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Perceptions by High School Teachers of Mathematical Readiness of Students with Disabilities Transitioning to College

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PERCEPTIONS BY HIGH SCHOOL TEACHERS OF MATHEMATICAL READINESS OF

STUDENTS WITH DISABILITIES TRANSITIONING TO COLLEGE

by

Adam Dwight King

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ABSTRACT

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by

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Students with mild/moderate disabilities frequently experience difficulty in mathematics in high school, and thus are often unprepared for math in college. The student researcher conducted a survey examining the perceptions regarding mathematical readiness of such students by professionals who work with them in high school. Participants included 47 high school special education teachers who completed an online questionnaire about the preparedness of students with disabilities in various mathematical constructs (i.e., algebra, geometry, number sense, calculator skills, and study skills) and the importance of those constructs using Likert-type rankings, as well as perceptions of barriers for transitioning to college. Ratings of student preparedness were low, with a variety of perceived barriers related to family, student, system, and teacher factors. A wide range of potential solutions was also offered, including more parent involvement, more study time and perseverance, better teaching/greater accountability from teachers in younger grades, more co-teaching/less pull-out classes, more math labs in upper grades, more math exposure and practice/math every day, and making math more interesting and applicable/gain student buy-in. Results have implications in terms of the need for greater mathematical preparation for students with disabilities transitioning to college, the importance of teacher perception, and for greater communication and collaboration between high school special education teachers and college disability resource center personnel to increase that preparation.

(91 pages)

PUBLIC ABSTRACT

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More and more students with mild disabilities enroll in and attend college. However, test scores and other achievement measures show that they are well behind their regular education peers in math achievement, and thus unprepared for the rigors of college. While much has been done to revise laws and policy involving students with disabilities and academic core standards to increase preparedness, it is still what happens in the classroom that has the greatest effect on student preparation. Due to the nature of pullout/resource classes where pacing is typically slower and less content is covered, special education teachers make a myriad of decisions every day about what to cover in depth, what to reteach, and what to leave out entirely. Thus, teacher perceptions about student math abilities and the importance of specific math topics and college attendance are critical, because they greatly influence those daily instructional choices.

The student researcher conducted a survey to determine high school special education teacher perceptions of student math preparation for college. Participants included 47 teachers from across the state. Question format was either rating scale based or open-ended. The ideas surveyed included student ability and topic importance in specific math skills, calculator skills, and study skills. Teachers were also asked about time spent teaching those topics, student strengths and weaknesses, and barriers and solutions to math preparation. In general, participants believed that their students have potential to be more than “somewhat successful in college” and that is more than “important” for them to attend college. However, they perceive their students to be less than “adequately” prepared mathematically, indicating a large gap. Areas of particular concern were calculator skills, study skills, and reasoning and generalization. Participants also offered a wide variety of perceived barriers (lack of parent involvement, low student motivation, and that it is too late by the time students reach high school, etc.) and perceived solutions (more parent involvement, better teaching in younger grade, etc.). The study has implications that educators need to implement solutions to increase math preparation for students with disabilities.

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INTRODUCTION

Students in the U.S. achieve at lower levels in mathematics when compared to students from other countries. One source of information about this relatively low math achievement is the *Trends in International Mathematics and Science Study* (TIMSS), an extensive comparative study of student achievement in math and science across 36 countries. The 2007 iteration of TIMSS has shown that U.S. students in fourth and eitgth grade, while still above the international median, were significantly lower than the leading countries in achieving benchmarks (National Center for Education Statistics, 2007). Furthermore, the study showed that U.S. scores declined as students aged. Similarly, in the *Program for International Student Achievement* (PISA), another cross-national study, the U.S. was shown to be below the international average in mathematical literacy (Organization for Economic Co-Operation and Development, 2004). Experts have been concerned that this discrepancy puts the U.S. behind in a global economy with increasing emphasis on jobs requiring skills in math, science, technology, and engineering.

A similar problem also exists on a more domestic level involving comparisons of students with and without disabilities. In public schools in the U.S., students with disabilities fall far behind their nondisabled peers in math achievement. As early as 1989, Cawley, Kahn, and Tedesco found that students with learning disabilities are often 5 to 6 grade levels behind their peers upon graduation. Also, research has shown that students with learning disabilities often lag even further behind in math abilities over the years (Cawley, Parmar, & Smith, 1995, as cited in Parmar & Cawley, 1997). Further contributing is the fact that students with disabilities drop out of high school at twice the rate of their nondisabled peers (Olson, 2004). This achievement gap in public school puts students with disabilities at a disadvantage for succeeding in postsecondary education and gaining and maintaining meaningful employment in competitive local markets. Wolanin and Steele (2004) reported that while 73% of students with learning disabilities enroll in higher education (compared to 84% of their peers without disabilities), only 28% of students with disabilities achieve diplomas in 4-year institutions (compared to 54% of peers without disabilities).

For the past two decades, educators have established initiatives to remedy the gap in mathematical readiness for the general population. A frequently used solution has been to change *what* is taught by revising math standards and objectives, the most recent iteration being the Common Core State Standards in 2011. Furthermore, the National Science Board (2007) recommended improved coherence in the nation's educational system and well-prepared, highly-effective teachers in the areas of science, technology, engineering, and mathematics. Interestingly, not only has the mathematical content been under scrutiny, but also *how* it is taught. In 2007, the *Collective Foundations Project*, a multidisciplinary group working to create a “collective vision” of math improvement, called for teaching in nontraditional methods rather than simply changing content, while noting that it may be “ill advised” to model high school mathematics courses after college courses (Marcus, Fukawa-Connelly, Conklin, & Fey, 2007, pp. 355-356). While many teachers have worked fervently to apply these changes in their classrooms, challenges and demands associated with implementation and student ability have resulted in them feeling unprepared (Gewertz, 2013) and moving more quickly through the content. This consequential loss of needed differentiated instruction and individualization has also contributed to the learning gap for students with disabilities (Hawkins, 2007; Powell, Fuchs, & Fuchs, 2013).

Lawmakers have also worked to remedy this problem and assist students with disabilities through revisions to Special Education (SPED) policy. In 2004 Congress included improvements to transition planning as part of the reauthorization of the Individuals with Disabilities Education Improvement Act (IDEIA, 2006), the intent of which being to help educators systematically prepare students with disabilities for post-secondary education, employment, and independent living. These changes require a transition plan for students no later than age 16. Individual Education Plan (IEP) teams conduct formal and informal assessments to identify student's strengths, preferences, interests, and needs. Transition plans are then created to help the students work towards identified transition goals through a coordinated set of results-oriented activities. However, many transition plans, while being technically compliant, are often inadequate for helping students to prepare for postsecondary education. Statistics have shown that many traditionally employed SPED services (i.e. having as many accommodations as possible, course waivers, etc.) are short-term solutions and may actually lead to reduced preparedness and transition outcomes (Field, Sarver, & Shaw, 2003; Horn, Berktold, & Bobbit, 1999).

While SPED services under IDEIA end when the student graduates (or exceeds age 21), services for students with disabilities are still available in colleges under Section

504 of the Rehabilitation Act of 1973 (2006; Section 504) and the Americans with Disabilities Act Amendments Act in 2008 (ADAAA, 2009). Interestingly, a recent change has also taken place in these policies affecting eligibility and services in college. Congress reauthorized the ADAAA with the intent of broadening the definition of disabilities and major life activities so that many more people could qualify as disabled, opening the door of eligibility, and potentially accommodation plans, to more people than ever before. However, under the ADAAA and Section 504 (but not under IDEIA), a student must be otherwise qualified in learning and performing the essential functions of the courses and programs, and any accommodations must not fundamentally alter the nature of the program. Postsecondary institutions typically require additional documentation of disability and impact, and are very thorough in determining whether an accommodation is truly needed and will be allowed for the student, and in what classes. Consequently, accommodations granted at the college level are typically much less extensive than those received by students in public school, and more is required of the students. Previously listed accommodations on the IEP from high school are viewed as recommendations only, and need not necessarily be followed by the college. This can be confusing and disconcerting to students and families, who may have developed a reliance or even overdependence on such IEP services. The question arises: Are such students, despite their disabilities and even with the help of accommodations, qualified and ready to go to college?

The construct of *college readiness* is thus critical, but accurately describing it is problematic. Conley (2008) defined it as “the level of preparation a student needs in order to enroll and succeed—without remediation—in a credit-bearing general education course at a postsecondary institution that offers a baccalaureate degree or transfer to a baccalaureate program" including the essential components of key cognitive strategies, content knowledge, academic behaviors, and contextual skills and knowledge (p. 24). Unfortunately, efforts to establish benchmarks on specific strategies, knowledge, behaviors, and skills by numerous groups (i.e. public schools, postsecondary institutions, and national organizations) has proven varied and difficult, particularly with ever-changing ideas about what is important. In fact, the idea of high schools and colleges creating their own definitions may have actually contributed to the gap between the two settings. McCormick and Lucas (2011) noted that college readiness at the secondary level is usually signified by "successful completion of a required number of high school mathematics courses" while at the post-secondary level it is "more often judged by scores on institutional placement exams or on nationally recognized college entrance exams" (p. 5). However, Carey (2004) noted that one in five students entering public colleges must take remedial courses. Other experts state that even students without disabilities come to college unprepared academically (Corbishley & Truxaw, 2010; Hing Sun, 2005). Thus, while the many students may not fit certain definitions of college readiness (whether disabled or not), they are indeed enrolling and taking classes.

With such differing ideas of what constitutes college readiness, the perceptions of those who are preparing students in the classroom become even more important. No matter what new emphasis to mathematical content, disability laws, and teaching practices has been advocated by educational and governmental leaders, these high school teachers still ultimately determine what is emphasized and how it is taught in their classrooms. While much has been documented to show the achievement gap through student data (i.e., grades, test scores, and other performance measures), less has been done to determine the perceptions of high school teachers about student preparedness and achievement mathematically (see Literature Review, below). This holds true not only for the general population of students, but also for students with disabilities (the subpopulation that this study targets). In resource math classes where the students with disabilities are taught using a pull-out model away from the general population, they typically progress at a slower pace and cover less content. Because of this, resource teachers must make even more decisions about what students are capable of learning, what new content is important enough to cover, what past content needs to be retaught, and what should be left out entirely. Thus their perceptions about content importance and student capability exert a powerful influence on math achievement, college preparedness, and the achievement gap.

Literature Review

With that in mind, the goal of the student researcher was to identify studies in the literature that systematically examined educator perceptions about mathematic readiness for students with disabilities moving to postsecondary education. He searched the electronic databases of EBSCO Host, Google Scholar, and ProQuest Dissertation and Theses. Search terms included *postsecondary, college, preparation, mathematics,* *disabilities, readiness, perception, high school,* and *faculty* in various combinations. Search results yielded dozens of articles; however, very few were empirical studies; most were position and recommendation papers. The student researcher also reviewed the reference lists of the articles in the search, and elicited suggestions from knowledgeable professors, including one (Corbishley & Truxaw, 2010) whose research has appeared in the literature. To date, the search has yielded two related studies yielding quantitative and/or qualitative data.

In her doctoral dissertation, Harms (2010) interviewed 10 college mathematics faculty (teaching experience: mean = 11 years, range = 3-21 years) from three colleges in South Dakota who taught college algebra. Her purpose was to explore college mathematics faculty perceptions about how to effectively prepare college-bound students to be successful in college algebra in order to "facilitate curriculum development and advisement in high schools, thereby increasing college math preparedness" (p. 4). The author followed a structured interview guide which contained 11 open-ended questions about perceptions and recommendations. These semi-structured interviews were conducted one-on-one and lasted 30 - 45 min each. The interviews were recorded and notes were taken for non-audible responses, and results were reviewed and analyzed for clusters of meaning and trends. Five common themes were generated by multiple interviewees: (a) the need for higher expectations from high school math teachers, (b) the need for better basic study skills, (c) the need for students to take math all 4 years of high school, (d) the need for students to have better basic math skills (i.e., addition, subtractions, multiplication, division, decimals, fractions, order of operations, solving equations), and (e) that students had an overdependence on calculators. She concluded that these results were comparable to other studies showing student performance measures. These results are also similar to those viewpoints of experts who have called for changes to teaching practices and not simply content standards (Marcus et al., 2007). Because of this, Harms recommended that high schools examine and make adjustments in all five areas. Finally, she noted that her work could be extended by applying the same research design to discover perceptions of high school teachers and college freshmen as well.

Corbishley and Truxaw (2010) also studied faculty perceptions of mathematical readiness of students entering college by employing a quantitative and qualitative format. To do so, they developed a questionnaire using math standards and professional literature to identify relevant mathematical subject matter. Four main math constructs were identified, which consisted of subject knowledge, measurement and data representation, number sense, and mathematical reasoning and generalization. The questionnaire contained 30 questions about these mathematical skills where respondents rated specific abilities of average incoming freshman on a scale of 0 – 5 (0 = never; 1 = very poor; 2 = poor; 3 = adequate; 4 = proficient; 5 = excellent), and the important of those skills for college mathematics on a scale of 0 – 2 (0 = not important; 1 = somewhat important; 2 = very important). Additionally, the questionnaire contained six questions about the faculty themselves and the number of students they taught, as well as three open-ended questions that provided opportunities for additional experiences and responses. However, the authors did not assess the survey for reliability or validity. The questionnaire was administered electronically to college faculty (*n* = 22) who taught freshman level math classes at eight 2- and 4-year colleges in a northeastern state. The authors analyzed the results by calculating means and standard deviations of each question and construct area. Because of the small sample size, they did not perform a factor analysis on the construct areas.

Results from Corbishley and Truxaw's (2010) four areas are shown in Table 1. Interestingly, college faculty perceptions showed that incoming freshman were the least prepared in the area judged most important (reasoning and generalization), while they were the most prepared in the second least important area (measurement and data). Furthermore, the free response items were coded according to the original constructs, and to identify themes and perceptions not previously identified. While free response results seemed to corroborate the scaled results, other salient themes emerged:

Table 1
Means and Standard Deviations for Overall Constructs from Corbishley and Truxaw (2010)

Mathematical construct	Perceived student skill [a]		Perceived importance [b]	
	Mean	*SD*	Mean	*SD*
Subject knowledge	2.17	1.032	1.52	0.666
Number sense	2.26	1.340	1.28	0.686
Measurement and data	2.72	1.149	1.33	0.767
Reasoning and generalization	1.72	0.944	1.74	0.514

[a] Ability measured on a 0-5 scale: 0 = never, 1=very poor, 2=poor, 3=adequate, 4=proficient, 5=excellent
[b] Importance measured on a 0-2 scale: 0 = not important, 1=somewhat important, 2=very important

incoming freshman were perceived as over reliant on calculators while lacking in independent study skills. The authors concluded that while their study could not be generalized to all incoming freshman, those who were represented by the sample were perceived as not ready for college mathematics, particularly in the areas of algebra and reasoning and generalization. They found this compatible with other empirical studies about student deficits. These findings also seem compatible with Harms (2010), particularly in that students are lacking in study skills and over-reliant on calculators. Finally, Corbishley and Truxaw (2010) noted that their work may be extended by enlarging sample size, defining more clearly the target student population, and by investigating perceptions of high school mathematics teachers along similar lines.

Purpose Statement and Research Questions

As can be seen through the literature review, with such limited research on educator perceptions of mathematical readiness, more investigation was needed. Existing research at the time was limited to perceptions of college faculty on the general population of incoming freshmen. No research was found on perceptions of preparedness using ratings of high school math teachers. Further, no research was found about the perceived abilities of any subpopulation, particularly students with mild/moderate disabilities. More specifically, no survey data have been collected on students with disabilities in terms of their preparedness for college math. Thus, the intent of this research was to adapt and extend Corbishley and Truxaw's (2010) work to determine the perceptions of mathematics readiness for students with mild/moderate disabilities transitioning to college, using high school SPED teachers as informants. Given a survey of approximately 40 SPED teachers at the high school level, this descriptive study addressed the following research questions:

1. To what extent do SPED teachers perceive students with mild/moderate disabilities who have postsecondary education goals to be prepared for math at the college level (i.e., 2 or 4-year college)?
2. What do SPED teachers perceive as barriers to such math preparedness, and possible solutions?
3. To what extent do ratings of student preparedness correspond with ratings of perceived potential college success?

METHOD

Participants and Setting

Participants were SPED math teachers from high schools in Utah. These teachers provide the perspective of educators responsible for preparing students with disabilities in a pull-out classroom for college. Regular education teachers from the general setting were not asked to participate. A recruitment email was sent to multiple potential participants by the student researcher, and teachers chose to participate in the survey by clicking on a link in the email (see “Procedure” below). There may have been multiple participants from the same school. The students with whom these SPED teachers worked and on whom they based their perceptions for this survey were junior and senior students with mild/moderate disabilities (i.e., learning disabilities, attention deficit/hyperactivity disorder, Asperger syndrome and autism spectrum disorders, emotional disabilities and behavior disorders, and traumatic brain injuries; Elksnin & Elksnin, 2010) where the students may still be otherwise qualified for college requirements. Student disability was not a controlled variable in this study because such students are typically taught together in high school using a pull-out resource model regardless of their disability; thus their mathematical preparation was similar. Furthermore, the students had to be receiving special education services for math in a pull-out setting away from general education and have postsecondary education goals on their IEPs to attend a 2- or 4-year college at some time after graduation. Students in 18- to 22-year-old special education programs in public schools (i.e., post-high school programs) were not included. Additionally, students with mild/moderate disabilities who are receiving 504 services but not special education math services were not included, as they are typically taught in the regular education math classroom rather than using the pull-out model. The questionnaire and protocol were approved by the Institutional Review Board (IRB) prior to data collection.

Questionnaire

Development of the Questionnaire

The student researcher adapted Corbishley and Truxaw's (2010) work in creating the questionnaire for this study, and also included information from the common themes in Harm's (2010) work as well. First, the questionnaire asked demographic questions for classification purposes including approximate district size, years of teaching experience, gender, and approximate number of students they were basing their perceptions on (no names or other personally identifiable information were collected). The questionnaire then asked six questions about math readiness in Corbishley and Truxaw's four constructs: (a) subject knowledge (subdivided into three areas: algebra; geometry; and calculus, trigonometry, and probability), (b) measurement and data representation, (c) number sense, and (d) mathematical reasoning and generalization. Each question also provided a brief description of what was included in each construct. For example, one item stated: "Students possess subject knowledge of algebra (i.e., students are able to solve one-step equations, word problems, and two variable equations, combine expressions, graph functions, and find inverses)." The questionnaire then asked two questions about calculator skills and study skills. For these eight questions, participants ranked the student abilities on one Likert-type scale (1=very poor, 2=poor, 3=adequate, 4=proficient, 5=excellent) and the importance of the skill on another Likert-type scale (1= not at all important, 2=somewhat important, 3=important, 4=very important, 5=absolutely critical).

Additionally, two questions were asked about teacher belief on how successful students with mild/moderate disabilities could be in college (based on a Likert-type scale of 1=not at all successful, 2=rarely successful, 3=somewhat successful, 4=successful, 5=highly successful) and how important it is for such students to attend college (based on a Likert-type scale of 1= not at all important, 2=somewhat important, 3=important, 4=very important, 5=absolutely critical). Finally, the questionnaire asked seven open-ended questions about math preparedness and barriers and solutions, where participants were able to note any other concepts they perceive as critical to math readiness and transitioning of students with disabilities, as well as their ideas on how to strengthen student readiness and mathematical skills. For example, one item stated: "What are some mathematical skills and topics that students with mild/moderate disabilities are lacking when entering college?" (see Appendix A for the complete questionnaire). The questionnaire and protocol were developed in compliance with IRB policies and approved as a study with minimal risk to participants.

Pilot Test of the Questionnaire

In order to ensure that the questionnaire was understandable to the participants and addressed the desired constructs, it was initially submitted to three SPED teachers to gather feedback. The student researcher made minor adjustments to the questionnaire and the email statement for teachers based on their suggestions.

Procedure

The survey was administered anonymously through an electronic questionnaire media (Qualtrics) sent out as a link in an email to high school SPED teachers from the student researcher. Consent was first obtained from the state SPED director, and she provided a statement showing approval and interest in results, which was copied and pasted in emails to district SPED directors and teachers. The student researcher then sent emails to district and charter school SPED directors across the state (also known as Local Education Agencies, or LEAs) seeking permission to administer the survey to their teachers, and if they gave consent, for a list of their teachers (and their email addresses) who fit the aforementioned requirements. Two reminder emails were sent to non-respondents after the initial email at weekly intervals (see Appendix B). During this process, it was discovered that some districts had a research proposal application that needed to be submitted and approved before any research could be conducted. The student researcher completed the application procedure in each case.

Upon receiving email addresses from directors, the student researcher then sent an email to potential participants' email addresses in blind copy fashion so that teachers remained anonymous to each other. The body of the email constituted a cover letter explaining the purposes of the survey and the requirements for participation. The IRB Letter of Information indicating project approval was attached to the email. If teachers chose to participate in the study, they click on the link in the email, which redirected them to the web-based questionnaire. Participants then completed the questions and clicked “submit” to finalize their answers. An initial round of emails was sent to potential participants, and then two reminder emails were sent out to all participants at weekly intervals thanking those who had responded and encouraging those who had not. Because the survey was administered anonymously online, no names of respondents were collected, so it was necessary to send the reminder to all collected email addresses (see Appendix C).

The online questionnaire program collected results from participants and generated a spreadsheet of responses. The student researcher sorted and analyzed the information. For the questions involving Likert-type scales, means and standard deviations were calculated. For the open-ended questions, responses were analyzed and coded for patterns. Data from the readiness and importance questions was analyzed in answer to research question #1. Data from the barriers and solutions questions was compiled and analyzed in answer to research question #2. Data was disaggregated based on perception of potential college success in answer to research question #3.

RESULTS

The student researcher sent the LEA recruitment email to SPED directors from all 127 LEAs across Utah, and 18 (14.2%) approved the distribution of the questionnaire and provided names of teachers. Within those that provided approval, 17 were districts and 1 was a charter school. Of the non-participating LEAs, 71 (55.9%) did not respond, 3 (2.3%) refused to participate, 32 (25.2%) did not have the required teachers and/or students, 1 (0.8%) gave approval but failed to provide names, and 2 (1.6%) were still in the formal approval process when the survey closed.

Special education directors from the 18 participating LEAs provided 88 teacher email addresses, to which the student researcher sent the teacher recruitment email. Overall, 47 participants responded to the questionnaire (53.4% response rate). Seven respondents (14.9%) did not answer all the questions. Of those participating, 23 (49.0%) were male and 24 (51.0%) were female. Additionally, 28 (60.0%) reported that they were from a large-sized district, 6 (12.8%) reported that they were from a medium-sized district, and 13 (27.7%) reported that they were from small-sized district (to help maintain anonymity, participants were not asked to state if they were from a charter school specifically). Participants reported a mean of 10.5 years of teaching experience (SD = 8.6 years) and that they were basing their perceptions on a mean of 36 students (SD = 30 students).

Data from this survey comprised three areas: (a) results from mathematical readiness questions, (b) results from open-ended questions about perceived barriers and solutions, and (c) comparison of ratings of student preparedness to potential college success. Results from these three areas are presented below.

Results from Mathematical Readiness Questions

In answer to research question #1, information from the mathematical construct rating scale questions (see Table 2) and related open-ended questions were analyzed. For each construct, means and standard deviations for both ability and importance were calculated. Furthermore, to provide a way to compare teacher perceptions within the study and the size of the gap between ability and importance, mean ability rankings were subtracted from mean importance rankings in each construct to determine a Rating Difference Score Thus, the larger the gap between student ability and construct importance, the larger the Rating Difference Score.

In general, mean rankings on all but two of the ability constructs were between 2 (poor) and 3 (adequate). One was slightly higher (3.02: use calculators appropriately), and the other was much lower (1.27: subject knowledge of calculus, trigonometry, and probability). Mean ratings on the importance constructs were more varied; one was between 2 (somewhat important) and 3 (important), two were between 3 (important) and 4 (very important), and five were between 4 (very important) and 5 (absolutely critical). Items rated most important included *possess necessary study skill, use calculators appropriately,* and *reason and generalize*. For each of the eight rated items, mean ability ratings were lower than mean importance ratings, usually by approximately two standard deviations. Specific results are present below in descending order of perceived student ability.

Use Calculators Appropriately

Participants were told that using calculators appropriately included not using them for basic calculation (multiplication tables, addition and subtraction, etc.), showing work on paper when needed, and having a conceptual knowledge of subjects even when calculator is used.

Table 2

Means and Standard Deviations for Rating Questions about Mathematical Constructs by High School SPED Teachers, and Rating Difference Scores

Mathematical construct	Perceived student ability [a]		Perceived importance [b]		Rating Diff. Score
	Mean	*SD*	Mean	*SD*	
#11 – Use calculators appropriately	3.02	1.04	4.15	0.88	1.13
#9 – Number sense	2.70	0.88	4.06	0.76	1.36
#5 -- Subject knowledge of algebra	2.55	0.83	4.06	0.79	1.51
#12 – Possess necessary study skills	2.49	0.83	4.53	0.93	2.04
#6 – Subject knowledge of geometry	2.38	0.77	3.77	0.81	1.39
#10 – Measurement and data	2.36	0.85	3.68	0.75	1.32
#8 – Reason and generalize	2.28	0.80	4.11	0.89	1.83
#7 – Subject knowledge of calculus, trigonometry, and probability	1.27	0.58	2.91	1.00	1.64

[a] Perceptions of the average student's ability as measured on a 1-5 scale: 1=very poor, 2=poor, 3=adequate, 4=proficient, 5=excellent

[b] Perceived importance measured on a 1-5 scale: 1= not at all important, 2=somewhat important, 3=important, 4=very important, 5=absolutely critical

The mean student ability rating in this area was 3.02 (*SD* = 1.04), which lies between "adequate" and "proficient." This was the highest ability construct, but had the most variability in responses. The mean importance rating was 4.15 (*SD* = 0.88), which lies between "very important" and "absolutely critical." This was the second highest importance construct. Also, this item evidenced the smallest difference between ability and importance (rating difference score of 1.13).

Number Sense

Participants were told that number sense included knowing multiplication and addition identity relationships, being aware of different number systems [integers, complex, real, imaginary, rational, and irrational], being able to use properties of integers to justify relationships between whole numbers, being able to do calculations with complex numbers, and being aware of multiple coordinate systems. The mean student ability rating in this area was 2.70 (*SD* = 0.88), which lies between "poor" and "adequate." This was the second highest ability construct. The mean importance rating was 4.06 (*SD* = 0.76), which lies between "very important" and "absolutely critical." This was tied for the median importance construct. Also, this item evidenced the third smallest difference between ability and importance (rating difference score of 1.36).

Subject Knowledge of Algebra

Participants were told that subject knowledge of algebra included being able to solve one-step equations, word problems, two-variable equations, combine expressions, graphs functions, and find inverses. The mean student ability rating in this area was 2.55

(*SD* = 0.83), which lies between "poor" and "adequate." This was the third highest ability construct. The mean importance rating was 4.06 (*SD* = 0.79), which lies between "very important" and "absolutely critical." This was tied for the median importance construct. Also, this item evidenced the fourth largest difference between ability and importance (rating difference score of 1.51).

Study Skills

Participants were told that study skills included class attendance, note-taking skills, test preparation skills, participation in class, pacing, self-motivation, and patience and persistence with the material. The mean student ability rating in this area was 2.49 (*SD* = 0.83), which lies between "poor" and "adequate." This was the fourth highest ability construct. The mean importance rating was 4.53 (*SD* = 0.93), which lies between "very important" and "absolutely critical." This was by far the highest importance construct, but also represented the least agreement among participants as evidenced by higher standard deviation. Also, this item evidenced the largest difference between ability and importance (rating difference score of 2.04).

Subject Knowledge of Geometry

Participants were told that subject knowledge of geometry included being able to determine similarity between objects based on properties, calculate the area of two-dimensional figures, and analyze properties of three-dimensional objects. The mean student ability rating in this area was 2.38 (*SD* = 0.77), which lies between "poor" and "adequate." This was the fourth lowest ability construct. The mean importance rating was 3.77 (*SD* = 0.81), which lies between "important" and "very important." This was the third lowest importance construct. Also, this item evidenced the fourth smallest difference between ability and importance (rating difference score of 1.39).

Measurement and Data

Participants were told that measurement and data included being able to represent angle measurements in degrees and radians, determine reasonable scale when measuring objects, represent given data using correct units, and use rulers, protractors, and compasses. The mean student ability rating in this area was 2.36 (*SD* = 0.85), which lies between "poor" and "adequate." This was the third lowest ability construct. The mean importance rating was 3.68 (*SD* = 0.75), which lies between "very important" and "absolutely critical." This was the second lowest importance construct. Also, this item evidenced the second smallest difference between ability and importance (rating difference score of 1.32).

Reason and Generalize

Participants were told that reasoning and generalizing included being able to problem solve, find connections between mathematical ideas, reflect on their own reasoning, develop and prove a conjecture, justify answers, use various forms of reasoning, and develop some form of proofs. The mean student ability rating in this area was 2.28 (*SD* = 0.80), which lies between "poor" and "adequate." This was the second lowest ability construct. The mean importance rating was 4.11 (*SD* = 0.89), which lies between "very important" and "absolutely critical." This was the third highest importance construct. Also, this item evidenced the second largest difference between ability and importance (rating difference score of 1.83).

Subject Knowledge of Calculus, Trigonometry, and Probability

Participants were told that subject knowledge of calculus, trigonometry, and probability included being able to use trigonometric relations to determine angle measure of n-gons, calculate the probability of both dependent and independent events, and understand the concept of a limit. The mean student ability rating in this area was 1.27 (*SD* = 0.58), which lies between "very poor" and "poor." This was by far the lowest ability construct, and the only one lower than "poor." The mean importance rating was 2.91 (*SD* = 1.00), which lies between "somewhat important" and "important." Interestingly, this was also by far the lowest importance construct. It is also interesting to note that while the ability rating represented the most agreement among participants as shown by the narrowest standard deviation (*SD* = 0.58), yet the corresponding importance rating represented the least agreement (*SD* = 1.00). Also, this item evidenced the third largest difference between ability and importance (rating difference score of 1.64).

Responses to Open-ended Questions

To provide supplemental data to rating scores, open-ended responses for perceived areas of strengths (question #15) and weaknesses (question #16), as well as math topics on which participants spent most of their time teaching (question #19) and those they wished they had more time to get to (question #20), were coded according to the original eight constructs. To code the responses, the student researcher determined if a given response contained any ideas related to the eight mathematical constructs. Participants frequently listed multiple ideas in their responses, so many responses were coded into multiple constructs. If a participant listed any ideas from a construct, it was counted. Thus, it should not be assumed that a response which listed some specific algebraic concepts means that the participant felt that students were strong in all parts of algebra; only that they were strong in some part of algebra.

Table 3

Percentage of Responses Listing Any Ideas from Given Constructs from Open-Ended Questions about Strengths and Weaknesses

Mathematical Construct	Percent Listing as a Strength (Question #15)	Percent Listing as a Weakness (Question #16)
#5 -- Students possess subject knowledge of algebra	52.5	50.0
#6 – Students possess knowledge of geometry	15.0	30.0
#7 – Subject knowledge of calculus, trigonometry, and probability	7.5	22.5
#8 – Reason and generalize	0.0	35.0
#9 – Number sense	10.0	7.5
#10 – Measurement and data	5.0	2.5
#11 – Use calculators appropriately	20.0	2.5
#12 – Necessary study skills	2.5	2.5
Basic Math	45.0	17.5

Percentages for each construct were calculated by dividing the amount of responses referencing a construct by the total responses to that question and multiplying by 100. Through this method, a percentage means the amount of responses that referenced a construct in any way compared to the total. Because responses were not necessarily exclusive to one construct, they did not total 100%. Interestingly, a new construct was generated from being commonly listed by participants in response to these questions: *basic math* (see below).

Table 3 presents the percentage of responses listing any ideas from given constructs from open-ended questions about strengths and weaknesses. Table 4 presents the percentage of responses listing any ideas from given constructs from open-ended questions about most time spent and more time to cover. See Appendix D for full responses to open-ended questions (with spelling and grammar errors unchanged). In general, responses about *strengths* ranged from 0% to 52.5%, and responses about *weaknesses* ranged from 2.5% to 50%. Also, responses about *most time spent teaching* ranged from 0% to 70.7%, and responses about *more time to cover* ranged from 0.0% to 36.1%. Specific results for each construct are present below.

Use calculators appropriately. In open-ended questions, 20.0% of participants listed components of appropriate calculator use as areas of student strength, while 2.5% listed such components as areas of student weakness. However, in the strengths question, a number of participants (12.5%) noted that the students still needed a calculator to do basic math calculations, which may represent a misunderstanding, miscommunication, or inconsistency of the definition of appropriate calculator use.

Also, 0.0% of participants listed that they spent most of their time teaching components of using calculators appropriately, while 0.0% listed that they wished they had more time to get to such components.

Number sense. In open-ended questions, 10.0% of participants listed components of number sense as areas of student strength, while 7.5% listed such

Table 4
Percentage of Responses Listing Any Ideas from Given Constructs from Open-Ended Questions about Most Time Spent Teaching and Want More Time to Cover

Mathematical Construct	Percent Listing as Most Time Spent Teaching (Question #19)	Percent Listing as Want More Time to Cover (Question #20)
#5 -- Students possess subject knowledge of algebra	70.7	36.1
#6 – Students possess knowledge of geometry	12.2	19.4
#7 – Subject knowledge of calculus, trigonometry, and probability	4.9	5.6
#8 – Reason and generalize	4.9	8.3
#9 – Number sense	12.2	0.0
#10 – Measurement and data	4.9	2.8
#11 – Use calculators appropriately	0.0	0.0
#12 – Necessary study skills	0.0	0.0
Basic Math	51.2	19.4

components as areas of student weakness. Also, 12.2% of participants listed that they spent most of their time teaching components of number sense, while 0.0% listed that they wished they had more time to get to such components.

Subject knowledge of algebra. In open-ended questions, 52.5% of participants listed components of algebra as areas of student strength, while 50.0% listed such components as areas of student weakness. Also, 70.7% of participants listed that they spent most of their time teaching components of algebra, while 36.1% listed that they wished they had more time to get to such components.

Study skills. In open-ended questions, 2.5% of participants listed components of study skills as areas of student strength, while 2.5% listed such components as areas of student weakness. Also, 0.0% of participants listed that they spent most of their time teaching components of study skills, while 0.0% listed that they wished they had more time to get to such components.

Subject knowledge of geometry. In open-ended questions, 15.0% of participants listed components of geometry as areas of student strength, while 30.0% listed such components as areas of student weakness. Also, 12.2% of participants listed that they spent most of their time teaching components of geometry, while 19.4% listed that they wished they had more time to get to such components.

Measurement and data. In open-ended questions, 5.0% of participants listed components of measurement and data as areas of student strength, while 2.5% listed such components as areas of student weakness. Also, 4.9% of participants listed that they spent most of their time teaching components of using calculators appropriately, while 2.8% listed that they wished they had more time to get to such components.

Reason and generalize. In open-ended questions, 0.0% of participants listed components of reasoning and generalizing as areas of student strength, while 35.0% listed such components as areas of student weakness. Also, 4.9% of participants listed that they spent most of their time teaching components of reasoning and generalizing, while 8.3% listed that they wished they had more time to get to such components.

Subject knowledge of calculus, trigonometry, and probability. In open-ended questions, 7.5% of participants listed components of calculus, trigonometry, and probability as areas of student strength, while 22.5% listed such components as areas of student weakness. Also, 4.9% of participants listed that they spent most of their time teaching components of calculus, trigonometry, and probability, while 5.6% listed that they wished they had more time to get to such components.

Basic math. As stated above, common responses from the open-ended questions about generated a new construct that was not included in the original eight from the questionnaire: basic math. Based on responses, participants defined basic math as students being able to perform basic calculations with whole numbers, fractions, decimals, percentages, money, and order of operations. In open-ended questions, 45.0% of participants listed components of basic math as an area of student strength, while 17.5% of participants listed such components as an area of student weakness. Also, 51.2% of participants listed that they spent most of their time teaching components of using calculators appropriately, while 19.4% listed that they wished they had more time to get to such components.

Results from Questions about Perceived Barriers and Solutions

In answer to research question #2, the open-ended questions about barriers (question #17) to math preparedness and potential solutions (question #18) were coded and analyzed using a similar procedure to that with the open-ended questions about strengths, weaknesses, and time spent teaching (see above). Ideas were separated and sorted in to four subcategories based on the source of the barrier or solution: family, student, system, and teacher. Similar responses were grouped together with percentages of occurrence calculated. Because participants often listed multiple ideas in their responses, these percentages are based on the number of times an idea was listed out of total responses for that question. Thus, there is often overlap in the percentages, and those listed do not total to 100%. See Appendix D for full responses to open-ended questions (with spelling and grammar errors unchanged).

Perceived Barriers

See Table 5 for subcategory percentages and most common responses (made by more than two participants) about barriers. Of the 47 participants in the survey, 43 responded to the barriers question. They generated 91 statements of ideas, which due to similarities were condensed into 40 barriers. After coding, 30.2% of participants listed barriers that fit into the *family* subcategory, 39.5% that fit into the *student* subcategory, 41.9% that fit into the *system* subcategory, and 14.0% that fit into the *teacher* subcategory. More specifically, within the family subcategory, the most common responses included the *lack of family involvement* (18.6%) and *the family having/allowing low expectations* (9.3%). Within the student subcategory, common responses included *lack of motivation/poor attitude/past failure* (18.6%), *difficult time retaining information/takes too long so less can be covered* (14.0%), *slow processing speed or lack of intellectual ability* (11.6%), *giving up too easily when something is difficult/does not persist* (11.6%), and *not seeing the need for math in real life* (7.0%). Within the system subcategory, the most common response was that *it is too late to fix/students are too behind by high school* (18.6%). Within the system subcategory, the most common response was *low expectations from teachers protecting students from failure* (11.6%).

Perceived Solutions

See Table 6 for subcategory percentages and most common responses (made by more than two participants) about solutions. Of the 47 participants in the survey, 40 responded to the solutions question. They generated 60 statements of ideas, which due to similarities were condensed into 37 barriers. After coding, 2.5% of participants listed barriers that fit into the *family* subcategory, 5.0% that fit into the *student* subcategory, 50.0% that fit into the *system* subcategory, and 32.5% that fit into the *teacher* subcategory. More specifically, within the family subcategory, there was only one response: *more parent involvement* (2.5%). Within the student subcategory, there were only two responses, each listed once: *have more study time* (2.5%) and *persevere and work harder* (2.5%). Within the system subcategory, common responses included *better* *teaching/greater accountability from teachers in younger grades* (12.5%), *more co-teaching/less pull-out classes* (7.5%), and *more math labs in upper grades* (7.5%). Within the teacher subcategory, common responses included *more math exposure and practice/math every day* (15.0%) and *make math more interesting and applicable/gain student buy-in* (12.5%).

Table 5
Subcategories, Common Responses, and Percentages of Perceived Barriers

Subcategories and common responses	Percentage of overall responses
Family	30.2
Lack of parent involvement/support	18.6
Family having/allowing low expectations	9.3
Student	39.5
Lack of motivation/poor attitude/past failure	18.6
Difficult time retaining information/takes too long so less can be covered	14.0
Slow processing speed or lack of intellectual ability	11.6
Give up too easily when something is difficult/does not persist	11.6
Not seeing the need for math in real life	7.0
System	41.9
Too late to fix/students are too behind by high school	18.6
Teacher	14.0
Low expectations from teachers protecting students from failure	11.6

Interestingly, two participants listed “who knows” and “no idea” (5.0%), which were not sorted in the four subcategories.

Comparison of Ratings of Student Preparedness to Potential College Success

Data on the rating questions about potential successfulness in college and importance of college were analyzed, with means and standard deviations calculated. A mean of a participant’s responses to the eight ability questions was calculated and called an Overall Math Ability Score, and then a mean of those scores were calculated. A similar procedure was followed to determine an Overall Math Importance Score (see Table 7).

Table 6
Subcategories, Common Responses, and Percentages of Perceived Solutions

Subcategories and common responses	Percentage of overall responses
Family (only 1 response in this subcategory)	2.5
Student (only 2 responses in this subcategory)	5.0
System	50.0
Better teaching/greater accountability in younger grades	12.5
More co-teaching/less pull-out	7.5
More math labs in upper grades	7.5
Teacher	32.5
More math exposure and practice/math every day	15.0
Make math more interesting and applicable/gain student buy-in	12.5

The mean rating for belief on how successful students could be in college was 3.69 (*SD* = 0.82), which lies between “somewhat successful” and “successful.” The mean rating for importance of going to college was 3.29 (*SD* = 0.84), which lies between “important” and “very important.” The mean Overall Math Ability Score was 2.38 (*SD* = 0.55), which lies between “poor” and “adequate.” The mean Overall Math Importance Score was 3.91 (*SD* = 0.62), which lies between “important” and “very important.” It is interesting to note that the lowest score for this section (Overall Math Ability Score; 2.38) also had the tightest standard deviation (0.55).

Table 7
Means and Standard Deviations for Rating Questions about Successfulness at and Importance of College, and Overall Ability and Importance Ratings

Question	Mean	*SD*
#13 – How successful do you believe students with mild/moderate disabilities can be in college? [a]	3.69	0.82
#14 – How important is it for students with mild/moderate disabilities to attend college? [b]	3.29	0.84
Overall Math Ability Score	2.38	0.55
Overall Math Importance Score	3.91	0.62

[a] Perceived success measured on a 1-5 scale: 1=not at all successful, 2=rarely successful, 3=somewhat successful, 4=successful, 5=highly successful
[b] Perceived importance measured on a 1-5 scale: 1= not at all important, 2=somewhat important, 3=important, 4=very important, 5=absolutely critical

DISCUSSION

This study investigated the perceptions of a sample of high school SPED teachers about the mathematical preparedness of high school students with mild/moderate disabilities. Results indicate that teachers perceived students to have relatively low ability in many mathematical constructs, and that those constructs were very important to critical to success in college. Although the ability and importance rating scales were different and comparison should be qualified, the largest difference scores were found to be in constructs of *possess necessary study skills, reason and generalization,* and *subject knowledge of calculus, trigonometry, and probability*. Although all were important, the survey findings suggest that these three constructs have increased importance for students with mild/moderate disabilities desirous of participating in a standard college program. Furthermore, in every math construct, participants rated student ability lower than importance, suggesting that they recognize a gap between current math achievement level and the requirements awaiting students in regular college classrooms.

According to the data, participants believed students with mild/moderate disabilities to have potential to be more than “somewhat successful” in college and that is it more than “important” for them to attend college. However, they also perceive them to be less than “adequately” prepared mathematically. Given that many students with disabilities enroll in college even if they were not adequately prepared or judged to be college-bound, this has implications for the importance of higher expectations and greater preparation in public school. Furthermore, additional research is needed to explore teacher perceptions of how students with mild/moderate disabilities may participate in a regular college environment or whether alternative courses of study need to be explored in regards to college math requirements (Grigal & Hart, 2010).

The data surrounding the construct of *study skills* is noteworthy. Participants rated it as the most important (4.53) by a significant amount, but only the fourth highest in student ability. This gave it the largest Rating Difference Score (2.04), also by a significant amount. Ironically, no participants stated that they spent time teaching study skills, and none stated that they wished they had more time to teach them. It seems that participants felt that students should come with the necessary study skills by the time they reached high school, or else learn them implicitly; that it was not their responsibility to teach them. However, given this information and that from the literature (Corbishley & Truxaw, 2010; Harms, 2010), it would seem that it is a significant area for teachers to address on a day-to-day basis. Explicitly teaching students these study skills at all grade levels would not only benefit them in college, but all along the way, potentially reducing some of the barriers in the student category.

Another salient but enigmatic theme that has emerged in this study is the appropriate role of a calculator. Participants rated *appropriate calculator use* as the highest ability construct (3.02), but showed the widest variation in responses through standard deviation (*SD* = 1.04). It was also rated as the second highest importance construct (4.15), had the smallest Rating Difference Score (1.13), and 20% of participants listed it as an area of student strength. However, many participants noted that their students are "dependent" on them, even to do basic calculations, and some stated that their students struggle even with the use of a calculator. Also, two participants were frustrated that calculators could not be used in lower college classes. By way of comparison, while participants in this study rated calculator use as the students' greatest skill, college faculty in Corbishley and Truxaw (2010) and Harms (2010) noted that students were over-reliant on them. This suggests a need for greater clarification of the role of a calculator as an accommodation or a modification. It also suggests the need for greater communication between public schools and post-secondary schools (and even employers) about what math skills are required in different settings and why, so that it may be determined when calculator use is appropriate. Finally, it may suggest the need for more explicit teaching about how and when to use the calculators for the students themselves.

The findings on perceived barriers and solutions are difficult to analyze. In many cases, barriers and solutions were equivalent. For example, while some participants felt that harder topics, moving ahead, and common core were barriers, others felt that more rigor, higher expectations, and common core were solutions. Similarly, while some participants felt that students needed a slower pace in resources classes, others felt that co-teaching in the regular classroom environment was the solution. This difference in opinions may represent lack of information, local situations and availability of resources, or a belief that the ability to address problems is outside participants' locus of control (see below). In any case, the variety of ideas and opinions suggests the need for better information and greater communication among stakeholders to remediate barriers and implement solutions.

Perhaps the most concerning finding of this study is what participants perceive about accountability for student math preparedness. When asked about barriers, 30.2% of participants listed family-caused barriers, 39.5% listed student-caused barriers, and 41.9% listed system-caused barriers, all outside their direct ability to control. Only 14.0% listed teacher-caused barriers. Popular responses including lack of parent involvement, lack of student motivation, and previous teachers not teaching well enough represent a feeling of helplessness about problems that seemingly cannot be fixed. Participants definitely recognized that it is more than important for students with disabilities to go to college and that they are not prepared mathematically; yet seem to be saying “it’s not my responsibility.” While teaching is certainly not the only variable affecting student math achievement, teachers must take responsibility for implementing solutions.

Findings of this study demonstrate the need for greater preparation of students with disabilities in mathematical college readiness. As such, this research contributes to the literature in a number of ways. First, the study extends previous qualitative and quantitative research to a more specific population than just the average incoming freshman (in this case, students with mild/moderate disabilities). Second, the research provides evidence on the importance of perception of those who teach and prepare students, particularly students with disabilities. What SPED teachers perceive about the abilities of their students, the importance of math concepts and college, and barriers to preparedness seems to affect what and how they teach in their classrooms. For students with disabilities to be more successful in math, educators need to change their perceptions and their practices. Finally, the research provides not only perceived barriers to students being mathematically prepared for college but also potential solutions that administrators and teachers may work to implement in their settings. However, the lack of clarity on what constitutes solutions should compel high school teachers, disability service professionals at postsecondary institutions, parents, employers, and all stakeholders to find common ground and implement agreed-upon instruction for college-bound students.

This study may be limited by a number of factors. First, because of a small sample size, it may not be generalizable to any larger group of special educators at the high school level. The opinions surveyed here may not represent those of other teachers. Second, it may be that the mathematical constructs in the questionnaire are too broad for an accurate measurement of ability or importance, particularly for SPED teachers who have not taught many of the constructs, or even all the concepts within a given lower construct. To a certain extent, “they may not know what they do not know.” One survey participant noted that it is a barrier that some teachers are “not sure how to teach/do higher math topics.” Finally, while the survey provides a foundation for future research, the questionnaire was not subjected to reliability or validity testing,

This study may be extended by future researchers in the following ways: (a) increasing the sample size of SPED teachers, (b) expanding the study across state lines, and (c) completing the survey by distinguishing among the way students with disabilities receive math instruction in high school (i.e., inclusion or co-teaching in regular education classes vs. pull-out/resource class). Alternatively, this study may be extended by conducting research using the Delphi technique (e.g., Powell, 2003) in which iterative surveys of the same respondents seek to arrive at consensus.

Nonetheless, the study extends previous research (Corbishley & Truxaw, 2010) and represents an initial attempt to gauge the perceptions of special education teachers on the readiness of students with mild/moderate disabilities for regular college math based on specific mathematical constructs. Due to changes in IDEIA and ADAAA placing greater emphasis on and opening the doors more widely to postsecondary education, students with disabilities are entering college. Thus a more fine-grained analysis of their preparedness will be required of researchers and teachers.

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APPENDICES

Appendix A

Questionnaire

Appendix A

Questionnaire

Demographic Information.

(Used for classification and statistical purposes, not for personal identification)

1. Size of your district (small, medium, large):
2. Years of teaching experience:
3. Gender:
4. Approximate number of students you are basing your responses on:

Mathematic Readiness Questions

Please use the following scales to respond to each item. Please base your perceptions on the **average junior/senior student with mild/moderate disabilities** (learning disabilities, attention deficit/hyperactivity disorder, Asperger syndrome and autism spectrum disorders, emotional disabilities and behavior disorders, and traumatic brain injuries) who has goals to attend college.

Student Ability Scale: 1=very poor, 2=poor, 3=adequate, 4=proficient, 5=excellent

Topic/Skill Importance Scale: 1= not at all important, 2=somewhat important, 3=important, 4=very important, 5=absolutely critical

5. Students possess subject knowledge of **algebra** (i.e., students are able to solve one-step equations, word problems, and two variable equations, combine expressions, graph functions, and find inverses)

Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

6. Students possess subject knowledge of **geometry** (i.e., students are able to determine similarity between objects based on properties, can calculate the area of two-dimensional figures, and are able to analyze properties of three-dimensional objects).

   Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

7. Students possess subject knowledge of **calculus, trigonometry, and probability** (i.e., students are able to use trig relations to determine angle measure of n-gons, calculate the probability of both dependent and independent events, and understand the concept of a limit)

   Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

8. Students are able to **reason and generalize** (i.e., students are able to problem solve, find connections between mathematical ideas, reflect on their own reasoning, develop and prove a conjecture, justify answers, use various forms of reasoning, and develop some form of proofs).

   Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

9. Students possess **number sense** (i.e., students know multiplication and addition identity relationships, are aware of different number systems [integers, complex, real, imaginary, rational, and irrational], are able to use properties of integers to justify relationships between whole numbers, area able to do calculations with complex numbers, and are aware of multiple coordinate systems).

   Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

10. Students understand **measurement and data** (i.e., students can represent angle measurements in degrees and radians, can determine reasonable scale when measuring objects, can represent given data using correct units, and are able to use rulers, protractors, and compasses).

    Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

11. Students can **use calculators appropriately** (i.e., not used for basic calculation [multiplication tables, addition and subtraction, etc.], show work on paper when needed, and have a conceptual knowledge of subjects even when calculator is used).

    Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

12. Students possess necessary **study skills** (i.e., class attendance, note-taking skills, test preparation skills, participation in class, pacing, and self-motivation, patience and persistence with the material).

    Ability Rating: 1 2 3 4 5 Importance Rating: 1 2 3 4 5

Please use the given rating scales on the follow two questions:

13. How successful do you believe students with mild/moderate disabilities can be in college? (1=not at all successful, 2=rarely successful, 3=somewhat successful, 4=successful, 5=highly successful)
14. How important is it for students with mild/moderate disabilities to attend college? (1= not at all important, 2=somewhat important, 3=important, 4=very important, 5=absolutely critical)

Please provide brief comments on the following questions:

15. What are some mathematical skills and topics that students with mild/moderate disabilities are strong in when entering college?

16. What are some mathematical skills and topics that students with mild/moderate disabilities are lacking when entering college?

17. What do you think are some of the barriers that make it difficult for students with mild/moderate disabilities to be prepared for math at the college level? (you may include school barriers, student barriers, family barriers, system barriers, legal barriers, or anything else)

18. What do you think are possible solutions to those barriers?

19. What math topics do you spend most of your time teaching?

20. What math topics do you wish you had more time to get to?

21. What strategies do you use to teach the students?

22. Please list any other comments you feel will assist with this survey.

Appendix B

Email to District and Charter School SPED Directors

Appendix B

Email to District and Charter School SPED Directors

Dear SPED Directors of Utah,

My name is Adam King, and I am a SPED/504 Coordinator in Davis School District. I am currently working on my Master's Degree at Utah State University as part of the new Transition-focused cohort. This has given me an opportunity to merge my two loves of teaching: math and transition. My thesis is a study to determine the mathematical readiness of students with mild/moderate disabilities for college, using high school teacher perceptions as a measure. The cooperating professor on this project is Dr. Bob Morgan from USU.

Research shows that more and more students with disabilities are enrolling in college, both on a national and local level. Thus, the results of this project could potentially benefit the state, districts, and individual teachers. Glenna Gallo, our state SPED director, is also interested in the outcome, as indicated by this statement: "Utah has put forth tremendous effort in improving school to post-school transition services and secondary math instruction for students with disabilities in the last two years. I am anxious to see the results of this project, with its focus on both priority areas (secondary math preparation and college for students with disabilities), and hope to utilize the results during planning of statewide activities in future years. I appreciate efforts of Utah's educators on behalf of our population of students, and am hopeful that many will find the time to complete this survey. Thank you" (Received through email on Feb. 28, 2013).

A greater numbers of participants will result in more generalizable and applicable data. I am asking for your district's participation. If willing, I need from you a list of names and email addresses (or email addresses only, if you feel more comfortable that way) of all the high school SPED resource math teachers in your district/school who teach junior and senior students with mild/moderate disabilities*. Once I receive this list from you, I will email those teachers (in blind copy fashion) a link to a one-time anonymous online survey consisting of approximately 20 questions. No personally identifiable information will be required in the survey, so your teachers will be completely protected. *(*learning disabilities, attention deficit/hyperactivity disorder, Asperger syndrome and autism spectrum disorders, emotional disabilities and behavior disorders, and traumatic brain injuries)*

I appreciate your consideration in this matter. If you are willing to participate, please email me the list of names as soon as possible. If you are not (or do not have such students/teachers in your district), please send me an email declining so I don't email you again. If your district has a research protocol that needs to be passed, please see the attached project Letter of Approval and Letter of Information from the Institutional Review Board (IRB) at USU.

Please feel free to email me with any concerns or questions. Thank you for your timely response!

Appendix C

Email to SPED High School Teachers

Appendix C

Email to SPED High School Teachers

Dear Teachers,

My name is Adam King, and I am a SPED/504 Coordinator in Davis School District. I am currently working on my Master's Degree at Utah State University as part of the new Transition-focused cohort. This has given me an opportunity to merge my two loves of teaching: math and transition. My thesis is a study to determine the mathematical readiness of students with mild/moderate disabilities for college, using high school resource teacher perceptions as a measure. The cooperating professor on this project is Dr. Bob Morgan from USU.

Research shows that more and more students with disabilities are enrolling in college, both on a national and local level, whether they originally intended to or not. Thus, the results of this project could potentially benefit the state, districts, and individual teachers. Glenna Gallo, our state SPED director, is also interested in the outcome, as indicated by this statement: "Utah has put forth tremendous effort in improving school to post-school transition services and secondary math instruction for students with disabilities in the last two years. I am anxious to see the results of this project, with its focus on both priority areas (secondary math preparation and college for students with disabilities), and hope to utilize the results during planning of statewide activities in future years. I appreciate efforts of Utah's educators on behalf of our population of students, and am hopeful that many will find the time to complete this survey. Thank you" (Received through email on Feb. 28, 2013). Furthermore, your district SPED director has given permission for your district to participate, and supplied me with your email addresses.

You have been referred to me as a teacher of resource math for 11th and 12th grade students with mild/moderate disabilities (learning disabilities, attention deficit/hyperactivity disorder, Asperger syndrome and autism spectrum disorders, emotional disabilities and behavior disorders, and traumatic brain injuries). I am asking for your participation in a brief survey of your perceptions about student mathematical preparedness for college. The survey is approximately 20 questions long (some rating scale and some open-ended) and should take you 15-20 minutes. The survey is online and completely anonymous, so your confidentiality is protected. Of course, your participation is voluntary. However, your opinions are very important to this study.

I am attaching a Letter of Information approved by USU's Institutional Review Board. Please read it before completing the survey. The survey can be found at: https://ususpecialed.qualtrics.com/SE/?SID=SV_cwDgWT7x8mGqLw9

Please click on the link or copy it into your browser to begin.

Thank you for your quick help, as I know you are very busy!

Appendix D

Responses to Open-ended Questions That Were Coded

Appendix D

Responses to Open-ended Questions That Were Coded.

(Note: spelling and grammar errors unchanged from original responses.)

Question #15. What are some mathematical skills and topics that students with mild/moderate disabilities are strong in when entering college?

- MOst can handle basic math and some basic algebra as long as they can use a calculator.
- Solving equations
- solving simple algebra problems, money
- Operating a calculator, simplifying expressions, solving basic equations, plotting points on a coordinate plane.
- A majority of out students are able to use rates, ratios and proportions, simplyfy and evaluate expressions with integer and zero exponents, find the probability of independent and dependent events, recognize and extend arithmetic sequences, locate and use intercepts, use scientific notation, use the distributive property to simplify rational expressions, simplify and evaluate expressions using teh power property of exponents, use deductive adn inductive reasoning, find rates of change and slope, find slope using the slope formula, translate between words and inequalities, simplify expressions with square roots and higher-order roots, analyze

mesures of central tendency, graph linear functions, write equations in slope-intercept form and graph inequalities.

- Computing integers, fractions, and decimals with a calculator. Order of operation
- My students now are functioning at a 3rd grade level in Math. Most of them struggle with adding and subtracting, even when using a calulator.
- Disabled students are better at time management. The academic math skills they have can't compete with other students, so they take longer. Because they take longer they are better at managing their time in order to get it done.
- Solving simple equations. Calculating percent of values. Basic calculations.
- They can be as strong as any other students.
- Very few of my students have strong mathematical skills needed for college. Until a couple of years ago, we were still only teaching pre-algebra to high school students with mild/moderate disabilities. Some students, those that take geometry have stronger skills, but for the most part, they are not ready for college math.
- Rounding, decimals, percents,
- Basic functions: add, subtract, multiply, and divide.
- Basic Alg. skills... Some geometry skills. They are still dependent on calculator.
- How to use a calculator. The special education students who enter college are a minority of the special education population. These are the students who are usually in general education math and English classes with support from the special education department. They will be strong in compensating for their disability.

They will take with them the strengths and weaknesses that they exhibited in their high school math and English classes.

- Number sense, basic operations of algebra, basic data and probability, basic knowledge of functions.
- Some Algebra skills and Geometry skills.
- number sense solving one step 2 step and multi-step equations
- I think the skills and topics that students with mild/moderate disabilities are strong in depends partly on whether the student's disability affects their math comprehension. If a student has a learning disability in math, a lot of them have been leaving high school being able to do one- or two-step equations and a few have made it to Geometry and learned angle measurement skills. There are a few who have not had disabilities in math and have gone up to Algebra 2 or even Calculus, but this tends to be the exception rather than the normal.
- Basic math skills and basic story problem/applications skills
- Calculator skills, measuring skills, single step equation skills,
- It really depends on the student. Some of my students leave high school with calculus mastered. I'd say 20% of my students have at least average mastery of Math 3 concepts. 50% of students have a decent (70% accuracy or higher) mastery of the major concepts in Algebra and Geometry. 30% leave school with pretty low skills in mathematics.
- GeÃ³metra

- It is hard to say, because each student I teach is good in different things. Most of them are good at algebra skillls because it makes sense to them.
- Use of calculator. Relying on adults for help. Copying Homework.
- I know that my students do really well when the are given a system. If there is a method or procedure that they need to apply they can do that really well once they get passed the learning curve.
- basic math skills, understand of fractions, concrete math topics
- Ratios. Area, perimeter, and circumference of shapes. Multi-step equations. Order of operations. Slope and intercepts of lines. How to graph an equation. How to read charts and graphs. Finding the missing angle of regular polygons.
- Basic skills and how to use a calculator
- Basic math calculations.
- The basic math and algebra are strong but could be stronger.
- Basic, simple, concrete calculations
- Basic math skills, some pre-algebra, some geometry
- Basic math facts and some pre-algebra concepts.
- Order of operations, adding subtracting multiplying integers. Converting fractions to percents and decimals
- I have only taught for 2 years and doing basic math problems and simple algebra problems.
- use of a calculator in solving most math concepts

- Use of the calculator to do basic calculations. Solving straight forward, nothing extra in story problems.
- graphing points and linear equations / substitution
- If they are math inclusion kids with a disability in something other than mate, they are strong in, at least, Math Core I A and B and some get as far a math Core 2 A and B.

Question #16. What are some mathematical skills and topics that students with mild/moderate disabilities are lacking when entering college?

- Many of these students has a hard time following directions. I have found that students with these kinds of issues have problems with math, because it requires them to "follow rules" and some get it wrong until they get past the "rules" issue.
- higher level math concepts such as trig, calculus, etc.
- geometry, trig, number sense
- Linear functions, graphing inequalities, simplifying rational expressions, radical expressions, complex probability problems, complex problem solving.
- Those not in a regular ed math track, will lack higher-order geometry skills such as proofs, trig, algebra 2 and calculus. I am not sure if students need more than algebra 1 knowledge for non-math centered degrees.
- Solving word problems. Simplifying and solving multiple step algebraic equations.
- When the students arrive for their high school years, and they are 5 grade levels below their ages.... either a " connection" is not being made with the students, OR, the students just do not care to learn.

- Being able to think what needs to be done. in order to get the answer, with out prompting.
- Solving story or real world problems. Problems that require more than three steps.
- Basic knowledge level, multiplication, division.
- I think I answered this in the above question. They are lacking most skills.
- equations, formulas, statistical analysis, graphing, fractions, area, volume, problem solving skills
- Systems of Equations and Exponential Functions
- Alg. 2 skills, story problems,
- Skills at the geometry level and above because special education students are allowed to receive their high school graduation math credit according to how many years of math they have passed rather than the general education requirement of the type of math class needed for graduation. Special education students can take basic math for three years in high school and receive their math credit. It seems that if this is allowed then basic math skills should be allowed for college graduation math credit.
- Geometry, algebra 2, trigonometry, pre-calculus, calculus
- Multiplication table knowledge and basic reasoning skills.
- Advanced Algebra skills
- Surprisingly, many students seem to lack skills related to everyday math. Many students do not know how to tell time on an analog clock, lack skills such as calculating a percentage or an average, and being able to do multiplication/division

by hand. If students are going into a field in college that requires math, students for the most part are struggling to get beyond basic algebra concepts and do more multi-step problems.

- Number theory,advanced career type application and math reasoning
- word problems, multi step problems
- Overall, I'd say problem solving and understanding the big picture. How to think through situations logically. Applying what they've learned to other areas.
- MÃºltiple stop problema / Word problema with extra info
- Geometry and higher than algebra skills.
- Understanding of what they are doing and why they are doing it in algebra, geometry and trig.
- My students lack an understanding of what these symbols and numbers mean. The real world application always is a struggle. Even after a lot of practice they will often need a prompt such as, "this is where we use that equation."
- abstract math skills,
- Combining and solving exponents. Trigonometry concepts. Pythagorean theorem / Volume formulas.
- Geometry and advanced algebra
- Algebra II/Geometry/ Trig------skills needed to pass required math classes.
- Higher maths skills.
- Word problems and those that require reasoning skills
- Generalization in mathematics,

- Basic algebra and geometry skills. Retention is a challenge for many students with disabilities.
- Algebra, algebra II and geometry
- The ability to read directions and understand what is being asked without someone showing them first. Slope and equation of a line very difficult.
- Not to use the calculator to do basic functions
- sorting out the required information in typical story problems, transferring concepts between problems. and problem types. Working towards an end project/semester projects. And preparing for comprehensive tests.
- reasonability of answers (putting too much trust on a calculator screen) / integers / fractions / the concept of an "expression answer" vs. the desire for a "constant answer" / interpreting data(<-- this topic was specifically stated by my students themselves as an area of self-reported weakness, being that it was an issue for them on the science section of the most recent ACT testing)
- Mild/ Moderate Students are lacking in upper division Mathmatical Thought and understanding.

Question #17. What do you think are some of the barriers that make it difficult for students with mild/moderate disabilities to be prepared for math at the college level? (You may include school barriers, student barriers, family barriers, system barriers, legal barriers, or anything else.)

- THe family is a big barrrier for all students. If going to the college is not the norm, then there seems to be little desire. I think the coming of the common core is going to end up being a barrier. Our students are there and I am not sure that we are going to get them there any faster. I feel that at the high school level we are trying to pick up the pieces. We in the high school have to focus on now and can't wait for future when possibly the students who come to us will be better prepared with the knowledge that they are suppose to gain through the common core classes. /
- They have been behind in math for so long that it is hard to catch up
- students struggled from a young age and tend to shut down as soon as something difficult is presented to them.
- In my perception, there is a cultural barrier that hinders the desire to learn math. In this country, learning math is not "sexy" and people who are good at math are given names like geek and nerd. And I often hear adults "brag" that they "never did understand math" where no one would ever say "I never did learn to read - oh well". / / Next, the population I teach have a difficult time delaying gratification, so they love solving simple calcuation problems, whereas if they run into a problem that looks too difficult or has too many words, they are more likely to refuse to try. It is preferable to lose a point than to work to solve the problem. / / Last, by the time the students reach my classroom it seems that there has been a learning history where the most important part of learning math is getting the correct answer, rather than thinking through the problem and using strategies to problem solve. So they have learned to just copy the neighbor's answer to get the point.

- I think that most of our students with mild disabilities could be successful in a regluar ed math track, if the instruction followed more of an I do, we do, you do model instead of lecture and work on your own model. I think reg ed teaches are overwhelmed with the amount of content they are required to cover, so they have to move so quickly through each concept that many kids, reg ed included, are left to fend for themeselves. / I have students in my resource alg that pass the core test, where the reg ed kids don't. We cover less material but we move at a slower pace with a lot more guided practice.
- Lack of experience in school with higher math, retaining information, not enough practice.
- I am sure there have been books written about the number of things that make it difficult for our students. I see students that do not want to try. I see Parents who enable the children. The apathy that exists is here to stay.
- Academic barriers - It takes longer to learn and remember and so they don't get the needed background information to carry on at the college level. They will spend two years in pre-algebra to get the skill level to do algebra 1. They then take two years of algebra 1 to learn all the concepts.
- Most students do not see the need to learn the skill and are not invested. Past failures make it difficult for the students to want to try again. Students have not learned to stay focused and engaged long enough to learn the material. They need small group environments with a one to five ratio at most.
- I believe one of the biggest barriers is self confidence.

- Slow processing speed, ability to retain learned information, and learned helplessness. Many times, they go over the same basic math concepts year after year and have not been expected to achieve beyond this level. Of course, there are always family barriers, individual confidence issues, etc.
- students face problems in personal ability, cognitive speed, lack of parent involvement/competence, peer pressure to not ask questions, inability to form questions mentally or verbally, and non attendance.
- Lack of motivation, family barriers (raising siblings, supporting family at a young age), wanting a job while in high school, some students are legal citizens and struggle with difficulties outside of school.
- Need more math in school.. Those that get to Alg. 2 are still behind their peers. The majority of resoursce students do not see a need for math. Family /student barriers hurt them when attendence is a major issue. They miss a lot of concepts, teachers have a hard time because they need to move forward in teaching concepts. Lack of $ for students to buy graphing calculator. Resource doesn't have the funds to buy them to rent out.
- Lack of rigor in special education resource classes. Ability to receive graduation math credit without actually earning it. Students who do not have a intellectual disability but still have a low IQ make up a significant portion of our special education students, therefore they lack the intellectual ability to reason in math at higher levels. Students need to be in regular math classes as the norm rather than resource classes as the norm. Maybe instead of resource classes providing math

credit, resource classes should provide support. If students need a slower paced math class, then provide it in the general education math curriculum taught by a certified math teacher. Provide math classes that take place daily. Provide math labs for help with homework and test prep. Provide accommodations like using notes for a test or re-takes instead of resource math class. MONEY

- Apathy for work. Very few kids know how to work and often they are not made to work at home and therefore do not do it at school either. I know from experience with siblings growing up that kids that struggle can make it in school if they work but many of our kids today do not get that.
- They have a learning disability in math. They at times become frustrated, and need concepts re-explained; while, their non-disabled peers move on to more complex ideas.
- They don't have home support nor do they take the time to understand the various concepts.
- They need to be challenged more in elementary school and junior high
- I definitely think that barriers such as the student's attitude towards math (many say, "I hate math!" and having a bad attitude greatly affects performance), and a students' family situation (lack of support at home where parents do not have time or know how to help the student) make it difficult for students with mild/moderate disabilities to be prepared for math in college.
- Home support, the lack of an multi-tiered supports, pervasive disabiliites such as Autism.

- Memory, too high of classes, attitude
- Families and students do not believe math is important. Or math just can't be learned by "some" people. "I am just not good at math". The schools seem to push them through and the material is never really mastered.
- Not enough hands on activities to help them see real life application.
- I think that the students I teach only have in mind to graduate high school which is a barrier for college.
- Many of the students with mild/moderate disabilities will not need a college education for what they will be doing. Lack of work ethic.
- I think these kids are used to taking everything literal. This is especially true with kids on the Autism Spectrum. They have a language they understand (our daily spoken language) and that language in-and-of-itself is hard enough for some of these kids to use. Now we are asking them to represent ideas and thoughts in a new language that looks quite a bit different: t=b+5. I feel like my kids are thinking, "that means Tom is 5 years older than Beckie???? Why didn't you just say that? And what does this have to do with me anyway?" / / Another barrier is time. These kids need more repetition and processing time. When they come to me they are already multiple years behind in math. If we moved a pace that gave more repetition they would fall even further behind. / / Another barrier is that personal accountability is missing a lot. Homework does not get completed at home too often.
- In my specific classroom population my students either grasp it after teaching and some corrections and others continually struggle no matter how varied the

instruction on each specific skill. Those that don't catch on are generally the students that give up when it's not easy or will take home the work for a parent or sibling to help them (or give them the answers.) The barrier is learned helplessness. Another barrier for some is the attitude that students with disabilities should not be required to do things that are hard. Just because they need modifications and accommodations does NOT mean that they cannot accomplish a task that is HARD. Parents need to realize that the process of learning is not meant to be easy, they need to allow and encourage their students to work, REALLY work.

- Students don't believe they can learn "tough math." Teachers are so worried that the child is going to fail that they don't teach tough math. Teachers are not sure how to approach the higher math topics (i.e. trig concepts) with the limited background/limited skills the students currently have. Teacher is not sure how to teach/do higher math topics. /
- Developmental barriers. These students develop cognatively at a slower rate and are often unable to process the higher math concepts on the same timeline as their peers. They need an additional year or two of remediation, repetition and practice. I have Jr.'s who will be able to process and comprehend Math 1 next year as Seniors, but it is only offered their 9th grade year. So how can they get the skills they are now ready for if they are capable of the class but 2 years behind their peers?
- Most are happy to pass with a D and still do not understand the concepts. They need more one on one or small group instruction and the teacher really monitoring for

understanding. I observe students turning in minimal work, trying to not be noticed or asked questions, and not asking for help when they don't understand.

- Teachers think they need to teach them at a lower level.
- I think the importance of math in high school is the toughest part of their learning math.
- The ones that could be the most successful are those with strong family support. There is little to no support for students at any college level and these students generally lack reading comprehension skills making it difficult to be successful with not only the curriculum but also the entire educational system. Also, these students have been supported by resource classes for many years which run at a slower pace, usually require smaller amounts of work, little to no homework and smaller class sizes than even regular high school classes. / It would be difficult to be suddenly cast into the very large and fast-paced environment of the college experience without support.
- In Ogden district, a lot of students are not taken care of at home emotionally or physically. I believe this has a huge impact on their success in math as well as the rest of their schooling. On top of that, students with mild/moderate disabilities are not performing on grade level; they are usually at least two whole grade levels below their peers. It is hard to prepare students for college math when they have been behind throughout grade school, middle school, and high school.
- Students are being pushed though elementary and junior high and lack many math skills when the get to the high school leve.

- Many don't know their times tables, but I try and teach them concepts and not let that keep them from learning higher level things. It seems that they are gradually showing up with at least some exposure to higher level concepts.
- There is no scope and sequence on how to teach the math at a lower level. There is also so many students with such different levels that it makes it very challenging to know where to begin. I have students who can't do fractions, money or time. But I am told they need to be taught the core. Then common sense tells me that if they can't do basic math to function in life what difference does the common core mean to them. I think the law of making sure they are introduced to everything messes things up, if they could do the math with the common core then they should be out in regular math being accommodated. If they are with me we need to make sure they can function in the world. Balancing their bank accounts, telling time, knowing the difference between a nickel and a dime.
- They lack basic 6th grade math skills when in high school. The math curriculum in the regualar class with common core 2 being the lowest level for students limits mild moderate students ability to access the regular curriculum
- The idea that all math calculations must be done without a calculator in early math classes in college. An unwillingness to seek help from available resources. Many students who come from low income families, do not know how to access funding, grants, and reasonable financing of post high school education.
- self-impsosed walls: negative thinking over multiple years of what they usually call "suck[ing] at math" / / lack of number sense- almost a fear of manipulating numbers

around to the point where they COULD test the rules, or truly understand WHY negative integers behave the way they do / / school barrier: I can think of a handful of students who are in a resource math class who could probably be pretty successful in a general ed setting, but with additional supports. Because that type of *inbetween* class (or co-teaching) does not exist at their school, they almost inevitably end up remaining in resource. Perhaps it is case manager fear of legal issues if that student ends up with a poor grade outside the "saftey net" of resource. Perhaps it is gen ed teacher fear of not knowing how to handle those particular needs.

- I would say that the barriers I would look at are family barriers, system barriers, student barriers and lack of prehigh school training to get them ready.

Question #18. What do you think are possible solutions to those barriers?

- Put the classes back the way they were prior to the changes made. We still need to change with tme, but not so quickly. These students need and qualify for "specialized" instruction, and we need to deliver.
- more co-teaching, less pull-out programs
- success in elementary grades
- Decide what math learning behaviors to reinforce. Instead of just giving points for the correct answer (which is important - to be accurate, give points and other reinforcement for the problem solving process and sticking with the problem. / / /

- I think that kids should not be grouped heterogenously in math. I think the kids that understand the concepts quickly and seem to be able to learn it on their own should not be grouped with kids who need extra examples in order to understand. I think there is too much curriculum to cover for kids to really grasp the material before they've moved on to the next topic. I think this race to the finish starts in 7th grade and a lot of kids, both resource and reg ed, fall behind and never catch up.
- Spending more time on math starting in the elementary schools, smaller math classes, and more math labs in upper grades.
- If my child was at a 3rd grade level in his Math ability when he got to highschool, we would spending many night s and many weekends working on that subject. I do not see the advantage of "pushing" students thru their academics if they haven't grasp the concept. If I didn't get the concept in fourth grade and I move on up to 5th grade, and I 'm now further behind, and then I move on to 6th grade, well... I'm done. I'm so lost I don't know what to do. At that point most children will shut down.
- Less required classes will allow for more time in classes they need.
- Hire more teachers or competent aides to allow for small group learning. Find a way to get buy in from the student. More parent involvement.
- Positive environments and reinforcements during their education experience.
- students with disabilities require a more highly structured environment, including regulation of : classmates, class times, instructor involvement, time focused on specific subject area, transportation, amount of varied instruction.

- Make math more interesting from the get go, offer support for parents, encourage students with wider varieities of opportunities.
- need more math Labs (not special ed) for all students. lack of money/teachers/schedule hurt having these classes. Math should be taught everyday.
- Lower the expectations in college for passing math classes like what is done in high school. You can't expect students who have low expectations required in high school to turn around and meet the high expectations of college. Or for those resource students who really have the intellectual capacity to go on to college, make sure they are in general education math classes and that the accessibility in those math classes match the accessibility in college math classes. This may mean providing college math classes for students with disabilities. More funds need to be provided. To expect miracles when funding is cut, class sizes are huge, case files are huge, or teachers must leave the classroom or give up prep time to test or conduct IEP meetings is ridiculous. If you want students to be math ready for college, provide the money, support teacher in classroom, and raise the expectations of special ed students.
- who knows
- I have no idea.
- Every day Math classes and additional study time.
- more co-taught classes

- I think students need to be taught that learning is a process and is something that if they have a better attitude about being successful, they will improve. The students (and perhaps their parents/families as well) also need to see the importance of math and how they will need it in the future in college and in life.
- Adminstrator training and support for RtI and PBIS or UMTSS within general education and special education.
- offer lower level classes and pull students up
- The way math is taught makes it very difficult for students to see the relevance.
- Common core seems to be Helping
- Get in their minds early that they can get through college and enjoy it.
- Create more vocational tracks for students to graduate.
- exposure. Often and repeated.
- I don't know how to teach parents that making students work is not mean or unfair. This attitude often spreads to the student and they give up. / / Having high expectations are probably the best approach, but I don't know if there is a solution.
- Don't tell the students this is "tough math." Have a scope and sequence that is manageable for teachers to follow over the course of the three years of high school. More co-taught classes or lab classes so that mild/moderate students can go into a main stream math class and still have the support needed to learn the "tough" concepts.
- offer remediation and skill building at all grade levels. Continue to offer Math I at the high schools. Make it skills based, not grade based.

- More tutoring, manipulatives, learning and teaching in different ways, more practice and more real world application. Even when put in problem solving groups, these kids tend to let the others solve the problem and just write down the answer.
- They can do the work, they usually just need more time to complete it.
- There are too many barriers from students to parents to overcome.
- Better programs for transitions, better communication between colleges and high schools about such programs if they exist. Maybe employ a Resource Transitions Coordinator to be a liason between the campuses to help with those things and to know and understand the resources of both locations so that tutors and others needs are better understood and can be arranged.
- Perserverance and hard work on the students part. Teacher's who are willing to work with the students to help them overcome the challenges.
- Better teaching methodolgies at the elementary level for studentd who have difficulty in math and more effort at the junior highs in preparing students to attend high school.
- Realize that they are in special ed for a reason, they are lacking in something. If the accommodations can't let them be successful in regular ed. then we need to make sure that they can function in society doing basic math, such as money, fractions, measurements.
- They need to get those beginning skills before the high school. Accountablility in lower grades

- More education on the part of schools, both high schools and post high school education.
- Teaching alternative algorithms EARLY / / Requiring students to justify their answers, just like they have to in English and History / / General education teachers should be inundated at the beginning of their course work to realize that they will be in charge of teaching the non-average student. I know some who naturally differentiate like sped requires us do, but the majority of observations I have done in a gen ed classroom show so much emphasis on note-taking that the student has very little opportunity to even *practice* the idea. Application seems to wait until homework is due, and by that point, my students in those classes are lost because they couldn't get all the notes down, so "teaching themselves" (what they're resorted to, with or without my help) is even LESS easy for them than peers. Perhaps if gen ed emphasized the same amount of practice resource gives, our "inbetweener* would not be so stuck on each section.
- Start the math programs at earlier ages and repition until they reach high school.

Question #19. What math topics do you spend most of your time teaching?

- understanding algebraic expressions
- Algebra
- algebra and pre-algebra
- Number sense, simplifying expressions, solving equations, basic word problem solving, basic probability, plotting points and lines on a coordinate plane.

- What I listed above is what we cover in 11th/12th grade math.
- Simplifying algebraic expressions and solving algebraic equations,
- My students do their best with functional math. I try to get topics and things that the students will being dealing with throughout their life. Even then, we have trouble with achieving some basic concepts. If and when we get into Problem Solving Math questions, usually the wheels fall off and we rae lucky to inch our way through this.
- measurements and converting them
- Integers and Fractions
- Algebra and Number sense
- Solving and graphing equations, fractions.
- Problem solving and problem analysis
- Basic Math Skills, Slope and equations of lines, and real life application of equations/systems of equations
- basic skills - by 4th term doing linear equations in resource setting.
- The topics that are part of the core for the math class. I co-teach. But I also have to spend time teaching how to calculate fractions, percents, decimals, integers etc. Students need these continually reviewed. It is difficult to fit all of it in during the time allotted.
- Algebra

- Order of operations, using inverse operations to solve: one, two, and multi-step equations, combining like terms, distributive property, distinguishing between a relations and a functions, and graphing linear functions
- Algebraic principles
- / basic math skills, basic algebra skills, and basic geometry skills
- Transition math (I teach a transition math class). We have talked about math as it applies in cooking, buying things, calculating percentages off, calculating interest on a loan/how to take out a loan, averaging numbers for grades, etc. Some of these skills require setting up an equation or proportions as well, so we have practiced these skills. We have also done some practice on doing addition/subtraction and multiplication/division of whole numbers and decimals/fractions by hand as well as with a calculator.
- Number sense, math reasoning, and math calculations skills
- pre algebra skills
- Solving equations. Factoring.
- Algebra
- Algebra - functions - graphing
- Algebra, patterns, etc
- division, fractions, decimals, money, percents (I focus on the basic skills that are needed for living. They STILL struggle with them!!!!!) I don't feel like I can move to more complex things when they don't even have the skills necessary for life. Even when given a calculator, pushing further does not seem like an option.

- / Multi-step equations (how to follow the steps necessary to get to the end of a problem.) Graphing functions. Exploring geometry concepts. /
- Basic math, pre-algebra/geomentry skills
- I have been co-teaching in two Secondary II math classes this year.
- Understanding the basic stay with us as we move along.
- Geometry
- Currently, I teach a very basic math skills class for those who have very low skills and also a Pre-Algebra class. / I work on Consumer math skills with both groups also.
- Division and subtraction
- Basic math concepts and some pre-algebra.
- Order of operations, add, subtract multiply and dividing integers, fractions and decimals
- Fractions, with out a doubt. Then it would be simple algebra problems every year.
- percents, measurement, solving for x in basic math, basic story problems, and graphing
- Solving one and two step algebraic equations, graphing functions and interpreting the information in the graphs. Number concepts, properties, and basic geometry and the use of algebra in geometry.
- Algebra
- I spend most of my time trying to get the fractions, and equation theories across and entirely to much time on the basic math areas of addition, subtraction, multiplication and division.

Question #20. What math topics do you with you had more time to get to?

- I wish there was a 12th grade math class with math credit attached which clearly was a conitnuatioin of the 10th and 11th grade classes. I would compare it to the Algebra A & B courses offered in prior years. The students progressed if they understood the concepts.
- Geometry
- geometry
- Linear functions and applying these to careers the students are interested in as well as using modeling to demonstrate concepts in algebra.
- I would love to have more geometry to cover.
- Word Problems, Real World Problems, Probability
- It would be great if the students could do all the basic Math functions. But I have had maybe two students in 12 years that could actually perform all the basic Math functions. I think when they gave claculators to the younger students, their abilty to do the actual math problems began to slide. And now, even with a calculator alot of them are struggling.
- Math needed for their identified occupation
- Solving story problems and higher level Algebra concepts
- Geometry
- on the job math, such as story problems that come directly from a specific occupation, ie electrician, mechanic, nurse, architect, etc.
- Money math

- Word problems, and the specific strategies for solving them. Teaching students how to critically solve math problems. More time for math manipulatives. Literacy strategies. Basic math calculations. I think daily math could help solve this.
- Algebra i think it is important to send kids to college. often times i feel that all they are going to learn is basic life skills math and that will have to be good enough because they havent figured out how to work to make it in college.
- Polonomials, slope, graphing nonlinear functions, grpahing inequalities, rational expressions, solving systems of equations.
- Greater depth in all concepts.
- Algebra skills
- I don't know. This is my first year teaching a math class.
- Grade level core material.
- consumer/buisness math
- Oh my. Historical connections. Real-world applications.
- Geometry
- Financial literacy
- If I had more time I would continue to teach the same topics, but I would have more real world application. I would go on field trips that applied the math we do and I would have more activities where the students are creating things and using the math to solve it all.
- I would LOVE to move past the basics. (Maybe I should teach back to back math class?)

- All of them.
- I wish that some of the topics in trig had been taught with the algebra 2 class, so we were reviewing as we should be and not teaching for the first time.
- Consumer Math, More higher math for those who can. / I really wish we had a Life Skills Math for these really low students who need to learn how to schedule, time, money, measurement, how to ride the bus, how to read a recipe. Yes this sounds like severe but there are MANY students in Resource who are low enough that they do not know these skills. / We also have the other end of the scale with students who have some awesome skills and just need very little support from us. /
- Algebraic and generalization
- A pre-algebra curriculum that is effective.
- Multi step equations, geometry.
- Money and measurements.
- algebra and gemetry
- ????
- Geometry
- I wish I could get the students to equations, graphing and upper mathmatical thought.