807400202>
- Hord, C., & DeJarnette, A. F. (2020). Perspectives on Algebra I tutoring experiences with students with learning disabilities. *Learning Disabilities: A Contemporary Journal*, 18(2), 177–192.
- Hord, C., Ladrihan, E., & Saldanha, R. L. (2020). A student with a learning disability and multi-step equations with fractions. *Learning Disabilities: A Contemporary Journal*, 18(1), 113–123.
- Hord, C., Marita, S., Ayaz, S., Tomaro, T. M., Gordon, K., Tunningley, J., & Haskins, S. (2018). Diverse needs of students with learning disabilities: A case study of tutoring two students in algebra. *Journal of Research in Special Educational Needs*, 18(1), 25–35. <https://doi.org/10.1111/1471-3802.12415>
- Hord, C., Marita, S., Walsh, J. B., Tomaro, T. M., Gordon, K., & Saldanha, R. L. (2016). Teacher and student use of gesture and access to secondary mathematics for students with learning disabilities: An exploratory study. *Learning Disabilities: A Contemporary Journal*, 14(2), 189–206.
- Jitendra, A., Rodriguez, M., Kanive, R., Huang, J., Church, C., Corroy, K., & Zaslofsky, A. (2013). Impact of small-group tutoring interventions on the mathematical problem solving and achievement of third-grade students with mathematics difficulties. *Learning Disability Quarterly*, 36(1), 21–35. <https://doi.org/10.1177/0731948712457561>
- Karsenty, R. (2010). Nonprofessional mathematics tutoring for low-achieving students in secondary schools: A case study. *Educational Studies in Mathematics*, 74(1), 1–21. <https://doi.org/10.1007/s10649-009-9223-z>
- Katsiyannis, A., Zhang, D., Ryan, J. B., & Jones, J. (2007). High-stakes testing and students with disabilities: Challenges and promises. *Journal of Disability Policy Studies*, 18(3), 160–167. <https://doi.org/10.1177/10442073070180030701>
- Klenowski, V., & Wyatt-Smith, C. (2012). The impact of high stakes testing: The Australian story. *Assessment in Education: Principles, Policy & Practice*, 19(1), 65–79. <https://doi.org/10.1080/0969594X.2011.592972>
- Leko, M. M., Brownell, M. T., Sindelar, P. T., & Kiely, M. T. (2015). Envisioning the future of special education personnel preparation in a standards-based era. *Exceptional Children*, 82(1), 25–43. <https://doi.org/10.1177/0014402915598782>
- Maheady, L., Harper, G. F., Mallette, B., & Karnes, M. (2004). Preparing preservice teachers to implement class wide peer tutoring. *Teacher Education and Special Education*, 27(4), 408–418. <https://doi.org/10.1177/088840640402700408>
- Maheady, L., Mallette, B., & Harper, G. F. (1996). The pair tutoring program: An early field-based experience to prepare general educators to work with students with special learning needs. *Teacher Education and Special Education*, 19(4), 277–297. <https://doi.org/10.1177/088840649601900402>
- Marita, S., & Hord, C. (2017). Review of mathematics interventions for secondary students with learning disabilities. *Learning Disability Quarterly*, 40(1), 29–40. <https://doi.org/10.1177/0731948716657495>
- Swanson, H. L., & Beebe-Frankenberger, M. (2004). The relationship between working memory and mathematical problem solving in children at risk and not at risk for serious math difficulties. *Journal of Educational Psychology*, 96(3), 471–491. <https://doi.org/10.1037/0022-0663.96.3.471>

- Swanson, H. L., & Siegel, L. (2001). Learning disabilities as a working memory deficit. *Issues in Special Education, 7*(1), 1–48.
- Watt, S. J., & Wasburn-Moses, L. (2018). The use of a collaborative math tutoring model to improve content knowledge among candidates. *Mentoring & Tutoring Partnership in Learning, 26*(3), 305–319. <https://doi.org/10.1080/13611267.2018.1511950>
- Xin, Y. P., Wiles, B., & Lin. Y. (2008). Teaching conceptual model-based word problem story grammar to enhance mathematics problem solving. *The Journal of Special Education, 42*(3), 163–178. <https://doi.org/10.1177/0022466907312895>
- Ysseldyke, J., Nelson, R., Christenson, S., Johnson, D. R., Dennison, A., Triezenberg, H., Sharpe, M., & Hawes, M. (2004). What we know and need to know about the consequences of high-stakes testing for students with disabilities. *Exceptional Children, 71*(1), 75–95. <https://doi.org/10.1177/001440290407100105>