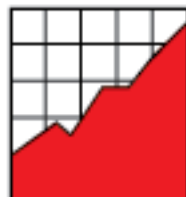


A Summary of the Research on the Effects of Test Accommodations: 2009-2010



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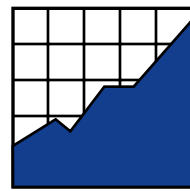
A Summary of the Research on the Effects of Test Accommodations: 2009-2010

Christopher M. Rogers • Elizabeth M. Christian • Martha L. Thurlow

November 2012

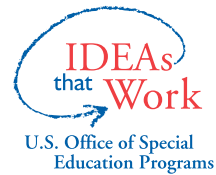
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NCEO Core Staff

Martha L. Thurlow, Director	Kristi K. Liu
Deb A. Albus	Ross E. Moen
Manuel T. Barrera	Michael L. Moore
Laurene L. Christensen	Rachel F. Quenemoen
Linda Goldstone	Rebekah Rieke
James Hatten	Christopher Rogers
Christopher J. Johnstone	Miong Vang
Jane L. Krentz	Yi-Chen Wu
Sheryl S. Lazarus	

National Center on Educational Outcomes
University of Minnesota • 207 Pattee Hall
150 Pillsbury Dr. SE • Minneapolis, MN 55455
Phone 612/626-1530 • Fax 612/624-0879
<http://www.nceo.info>

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Executive Summary

The use of accommodations in instruction and assessments continues to be of great importance for students with disabilities. This importance is reflected in an emphasis on research to investigate the effects of accommodations. Key issues under investigation include how accommodations affect test scores, how educators and students perceive accommodations, and how accommodations are selected and implemented.

The purpose of this report is to provide an update on the state of the research on testing accommodations as well as to identify promising future areas of research. Previous reports by the National Center on Educational Outcomes (NCEO) have covered research published since 1999. We summarize the research to review current research trends and enhance understanding of the implications of accommodations use in the development of future policy directions, implementation of current and new accommodations, and valid and reliable interpretations when accommodations are used in testing situations. In 2009 and 2010, 48 published research studies on the topic of testing accommodations were found. Among the main points of the 2009-10 research are:

Purpose: The majority of the research included in this review sought to evaluate the comparability of test scores when assessments were administered with and without accommodations. The second most common purpose for research was to report on perceptions and preferences about accommodations use. The majority of studies addressed multiple purposes.

Research design: Over 60% of the studies reported primary data collection on the part of the researchers, rather than drawing on existing archival data sets. Over half of the studies involved quasi-experimental designs. Researchers also drew on survey techniques and carried out literature meta-analyses.

Types of assessments, content areas: A wide variety of instrument types were used in these studies. Tests and descriptive surveys were the most common data collection methods used in the studies reviewed, as developed by the researchers for the purpose of the study. A large number of the studies involved academic content items drawn from specified sources outside of the researchers' work. Other studies used state criterion-referenced test data, norm-referenced measures, or multiple types of data in various combinations. Mathematics and reading were the most common content areas included in the 2009-2010 research. Other content areas were writing, other language arts, science, social studies, and psychology. Approximately one-quarter of all studies addressed more than one content area in the assessments used.

Participants: Participants were most frequently students, spanning a range of grade levels from K-12 to college/university students, although several studies included educators and parents as participants, in various combinations, as well. Studies varied in the number of participants; some studies included fewer than 20 participants, whereas other studies involved tens of thousands of participants.

Disabilities categories: Learning disabilities were the most common disabilities exhibited by participants in the research, accounting for over half of the studies. Attention problems and emotional behavioral disabilities were each the next most commonly studied. Low-incidence disabilities were included in about 40% of the studies.

Accommodations: Presentation accommodations were the most frequently studied category, with the Read Aloud accommodation being the most studied within this category (and across categories). Other commonly studied accommodations included Computerized Administration and Extended-time. There was a small number, about one-eighth of the studies, that analyzed relatively uncommon or unique accommodations from among various categories.

Findings: Most of the oral presentation and computer administration accommodations empirically tested showed positive effects on test scores. In addition, the read-aloud accommodation did not alter the construct being tested. Among studies of the perception of different accommodations, students often indicated a preference for one accommodation over others, whereas educator preferences were mixed regarding accommodations use. The most broadly-supported research finding was that accommodations provided during testing did not alter the academic constructs tested—including for mathematics, reading, science, and writing.

Limitations: Researchers often cited small sample size as well as a general lack of representativeness on age, grade level, and race as primary limitations of their research. Methodological issues such as the use of bundled (vs. individually administered) accommodations and non-random sampling of participants were also mentioned as limitations.

Directions for future research: A number of promising suggestions were noted, particularly for varying or improving on research methods to test the effects of specific accommodations, improving the representativeness of samples, and improving test development practices to reduce the need for accommodations. In many cases, researchers also found

that the results of their studies generated many suggestions for further investigation, such as concurrent validity studies using other measures.

The studies in 2009-2010 demonstrated several similarities when viewing them in comparison with previous research, especially in relation to the 2007-2008 studies examined in the previous accommodations research review. However, there were several differences, or shifts, as well. There were increases in research examining science assessment accommodations and decreases in reading assessment accommodations. There was a rise in multi-purpose study designs, and accordingly, more studies employed multiple data collection methods and instruments. Test performance of students in elementary and middle school received increased attention. The number of accommodations receiving focused examination – including common and unique accommodations – expanded to 10 in the current review. There were decreases in studies measuring impact of the extended-time accommodation, as well as a small increase in examining response accommodations. Further, students with disabilities were reported not to have benefited from extended-time in half of the relevant studies, and to have benefited in the other half of the studies. Research provided more support for the benefits of computerized administration, along with demonstrated score equivalency with and without this accommodation, indicating no problematic concern regarding academic construct validity. In fact, attention to the effects of accommodations on construct validity has increased in general, and only 2 of 21 separate findings indicated that academic constructs were different in the accommodated and non-accommodated testing conditions.

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Overview

Federal legislation has spurred states to include all students in statewide assessment, and vast improvements in inclusion have taken place over the past decade. For many students with disabilities, access to tests necessitates the provision of assessment accommodations. As the use of accommodations has increased, there has been a concurrent need to attend to the implementation of accommodations and to ensure the validity of results when accommodations are used. States look to educational research for answers about which accommodations have proven successful in increasing the validity of results for students with disabilities. Often this effort means looking for increased scores for students with disabilities, along with evidence that the constructs measured or the validity of inferences that can be drawn from results are not changed.

To synthesize research efforts, NCEO has provided reports on accommodations research completed over time. The time periods included 1999-2001 (Thompson, Blount, & Thurlow, 2002), 2002-2004 (Johnstone, Altman, Thurlow, & Thompson, 2006), 2005-2006 (Zenisky & Sireci, 2007), and 2007-2008 (Cormier, Altman, Shyyan, & Thurlow, 2010).

The purpose of this document is to provide a synthesis of the research on test accommodations published in 2009 and 2010. The research described here encompasses empirical studies of score comparability and validity studies as well as investigations into accommodations use and perceptions of their effectiveness. Taken together, the current research casts a wide net in exploring the issues surrounding test accommodations practices, with a number of efforts made on key accommodations. Reporting the findings of current research studies was a primary goal of this analysis; a second goal was to identify areas requiring continued investigation in the future.

Review Process

Similar to the process used in past accommodations research syntheses (Cormier, Altman, Shyyan, & Thurlow, 2010; Johnstone et al., 2006; Thompson, Blount, & Thurlow, 2002; Zenisky & Sireci, 2007), a number of sources were accessed to complete the review of the accommodations research published in 2009 and 2010. Specifically, five research databases were consulted, including Educational Resources Information Center (ERIC), PsycINFO, Academic Search Premier, Digital Dissertations, and Educational Abstracts. To confirm the thoroughness of our searches, we used the Web search engine Google Scholar to search for additional research. In addition, a hand-search of 30 journals was completed to ensure that no qualifying study was missed. A list of hand-searched journals is available on the National Center on Educational Outcomes website (www.nceo.info/OnlinePubs/AccommBibliography/AccomStudMethods.htm).

Online archives of several organizations were also searched for relevant publications. These organizations include Behavioral Research and Teaching (BRT) at the University of Oregon

(<http://brt.uoregon.edu/>), the National Center for Research on Evaluation, Standards, and Student Testing (CREST; <http://www.cse.ucla.edu/>), and the Wisconsin Center for Educational Research (WCER; <http://www.wcer.wisc.edu/testacc>).

The initial search was completed in December, 2010. A second search was completed in April, 2011 to ensure that all articles published in 2009 and 2010 were found and included in this review. Within each of these research databases and publications archives, we used a sequence of search terms. Terms searched for this review were:

- standardized (*also* large-scale, state, standards-based) test (*also* testing) changes
- standardized (*also* large-scale, state, standards-based) test (*also* testing) modification(s)
- standardized (*also* large-scale, state, standards-based) test (*also* testing)
- accommodation(s)
- test changes
- test modifications
- test accommodations

Many of these search terms were used as delimiters when searches yielded large pools of documents found to be irrelevant to the searches.

The research documents from these searches were then considered for inclusion in this review with respect to several criteria. First, the decision was made to focus only on research published or defended in doctoral dissertations in 2009 and 2010. Second, the scope of the research was limited to investigations of accommodations for regular assessment (hence, articles specific to alternate assessments, accommodations for instruction or learning, and universal design in general were not part of this review). Third, research involving English language learners (ELLs) was included only if the target population was ELLs with disabilities. Fourth, presentations from professional conferences were not searched or included in this review, based on the researchers' criteria to include only research that would be accessible to readers and that had gone through the level of peer review typically required for publication in professional journals or through a doctoral committee review. (This criterion was implemented for the first time during the 2007-2008 review) Finally, in order to be included in the online bibliography and summarized in this report, studies needed to involve either (1) experimental manipulation of an accommodation, (2) investigation of the comparability of test scores across accommodated and non-accommodated conditions, or (3) examination of survey results on teachers' knowledge and/or perceptions of accommodations.

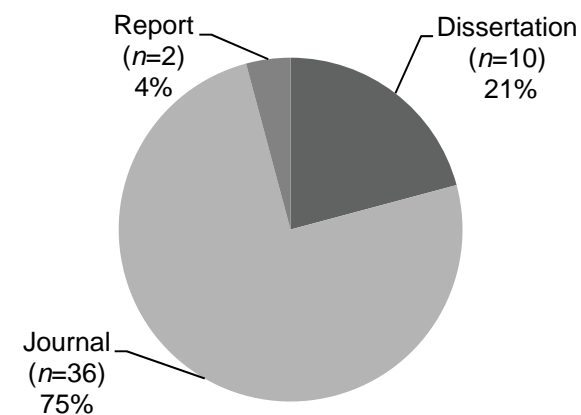
Results

The results of our analyses of the 48 studies published from January 2009 through December 2010 are presented in substantial detail. We provide the studies' publication types, as well as the range of research purposes. We specify the types of research approaches and the primary and secondary sources of data collection. We also describe the data collection methods and instruments. We provide the academic content areas covered in the research. We depict research participants in terms of their being students, educators, and parents, their ages or grade levels, the participant sample sizes and disability status, and the disability categories. We report the types of accommodations studied. We also explicate the research findings in terms of the impact of accommodations as well as perceptions about accommodations, incidence of accommodations use, and implementation. Additional sections offer perspectives on accommodations in postsecondary education, the accommodations decision-making process, and the association of accommodations to academic discipline. Finally, limitations and future research directions in the assembled body of research literature are presented as reported by the researchers.

Publication Type

The results of the review process showed a total of 48 studies about accommodations were published during the period from January 2009 through December 2010. As shown in Figure 1, of these 48 studies, 36 were journal articles, 10 were dissertations, and 2 were published professional reports released by research organizations (e.g., National Center on Educational Outcomes, University of Oregon Behavioral Research and Teaching).

Figure 1. Percentage of Accommodations Studies by Publication Type



The total number of studies published on accommodations in 2009-2010 ($n=48$) increased since the previous report examining accommodations research published in 2007-2008 ($n=40$). There was also an increase in the number of journal articles ($n=25$ in 2007-2008; $n=36$ in 2009-2010),

and a slight decrease in the number of dissertations published on accommodations ($n=13$ in 2007-2008; $n=10$ in 2009-2010). The increase in journal articles included in this report may be due, in part, to an increased number of journals that published research on accommodations in 2009-2010. The report on accommodations research in 2007-2008 included articles from 19 journals; the articles described in the current report were found in 24 journals.

Purposes of the Research

A number of purposes were identified in the accommodations research published in 2009 and 2010. Table 1 provides a view of the predominant focus of each of these 48 studies. In some cases, a work had only one expressed purpose; this describes 11 of the studies (see Appendix A-1). The majority of studies sought to accomplish multiple purposes. In those cases, we identified the “primary purpose” according to the title of the work or the first-mentioned purpose in the text of the work.

Table 1. Primary Purpose of Reviewed Research

Purpose	Number of Studies
<i>Compare scores</i> only students with disabilities (7 studies) only students without disabilities (0 studies) both students with and without disabilities (8 studies)	15
Study/compare perceptions and preferences about use	11
Compare test items	6
Evaluate test structure	5
Summarize research on test accommodations	4
Report on implementation practices and accommodations use	3
Investigate test validity	3
Identify predictors of the need for test accommodations	1
Discuss issues	0
Total	48

The most common primary purpose for research published during 2009-2010 was to report on the effect of accommodations on test scores (31%), through comparing scores of students who received accommodations to those who did not. The next most common primary purpose was studying perceptions of the accommodations and preferences between or among a small number of accommodations of a certain type (23%). Other primary purposes included comparing test items, which refers to whether item difficulty or other item-specific content validity issues changed when test format changed from print-based to electronic (e.g., Kim & Huynh, 2010), or to audio presentation (e.g., Cook et al., 2009), among others. The purpose of evaluating test

structure focused on the effects of accommodations on academic constructs. Factor structure was examined by comparing the tests with and without accommodations.

We identified the primary purpose of summarizing research in works that were expressly written as literature reviews; for example, Lindstrom (2010) inquired about the impact of different types of accommodations on the mathematics test scores of students with high-incidence disabilities. The purpose of reporting on implementation practices and accommodations use was fairly uncommon as a primary study purpose, yet an example was when Johnstone and his colleagues (2009) inquired about factors that may have affected use of assistive technology.

The investigation of test validity was the primary purpose of only three studies (Elliott et al., 2010; Laitusis, 2010; Lovett et al., 2010). For example, Laitusis (2010) used an external validation measure of teacher rating of comprehension abilities to analyze correlational data and regression procedures to examine possible connections with comprehension as measured by a standardized test both with and without a form of the oral presentation accommodation. The least common primary purpose was to identify predictors of the need for test accommodations, which was the primary focus of one study (Cawthon, 2009) in which relationships across instructional factors and the effect of accommodations use were explored (see Appendix A-2).

Table 2 provides a more detailed view of the body of literature showing the multiple purposes of many studies. For example, some efforts included analyses of score comparisons between students with disabilities and students without disabilities when using accommodations, yet also sought students’ comments through survey or interview about their test-taking experience.

Table 2. All Purposes of Reviewed Research

Purpose	Proportion of Studies ^a
<i>Compare scores</i> only students with disabilities (19%) only students without disabilities (2%) both students with and without disabilities (31%)	52%
Study/compare perceptions and preferences about use	40%
Discuss issues	38%
Report on implementation practices and accommodations use	21%
Compare test items	19%
Summarize research on test accommodations	17%
Evaluate test structure	10%
Investigate test validity	6%
Identify predictors of the need for test accommodations	2%

^a The total of these percentages is >100% due to the multiple purposes identified in most (37) of the studies; 23 of the studies had 2 identified purposes, and 14 of the studies had 3 identified purposes.

The most common single purpose of the 2009-2010 published studies was to demonstrate the effect of accommodations on test scores; this was included in over half of the works (52%). Study approaches either compared test scores of students with disabilities and students without disabilities when using accommodations, or compared test scores of students with disabilities when using and not using accommodations. The former approach was the most common, comprising fully two-thirds of this category of research. An additional study (Lovett et al., 2010) considered the impact of using supports commonly implemented as accommodations—word-processing and extra time—on the quality of essay-based college-level course examinations completed only by students without disabilities. Another purpose we identified in over one-third of the studies was a focus on discussing issues, usually noted when the researchers offered a detailed consideration of a central issue related to accommodations. For instance, Bayles (2009) presented discussion related to instructional and curricular access for students with disabilities, Lazarus and her colleagues (2009) discussed the trend line of accommodations policy development, Freeland and her colleagues (2010) considered training and experience with technology as a possible intervening variable, and Lovett (2010) structured his literature review around answering questions about the extended-time accommodation.

The purpose of reporting on implementation practices and accommodations use was present in about one-fifth of all studies. For instance, in the course of summarizing research about accommodations in technology-supported assessments, Salend (2009) also reported about related accommodations practices. The purpose of comparing test items co-occurred in many studies on comparing scores between accommodated and non-accommodated tests, yet added the focus on analyzing differential item functioning (DIF). For instance, Stone and her colleagues (2010) examined differential benefits of standard print, large-print, and braille formats for students with and without blindness or visual impairments. We made a judgment call as to which of these purposes was predominant for these types of studies, tending to note that comparing scores came first in the study text or encompassed more of the results reporting than comparing items. The purpose of summarizing accommodations research was identified when the researcher included a comprehensive review of literature; other than those studies that were written as literature reviews, examples of the level of comprehensiveness we sought occurred in dissertations where another purpose predominated but a substantive research summary was also completed.

Research Type and Data Collection Source

Just over half of the accommodations research reviewed here used a quasi-experimental research design to gather data on the research purposes. As seen in Table 3, the number of descriptive quantitative research studies decreased slightly in 2010 compared to 2009, while the number of studies using a quasi-experimental design remained about the same. Though few studies were

reported to use experimental, longitudinal, or meta-analytic designs, these categories also were rarely included in past reports. The data reported here may reflect an increase in the use of these designs in accommodations research. Furthermore, there appeared to be a large difference between data collection sources, with about twice as many studies using primary versus secondary sources of data overall and within each year. This is a change from the previous report, in which approximately equal numbers of studies used primary and secondary data sources. Primary data sources included actual data collection procedures that researchers undertook to obtain their data. Secondary data collection included the use of archival or extant data.

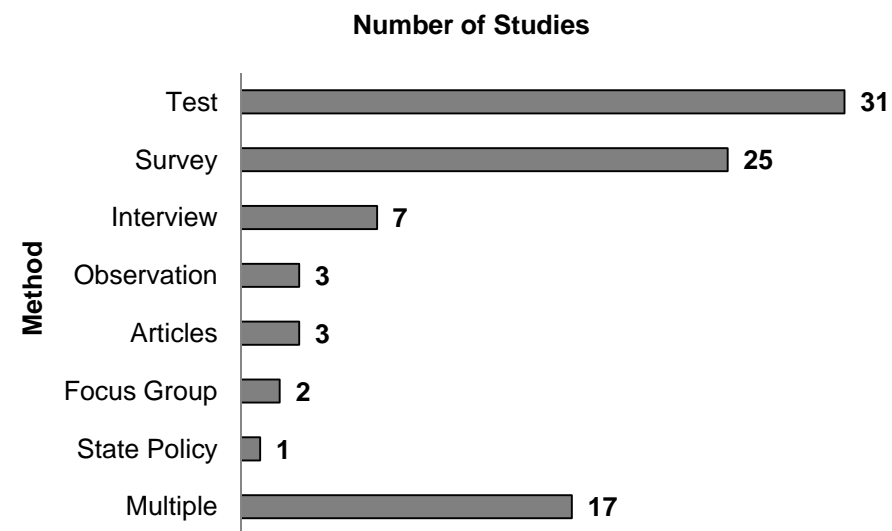
Table 3. Research Type and Data Collection Source by Year

Research Design	Data Collection Source				Research Type Tools
	Primary		Secondary		
	2009	2010	2009	2010	
Quasi-experimental	8	8	4	5	25
Descriptive quantitative	5	4	1	0	10
Descriptive qualitative	3	2	0	2	7
Correlation/prediction	0	1	1	0	2
Experimental	1	1	0	1	3
Longitudinal	0	0	0	0	0
Meta-Analysis	0	0	1	0	1
Year Totals	17	16	7	8	48
Source Totals Across Years	33		15		48

Data Collection Methods and Instruments

The researchers collected study data gathered through primary or secondary procedures using various methods and tools, as seen in Figure 2. The majority of the research included in this synthesis for 2009-2010 used data acquired through academic content testing. Just over half of the studies employed surveys to gather data. Interviews, observations, and focus groups were used much less frequently. For this analysis, we considered “articles” the method or source for those studies that reviewed research, including one study that employed formal meta-analysis. One study used state policies as the data source for the descriptive analyses completed. Fewer than half of the studies reported using more than one method or tool to gather data.

Figure 2. Data Collection Methods Used in 2009-2010 Research



Note: Of the 48 studies reviewed for this report, 12 reported using two data collection methods, and 5 reported using three data collection methods.

Nearly all of the studies used data collection instruments of one form or another; only four studies did not employ any instruments. Table 4 presents the types of data collection instruments used in studies. Surveys presented items of an attitudinal or self-report nature. Tests were course- or classroom-based. Assessments were statewide or large-scale in scope. Protocols refer to non-academic sets of questions, usually presented in an interview or focus group format. Measures referred to norm-referenced academic or cognitive instruments. All of these instruments were placed into five categories: protocols or surveys developed by study authors, norm-referenced cognitive ability measures, norm-referenced academic achievement measures, state criterion-referenced academic assessments, and surveys or academic tests developed by education professionals or drawn by researchers from other sources. Non-test protocols developed by the author or authors of the studies – the most commonly-used instrument type – included performance tasks, questionnaires or surveys, and interview or focus-group protocols, among others. Surveys or academic tests developed by education professionals or researchers used sources outside of current studies, and were exemplified by attitudinal surveys such as the Attitudes Toward Requesting Accommodations (ATRA) scale, or by subsets of items drawn from released or otherwise-available pools such as the National Assessment of Educational Progress, as well as course-content exams. State criterion-referenced assessments included those of Georgia, South Carolina, Texas, and Wisconsin, as well as some from states that remained unidentified in the research. Norm-referenced academic achievement measures included the Gates-MacGinitie Reading Test (GMRT). Norm-referenced cognitive ability measures included the Test of Silent Word Reading Fluency (TOSWRF), among others. A substantial minority – 10 studies in all

—used instrumentation of more than one kind. Additionally, a small number of studies used multiple instruments in each of them, often of the same kind (Laitusis, 2010; Logan, 2009; Lovett et al., 2010; Parks, 2009). A small number (n=5) of the instruments was used in more than one study: Attitudes Toward Requesting Accommodations (ATRA) survey, the Principles and NCTM standards for school mathematics test, the Gates MacGinitie Reading Test (GMRT), the Woodcock Johnson III Tests of Academic Achievement measure, and the South Carolina Palmetto Achievement Challenge Test (SC PACT) assessment. We present a complete listing of the instruments used in each of the studies in Appendix C, including the related studies that served as sources for these instruments, when available.

Table 4. Data Collection Instrument Types

Instrument Type	Number of Studies
Non-academic protocols or surveys developed by study author/s	19
Surveys or academic tests developed by professionals or researchers using sources outside of current study	17
State criterion-referenced assessments	11
Norm-referenced academic achievement measures	8
Norm-referenced cognitive ability measures	2
None	4
Multiple (types)	10

Content Area Assessed

A number of studies published during 2009-2010 focused on accommodations used in certain academic content areas. As shown in Table 5, math and reading were the two most commonly assessed content areas. Table 5 also provides a comparison to content areas in NCEO's previous reports on accommodations (Cormier et al., 2010; Zenisky & Sireci, 2007). In general, the emphasis on reading and math is consistent across reviews. The number of studies on writing, social studies, and psychology has remained fairly consistent since 2005. An increase in science studies is apparent across years. There were no studies citing Civics/US History as a content area in the 2007-2008 and 2009-2010 reports. All studies published in 2009-2010 specified a content area. This is a change from past reports, in which at least one study did not cite the content area studied.

Table 5. Academic Content Area Assessed Across Three Reports

Content Area Assessed	2005-2006 ^a	2007-2008 ^b	2009-2010 ^c
Mathematics	17	15	20
Reading	14	18	16
Writing	4	4	3
Other Language Arts ^d	9	4	4
Science	1	3	7
Social Studies	1	1	2
Civics/US History	1	0	0
Psychology	1	1	1
Not Specific	7	1	0
Multiple Content	14	10	13

^a Studies in 2005-2006 including examinations of more than one content area ranged in number of areas assessed from 2 to 6.

^b Studies in 2007-2008 including examinations of more than one content area ranged in number of areas assessed from 2 to 4.

^c Studies in 2009-2010 including examinations of more than one content area ranged in number of areas assessed from 2 to 5.

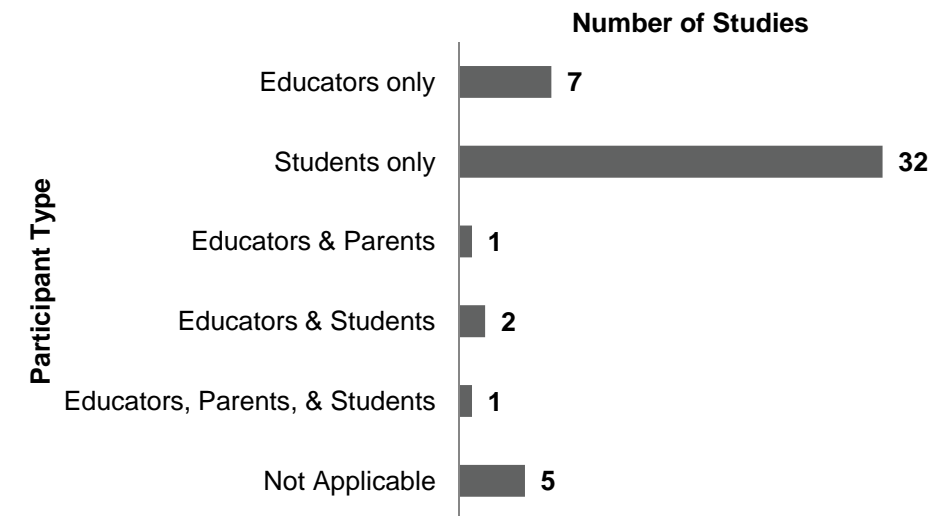
^d Detailed descriptions of what constituted 'Other Language Arts' for each of the four studies from 2009-2010 can be found in Appendix C, Table C-2.

Research Participants

Researchers drew participants from differing roles in education (see Figure 3 and Appendix D, Table D-1). A large majority studied only students – 32 of the 48 studies from 2009-2010. The next largest participant group studied was 'educators only,' describing or analyzing the educator perspective on accommodations. Additional data are reported about combinations of participant groups, as well as noting that some studies did not specify participants; these were usually the topical literature review documents.

Table 6 shows details about the size and composition of the participant groups in the research studies published during 2009 and 2010; this information is displayed in more detail by study in Appendix D. The size of the samples varied from 12 (Mastergeorge & Martinez, 2010) to 61,270 (Anjorin, 2009). In 2009-2010, there was a larger number of studies in which at least 50% of the participants were people with disabilities ($n=17$) than there were studies where at least 50% of the participants were people without disabilities ($n=15$). Eleven studies examined participant groups composed primarily of people with disabilities, which are reported in the 75-100% column. In fact, 10 of these 11 studies focused only on students with disabilities. Most studies involving participants with disabilities had numbers between 25-299, and only 2

Figure 3. Types of Research Participants



studies had participant numbers of 1,000 or more. Alternately, studies with 24% or fewer of the participants having disabilities tended to number 1,000 participants or more. Also, the studies with mostly participants without disabilities included studies focused on educator input and perspectives.

Table 6. Participant Sample Sizes and Ratio of Individuals with Disabilities

Number of Research Participants by Study	Number of Studies by Proportion of Sample Comprising Individuals with Disabilities					
	0-24%	25-49%	50-74%	75-100%	Unavail. ¹	Total
1-9	0	0	0	0	0	0
10-24	0	1	1	0	1	3
25-49	0	1	1	3	3	8
50-99	0	0	0	3	0	3
100-299	3	1	0	3	3	10
300-499	0	1	0	0	2	3
500-999	0	0	1	0	1	2
1000 or more	5	3	3	2	1	14
Total	8	7	6	11	11	43²

¹ 11 of the studies did not specify the proportion of participants who had disabilities.

² 5 of the studies did not specify the number of participants.

Analyzing the proportions more closely, a finer distinction is indicated in the center columns, in which the studies examined samples that had somewhat more participants without disabilities (25-49%) and somewhat more participants with disabilities (50-74%). These two columns have almost equivalent overall numbers, with a total of 6-7 studies in each. These studies, with relatively similar ratios of people with and without disabilities, tended to examine data from at least 500 participants ($n=7$) compared with 2 studies with 100-499 participants, and 4 studies with 10-49 participants. Finally, about ¼ of the studies with participant numbers reported did not specify the proportions of participants with or without disabilities; 7 of these 11 studies collected data only from educator participants.

School Level

Research on accommodations published during 2009 and 2010 involved kindergarten through college-aged participants (see Table 7). Previous reports included research with participants in kindergarten through postsecondary (see Appendix D for more detail); the category postsecondary/college represents a change from past reports.

As seen in Table 7, a plurality of the studies published in 2009 and 2010 focused on middle school students ($n=18$). Thirteen studies involved elementary school students, and ten involved high school students. About one quarter of the studies ($n=12$) involved samples from across more than one grade-level cluster; most of these studies included relatively larger groups of 50 or more participants (about 67%), and secondary data sources (see Appendices B and D). Put another way, these multiple grade-level studies were primarily analyses of extant large-scale assessment data sets, often drawn at the state level. Although not more common than K-12 studies, there was a noteworthy number of studies that examined accommodations use and implementation at the postsecondary/college level. Twelve studies did not involve students as participants.

Table 7. Grade Level of Research Participants

Education Level of Participants in Studies	Number of Studies
Elementary school (K-5)	13
Middle school (6-8)	18
High school (9-12)	10
Postsecondary	7
Multiple grade-level clusters	12
Not applicable (No age)	12

Disability Categories

A broad range of disability categories was included in samples in the 2009-2010 research (see Appendix D for details). As shown in Table 8, seven studies did not specify disability categories of participants, and eight studies did not include students in the sample. Of the remaining 33 studies, the most commonly studied disability category was learning disabilities ($n = 26$); nine of these studies had only participants with learning disabilities. In comparison to the previous reporting period, 2007-2008, the proportion of studies with participants with learning disabilities changed from about three-eighths of the studies to over half of the studies. Approximately one third of these remaining 33 studies included participants with an attention problem, an emotional behavioral disability, blindness/visual impairment, or deafness/hearing impairment. The least common disability category was autism, and all of the studies specifying that category also included participants with other categories as well. Sixteen studies included participant groups with various disabilities, rather than all having one specific category of disability. Only eight studies reported participants with “multiple disabilities”; that is, they included participants who each had more than one disability identified.

Table 8. Disabilities Reported for Research Participants

Disabilities of Research Participants	Number of Studies
Learning disabilities	26
Attention problem	11
Emotional behavioral disability	11
Blindness/Visual impairment	10
Deafness/Hearing impairment	9
Physical disability ^a	9
Speech/Language	7
Intellectual disabilities ^b	8
Autism	5
Multiple disabilities ^c	8
No disability	11
Not specified ^d	7
Not applicable ^e	8

^a Physical disability = mobility and/or impairment with arm use.

^b Intellectual disabilities = students who were referred to as having “mental retardation” in previous report; also, this number includes one European study (Peltenburg et al., 2009) that applied the term “learning disability” to its participants who were reportedly ages 8-12 but were identified as appropriate for assessment items at the educational level of grade 2.

^c Multiple disabilities = individual students who were specifically categorized as having more than one disability.

^d Not specified = those studies or reviews (3) of studies that did not report about or provide detail as to the participants' disabilities.

^e Not applicable = those documents that had only non-students as participants; this includes an NCEO policy review.

Types of Accommodations

The number of times specific categories of accommodations were included in 2009-2010 published research is summarized in Table 8. Presentation accommodations were the most frequently studied category ($n=28$), and within this category the most common accommodations were read-aloud ($n=20$) and computer administration ($n=9$). The next most frequent category studied was response, and in that category, computer administration ($n=9$) was the most common accommodation. It should be noted that the computer administration accommodation fits into three categories: presentation, equipment/materials, and response. Several studies ($n=15$) analyzed accommodations from more than one category. Three studies – Bayles (2009), Bublitz (2009), and Mastergeorge and Martinez (2010) – examined accommodations as naturalistically identified in students' IEPs, but were not specified by the researchers. One study – Altman et al. (2010) – examined accommodations naturalistically identified in students' IEPs, but these were too numerous to mention, and their specific effects on score data were not the central focus of the study. A complete listing of accommodations studied is provided in Appendix E.

Table 8. Accommodations in Reviewed Research

Accommodation Category	Number of Studies
Presentation	28
Equipment/Materials	10
Response	19
Timing/Scheduling	16
Setting	9
Multiple accommodations	15

Research Findings

The findings of the body of research literature on accommodations published from 2009-2010 are summarized in Tables 9-19. We present information according to the nature of the studies, in keeping with their varying purposes and focuses. The findings included reviews of perceptions about accommodations, including those of student test-takers as well as educators and other stakeholders, primarily parents. We summarize the findings of the research on specific accommodations, including read-aloud, computerized administration, extended-time, calculator, and aggregated sets of accommodations commonly called “bundles.” We also summarize the findings on unique accommodations – those examined in only one study each – including

scribing, word-processing, a virtual manipulative tool, a resource guide modification, American sign language (ASL) via avatar, and braille and large-print. Separate summaries of findings include varying implementation conditions as well as incidence of use of various accommodations across large data sets. The findings from studies in postsecondary educational contexts, which have numbered about 6-7 in 2005-2006, 2007-2008, and 2009-2010, receive separate attention. We also report separately accommodations decision making as addressed by five studies. This report also presents findings by academic content areas: math, reading, writing, other language arts, science, and social studies. In Appendix F, we provide substantial detail on an individual study level.

Impact of Accommodations

Research examining the effect of accommodations on assessment performance for students with disabilities comprised 34 studies published in 2009 and 2010 (see Table 9; see also Appendix F, Tables F-1 to F-6 for details about each study of this type). In a continuing trend, oral administration, or the “read-aloud” accommodation, was the single most investigated accommodation in 2009-2010, with nearly one-third of the accommodation-specific studies ($n=11$). Several of the studies found that the academic construct was not altered by the inclusion of read-aloud to support test-takers. Three studies indicated that read-aloud provided a differential boost for students with disabilities in comparison with students without disabilities, while two studies showed that read-aloud helped to improve performance for all students, and one study showed that it helped improve scores for students with disabilities in comparison to their scores without read-aloud. One of the studies finding differential boost reported the effects of read-aloud alone although it actually implemented the read-aloud accommodation in an accommodations bundle that included 150% extended-time and recording answers in the test booklet. (See Appendix F, Table F-1.)

Computerized administration was another frequently-examined accommodation in the 2009-2010 published literature, with seven studies. The findings were somewhat mixed, with some studies affirming this test mode as supporting construct validity and the needs of students with disabilities, and others finding the opposite. Three studies indicated that this accommodation helped to improve performance of students with disabilities, yet one study found that there was no difference in test results for students with learning disabilities. One study indicated that test mode had no effect on the test construct, and one study – a meta-analysis of 81 studies – indicated that the computerized presentation of tests was comparable to paper-based assessments in science, but not in reading or other language arts, not in social studies, and not in mathematics. Finally, one study (Russell et al., 2009b) examined the relative impact of two different ways of providing ASL – through a recording of a human signing and an avatar signing – and found that neither had more impact on test scores of students with hearing impairments or deafness than the other. (See Appendix F, Table F-2.)

The extended-time accommodation was examined primarily as to its impact on assessment scores of students with disabilities. In comparison with no additional time, students with disabilities did not score differently when given extended-time to complete testing, according to three studies. Alternately, two studies indicated that, in comparison with students without disabilities, students with disabilities differentially benefited from extended-time – that is, extended-time provided a “differential boost” for students with disabilities. (See Appendix F, Table F-3.)

Effects of the calculator accommodation were explored in three studies. One study found that students without disabilities were provided a differential boost when using a graphing calculator, in comparison with students with disabilities. Another study comparing performance of students with learning disabilities and students with attention deficit/hyperactivity disorder who received or did not receive the calculator accommodation resulted in no improvement in performance and no overall decrease in math anxiety for students in either group – in fact, some individual students with disabilities experienced higher math anxiety when using the calculator accommodation. The third study yielded no difference in scores when using a graphing calculator compared with using a four-function calculator for either students with disabilities or students without disabilities. (See Appendix F, Table F-4.)

Two studies scrutinized effects of different aggregated sets of accommodations – also called accommodations bundles. One study combined unique extended-time and unique read-aloud approaches, comparing effects for accommodated and standard administrations for students with disabilities and students without disabilities, and reported that the accommodations package helped to improve scores of all students – both those with and those without disabilities – yet not consistently across both accommodations. Another study compared performance when provided IEP-specified accommodations for students with disabilities as well as teacher-recommended accommodations for students without accommodations to performance when provided with a package of accommodations – read-aloud directions, paraphrase directions, verbal encouragement, and extended-time – for students with disabilities and students without disabilities. Most students with disabilities (78%) benefited from accommodations in comparison to the no accommodations condition, and about half of the scores of students without disabilities (55%) improved, although about the same proportion of scores of the students without disabilities improved from the teacher-specified accommodations as improved from the standard package of accommodations. (See Appendix F, Table F-5.)

We categorized six studies as having inspected the effect of unique accommodations – that is, accommodations included in only one study. Most of these studies considered accommodations that were novel or otherwise not typical in their design or implementation. For instance, a virtual manipulative tool offered through a computer-based test platform assisted with basic operations for most students with learning disabilities (Peltenburg et al., 2009), as defined in the

Netherlands context, in which students ages 8-12 were performing at the level of “end Grade 2” (p. 276). (See Table 9 for detail about findings of each study; also, see Appendix F, Table F-6.)

Table 9. Summary of Research Findings by Specific Accommodation

Accommodation Studied (total)	Finding	Number of Studies
Read-aloud (11)	Did not alter the construct being tested	5
	Provided a differential boost for scores of students with disabilities compared to those of students without disabilities	3
	Improved performance of all students	2
	Improved performance of students with disabilities	1
Computerized administration (7)	Improved performance of students with disabilities	3
	Did not improve performance of students with disabilities	1
	Changed the construct being tested	1
	Did not change the construct being tested	1
	Two different types did not benefit students with disabilities more in comparison to one another	1
Extended-time (5)	Did not improve performance of students with disabilities	3
	Provided a differential boost for scores of students with disabilities compared to those of students without disabilities	2
Calculator (3)	Provided a differential boost for scores of students without disabilities compared to those of students with disabilities	1
	Did not improve performance of students with disabilities	1
	Two different types did not benefit students with disabilities more in comparison to one another	1
Aggregated set (2)	Had mixed effects on performance of students with disabilities	1
	Had positive effect on scores for students without disabilities	1
Partial scribing (1)	Perceptions of students, parents, and teachers varied about familiarity with implementation practices, including “partial scribing” method, during state English and mathematics assessments	1
Word-processing (1)	During course examinations, college students typed more words in the essay and speed tasks than they handwrote, but there were no differences in quality measures; in combination with extended-time, word-processed essays increased in length and improved in quality in comparison to handwritten essays	1

Table 9. Summary of Research Findings by Specific Accommodation (continued)

Accommodation Studied (total)	Finding	Number of Studies
Virtual manipulatives (1)	Improved performance of most students with LD (as defined in Netherlands context) even when this “100 board” was not fully used for every mathematics item	1
Resource guide (modification) (1)	Had negative effect on scores for grade 4 and grade 7 students with disabilities, and mixed effects on performance for students without disabilities, on state reading assessment	1
ASL via avatar (1)	Had no different effect on scores for students who were deaf or had hearing impairments, at varying performance levels, in comparison with ASL accommodation through recorded human interpreters. About 2/3 of test-takers expressed preference for human interpreter, and 1/3 expressed preference for avatar interpreter.	1
Braille and large-print (1)	Had mixed effects on students who were blind or had visual impairments, varying by grade level (grades 4 and 8) and by ELA area (reading and writing), in comparison with students without disabilities.	1

Perceptions about Accommodations

Table 10 shows the results of research on perceptions about accommodations. More than one-half of the studies ($n=9$) reported on student perceptions, with most of those studies ($n=5$) relating to preferring one accommodation of some kind over another – for instance, some students preferred the human ASL interpreter over an avatar (Russell et al., 2009b). Further, student preferences tended to support computerized test administration over a paper-and-pencil format, according to three studies (Arce-Ferrer & Guzman, 2009; Kingston, 2009; Russell et al., 2009a), although one study (Lee et al., 2010) found the opposite. Students also indicated a complicated view of the modifications in one study (Roach et al., 2010) and of the accommodations in another study (Logan, 2009). The perceptions of educators about accommodations were mixed in three studies, and were primarily positive in one study. The mixed nature of educator perceptions was related in one study to a concern about altering the exam itself (Byrd, 2010), yet many educators affirmed the inherent value of supporting students through test accommodations but with reservations (Zhang et al., 2010). One study noted that educators tended to support IEP-specified accommodations, but not accommodations that were not planned in advance (Elliott et al., 2009). One study indicated that educators had primarily a positive view of accommodations, due in part to the fairness in test results that they established (Mastergeorge & Martinez, 2010). One study presented the varying understandings and frames of reference on accommodations for research participants, including students, teachers, and parents (Jordan, 2009). (See Appendix F, Table F-7 for more detailed explanation of findings of each study.)

Table 10. Summary of Research Findings on Perceptions about Accommodations

Study Findings	Number of Studies
Student perceptions indicated a preference for one accommodation over others	5
Educator perceptions were mixed regarding use of accommodations	3
Participant groups had differing perspectives about accommodations provided	1
Student perceptions were mixed about the accommodations studied	2
Student perceptions were mixed about the modifications studied	1
Findings were inconclusive about student's perceptions of accommodations	1
Educator perceptions were mostly positive about use of accommodations, and supportive of equal treatment of test results for tests using accommodations	1

Implementation and Use of Accommodations

Table 11 shows several studies ($n=10$) that reported on incidence of accommodations use and implementation-related matters. Most of these findings ($n=7$) reported on common accommodations in use in various settings and with specific disability categories; for instance, five studies indicated that the state assessments examined most commonly offered small group administration as an accommodation. Findings also focused on the manner in which some accommodations are implemented, with one study reporting on the computer as medium for different accommodations practices (Salend, 2009), and another on implementation of read aloud (Lazarus et al., 2009). Finally, one study expounded the variety of factors associated with the implementation of accommodations, including educator training and knowledge (Bayles, 2009). (See Appendix F, Table F-8 for more detailed explanation of findings of each study.)

Table 11. Summary of Research Findings on the Implementation of Accommodations

Study Findings	Number of Studies
The most common accommodation involved small group administration	5
Common accommodations for students with visual impairments on reading assessments included audio recordings, enlarged print or page, read-aloud by teacher, and magnification tools, as well as tactile graphics on mathematics assessments	2
Accommodations presented through computer-based platforms have had variations in their implementation	1
The read-aloud accommodation has had variations in its implementation	1
Educators have had varying degrees of familiarity with accommodations, depending in part on school grade level	1

Accommodations in Postsecondary Education

Table 12 presents a set of research findings for nine studies that were focused specifically on accommodations in educational settings beyond the K-12 school setting. This report marks the first time we have separated these findings from the findings for other groups. Studies sought to investigate effects of accommodations on test performance, test-takers' experiences using accommodations, and stakeholder groups' perceptions of accommodations, along with implementation and decision-making issues. The studies ($n=4$) on the perceptions of postsecondary students with disabilities of accommodations provided insights into factors that were related to students' decisions to seek accommodations support in coursework and course examinations – including aspects of the university size and type (relative enrollment numbers and public or private institution), as well as the learning environment (in-person or online), and the nature of disabilities (visible or invisible to peers or others). Another group of findings pertained to accommodation effects; computerized administration compared favorably to paper-and-pencil format, and extended-time added complexity to the effects (Lee et al., 2010); further, word-processed essays composed with extended-time were scored highly, yet there were mitigating elements limiting this pattern (Lovett et al., 2010); and finally, students with disabilities completing selected response course exams performed equivalently to their peers without disabilities (Ricketts et al., 2010). (See Appendix F, Table F-9 for more detailed explanation of findings of each study.)

Table 12. Summary of Research Findings on Accommodations at the Postsecondary Level

Study Findings	Number of Studies
Perceptions of university students with disabilities about whether they sought accommodations varied, and were affected by university characteristics, the learning environment, and the relative visibility or invisibility of their disabilities, among other factors.	4
University student performance on course-related exams improved with various accommodations under specified conditions, and students preferred some accommodations over others.	3
University faculty perceptions about accommodations were primarily positive, and students had a sense that their professors were supportive in providing accommodations; faculty perceptions may have been specific to types of accommodations, were related to personal beliefs about education of students with disabilities, knowledge about legal responsibilities, and institutional support, among other factors.	2

Accommodations Decision-making Process

Another small number of studies ($n=5$) provided insight into the nature of, and factors related to, the process of selecting accommodations (i.e., accommodations decision making). Research

findings are presented in Table 13. Two of these studies (Bublitz, 2009; Mariano et al., 2009) focused only on seeking findings about accommodations decision making, whereas the other three studies (Altman et al., 2010; Cawthon, 2010; Lovett, 2010) also reported additional findings other than those pertaining to decision making. Three studies specifically examined factors that influence decision making. For instance, one study (Mariano et al., 2009) compared educator training on different decision-making models, and the possible effects of educators trained with one model recommending significantly more presentation accommodations than educators trained with the other model. Two studies relayed educators' conscious considerations in selecting accommodations. For instance, one study (Cawthon, 2010) identified the pieces of evidence that educators of students who are deaf or hard-of-hearing used in decision making. (See Appendix F, Table F-10 for more detailed explanation of findings of each study.)

Table 13. Summary of Research Findings on Accommodations Decision-making Processes

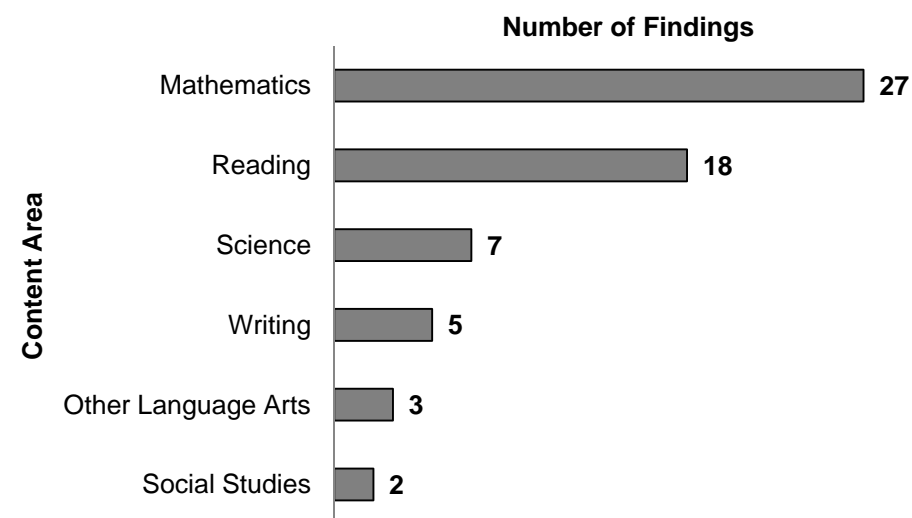
Study Findings	Number of Studies
Researchers factored out considerations best influencing and not influencing accommodations selection decisions	3
Educators reported about considerations in making accommodations selection decisions	2

Accommodations by Academic Content Assessments

For the first time in this report, we analyzed findings according to academic content area. This focus reflected a recognition that many accommodations are associated with specific academic content. Some examples of these cases include: calculators for math and science assessments, and word-processing for writing assessments or constructed responses on reading, other English language arts assessments, and science assessments. Some accommodations, such as oral administration, may be presented differently depending on the academic construct being assessed.

We present findings for each content area here according to the frequency with which the content areas were identified in the set of 48 research studies reviewed: 27 findings from 20 studies in mathematics, 20 findings from 16 studies in reading, 7 findings from 7 studies in science, 4 findings from 4 studies in other language arts, 3 findings from 3 studies in writing, and 2 findings from 2 studies in social studies (see Figure 4). Analysis of findings for each content area are the same as those we employed earlier in this report, including the impact of accommodations on assessment performance, perceptions about accommodations, construct validity of accommodated assessments, and matters of implementation and instances of use of accommodations.

Figure 4. Research Findings by Content Area



Note: The number of findings does not equate with the number of studies, because many studies reported more than one finding.

Table 14 displays the 27 research findings for accommodations in 20 studies of mathematics assessments, sorted by frequency according to the nature of the findings. The most common individual finding was that accommodations did not change the mathematics construct or constructs assessed, noted in five studies. These studies focused on over 10 accommodations, including calculator, read-aloud directions, read-aloud questions, alternate test setting, extended-time, computerized administration, small group administration, and checking comprehension of directions. Eleven of the math findings were unique; we present them individually in Table 14 and Table F-11, by signifying that only one study produced each of the findings.

Twelve studies of mathematics provided insights on the performance of students using accommodations – including one study examining the impact of modifications (Elliott et al., 2010). Half of the performance findings ($n=6$) resulted from a comparison of scores between students with disabilities and students without disabilities, and these findings diverged widely from one another. Four findings pertained to the differential score increases that accommodations brought to some students in comparison to others; these findings were for teacher-recommended accommodations and a standard accommodations package (Elliott et al., 2009), as well as computerized administration (Russell et al., 2009a), a virtual manipulative tool (Peltenburg et al., 2009), and various modifications (Roach et al., 2010). However, three findings indicated that both students with disabilities and students without disabilities improved when provided supports – such as four-function and graphing calculators (Bouck, 2010) and some specific modifications (Elliott et al., 2010), and one study using the graphing calculator yielded that not all students with disabilities improved in scores (Bouck, 2009). Further, two studies found that accommodations did not assist students with disabilities in improving more than students without disabilities, and

one study (Lindstrom, 2010) found that students without disabilities improved more when using read-aloud accommodations than did students with disabilities. In the remaining two studies, the findings were complex in the literature review (Lindstrom, 2010), and the other (Parks, 2009) found that calculator use did not improve test results.

In the other six studies, which compared effects of accommodations use to non-use for students with disabilities, there was more concurrence in the findings. Three studies found that these students' scores were higher for those using supports than those who did not. These studies involved the following supports: virtual manipulative tool (Peltenburg et al., 2009), a set of accommodations offered through an online platform (Russell et al., 2009a), and a set of modifications (Roach et al., 2010). Two studies compared the relative benefit of two accommodations of the same type, and found that neither supported students with disabilities more than the other. The accommodations were four-function and graphing calculators (Bouck, 2001), and American Sign Language (ASL) through recording of human or avatar signer (Russell et al., 2009b). Finally, only one study found that students with disabilities scored essentially the same whether using accommodations or not (Freeland et al., 2010).

Approximately one-fourth of the findings ($n=7$) pertained to perceptions about accommodations offered in math testing, and most of the perspectives reported ($n=6$) were those of the test-takers themselves. In two studies, students with disabilities in general offered information about accommodations preferences including that accommodations offered through a computer-based test administration platform are preferable to their previous testing experiences in which accommodations are offered in non-digital formats (Russell et al., 2009a; Russell et al., 2009b), and that they prefer a specific version of an American Sign Language (ASL) – when humans sign rather than avatars signing (Russell et al., 2009b). When comparing perceptions about accommodations between students with disabilities and others, two studies found apparent contradictions: that students with ADHD and LD experienced higher anxiety during the test than students without disabilities, and sustained the anxiety whether or not they received a calculator accommodation (Parks, 2009), yet that students with a typical variety of disabilities had similar preferences for using calculators as students without disabilities (Bouck, 2010). Additionally, one study (Jordan, 2009) reported on the differing views of students with disabilities and their educators and parents. Two other studies reported their uniquely specific findings about the effect of accommodations on students' (Roach et al., 2010) and educators' perspectives (Mastergeorge & Martinez, 2010).

Finally, two studies reported patterns of use of specific accommodations – one comparing students with disabilities and students without disabilities (Bouck, 2010), and the other comparing students with disabilities and their educators (Schoch, 2010). A single study (Cawthon, 2010) reported findings related to educators' accommodations decision-making processes and accom-

modifications practices. (See Appendix F, Table F-11 for more detailed explanation of findings of each study.)

Table 14. Summary of Research Findings on Accommodations in Mathematics Assessments (from 20 studies)

Study Findings	Number of Studies
PERFORMANCE	12
All Students	6
The accommodations and modifications DID NOT provide a differential boost for scores of students with disabilities as compared to those of students without disabilities; all students benefited from the accommodations	2
The accommodations provided a differential boost for scores of students without disabilities as compared to those of students with disabilities as a whole; NOT all students with disabilities benefited from the accommodations	1
The accommodations provided a differential boost for scores of students with disabilities as compared to those of students without disabilities; all students benefited from the accommodations	1
Students with disabilities and students without disabilities who used the accommodations experienced mixed results in comparison to one another and in comparison to those who did not use accommodations	1
Students with disabilities and students without disabilities who used accommodations did NOT perform significantly better than those who did not use accommodations	1
Students with Disabilities	6
Students with disabilities who used the accommodations performed significantly better than those who did not use the accommodations	3
Students with disabilities using two different accommodations benefited from neither accommodation more in comparison to the other	2
Students with disabilities who used the accommodations DID NOT perform significantly better than those who did not use accommodations	1
PERCEPTIONS	7
Students' and other participant groups' perceptions differed or were mixed regarding the accommodations studied	2
Students with disabilities expressed preference for one version of an accommodation over another	2
Students with disabilities and students without disabilities indicated similar benefits when using accommodations	1

Table 14. Summary of Research Findings on Accommodations in Mathematics Assessments (continued)

Educators evidenced no bias in rating scores of students with disabilities in comparison with scores of students without disabilities	1
Students with disabilities indicated benefits when using accommodations	1
VALIDITY	5
The accommodations DID NOT change the construct/s	5
INCIDENCE OF USE	2
Students with and without disabilities reported similar accommodations use patterns	1
Educators and students reported about their accommodations use patterns	1
DECISION MAKING	1
Educators reported about their decision-making processes and accommodations practices for assessments	1

Note: Some of these 20 studies reported support for more than one category of findings.

Table 15 details the 18 findings for accommodations in reading assessments. Similar to the math findings, the finding with the researchers agreeing most, in 6 studies, was that the accommodations on the reading assessments did not change the academic construct or constructs being tested. The accommodations examined included read-aloud (Cook et al., 2009; Cook et al., 2010; Snyder, 2010), computerized administration (Kingston, 2009), various state-allowed accommodations (Roxbury, 2010), and braille (Stone et al., 2010).

Seven studies reported findings about the performance of students using test supports – including three studies examining impact of modifications. Most of the performance findings ($n=5$) resulted from a comparison of scores between students with disabilities and students without disabilities, and these findings were mostly convergent on the point that accommodations like read-aloud (Cook et al., 2009) or modifications (Elliott et al., 2010; Randall & Engelhard, 2010; Roach et al., 2010) supported students both with and without disabilities. From among all of the data of these four studies, there was only one instance of differential benefit in comparing students with disabilities and students without disabilities: the grade 3 students with disabilities using the read-aloud modification on the reading assessment improved more than their peers without disabilities, although this differential benefit was not present for the grade 7 students in the same study (Randall & Engelhard, 2010). In contrast, two studies found that accommodations benefited students with disabilities more than students without disabilities. These studies examined a bundled set of accommodations (Fletcher et al., 2009) and read-aloud for students with learning disabilities (Laitusis, 2010). The remaining performance study, comparing accommodations use and non-use for students with disabilities, found that students with visual

impairments scored essentially the same whether using various unspecified access technologies or not (Freeland et al., 2010).

A small number of the findings ($n=3$) pertained to perceptions about accommodations offered on reading assessments. These studies generally supported the idea that the perceptions were mixed; that is, use of accommodations was not reflected in only positive attitudes and feelings. Each of the three studies demonstrated more complex results. One study (Jordan, 2009) reported on the views of students with disabilities and their educators and parents. In another study (Logan, 2009), the researchers found unexpected results: students with a set of motivations or attitudes, termed “achievement goals” according to the questionnaire, did not have positive experiences using accommodations on the reading assessment. The last study of this type (Roach et al., 2010) yielded uniquely specific findings about students’ preferences for or against the available accommodations.

Finally, one study (Roxbury, 2010) reported patterns of use of accommodations, comparing students with disabilities and students without disabilities. Another study (Cawthon, 2010) reported findings related to educators’ accommodations decision-making processes and accommodations practices. (See Appendix F, Table F-12 for more detailed explanation of findings of each study.)

Table 16 presents the findings for the science assessment accommodations. The most common individual finding was that accommodations did not change the science construct or constructs assessed, a finding supported by four studies. The accommodations examined included read-aloud (Kim et al., 2009a; Kim et al., 2009b), computerized administration (Kingston, 2009), and various state-allowed accommodations (Roxbury, 2010). The remaining three studies reported unique findings, each not supporting the others. Two of the findings pertained to the effects of accommodations on performance. In a comparison of the science scores of students with disabilities and students without disabilities, the standard accommodations package assisted both groups in improving their scores, yet students with disabilities benefited differentially more than their peers without disabilities (Elliott et al., 2009). In a comparison of the assessment results of students with disabilities using accommodations with those not using accommodations, both groups had similar results, indicating no benefit of access technologies on a computer-based test (Freeland et al., 2010). The last study (Cawthon, 2010) provided insights into the accommodations decision-making process for special educators. (See Appendix F, Table F-13 for more detailed explanation of findings of each study.)

Table 15. Summary of Research Findings on Accommodations in Reading Assessments (from 16 studies)

Study Findings	Number of Studies
PERFORMANCE	7
All Students	6
The modifications and accommodations assisted students with disabilities and students without disabilities in improving assessment performance	4
The accommodations provided a differential boost for scores of students with disabilities as compared to those of students without disabilities; all students benefited from the accommodations	1
Students with disabilities using two different accommodations benefited from one accommodation more in comparison to the other, and the same accommodation provided a differential boost for scores of students with disabilities as compared to those of students without disabilities	1
Students with Disabilities	1
Students with disabilities who used accommodations did NOT perform significantly better than those who did not use accommodations	1
VALIDITY	6
The accommodations DID NOT change the construct/s ¹	6
PERCEPTIONS	3
Students and other participant groups differed or were mixed about perceptions regarding the accommodations studied	3
INCIDENCE OF USE	1
Students not provided accommodations (without disabilities) performed better than students provided accommodations (with disabilities)	1
DECISION MAKING	1
Educators reported about their decision-making processes and accommodations practices for assessments	1

Note: Some of these 16 studies reported support for more than one category of findings.

¹ This finding indicates that read-aloud served not as a modification on the reading test, but rather was an accommodation.

Table 16. Summary of Research Findings on Accommodations in Science Assessments (from 7 studies)

Study Findings	Number of Studies
VALIDITY	4
The accommodations DID NOT change the construct/s	4
PERFORMANCE	2
All Students	1
The accommodations provided a differential boost for scores of students with disabilities as compared to those of students without disabilities; all students benefited from the accommodations	1
Students with Disabilities	1
Students with disabilities who used accommodations did NOT perform significantly better than those who did not use accommodations	1
DECISION MAKING	1
Educators reported about their decision-making processes and accommodations practices for assessments	1

Table 17 shows findings of four studies on accommodations offered in assessments on “other language arts,” an academic construct which explicitly excludes reading and writing. This narrow body of literature yielded five separate findings, most of which illuminated the area of construct validity, but with divergent results. Two studies (Finch et al., 2009; Kim & Huynh, 2010) indicated that the tests with accommodations did not change the academic constructs tested by the non-accommodated assessment, while one study (Kingston, 2009) indicated that accommodations changed the construct. One study (Kim & Huynh, 2010) informed the impact of accommodations on performance, comparing scores of students with disabilities and students without disabilities, in both conditions of testing with and without accommodations. This study found that students with disabilities did not benefit from using accommodations and that students without disabilities did benefit from accommodations, at a minimal yet significant degree. Finally, one study (Mastergeorge & Martinez, 2010) demonstrated that educators had primarily a positive view of accommodations, due in part to the fairness in test results that they established. (See Appendix F, Table F-14 for more detailed explanation of findings of each study.)

Table 17. Summary of Research Findings on Accommodations in Other Language Arts Assessments (from 4 studies)

Study Findings	Number of Studies
VALIDITY	3
The accommodations DID NOT change the construct/s	2
The accommodations changed the construct/s	1
PERFORMANCE	1
All Students	1
Students with disabilities who used accommodations DID NOT perform significantly better than those who did not use accommodations; students without disabilities who used accommodations performed significantly better yet at a minimal increase over those who did not use accommodations	1
PERCEPTIONS	1
Educators evidenced no bias in rating scores of students with disabilities in comparison with scores of students without disabilities	1

Note: Some of these 4 studies reported support for more than one category of findings.

Table 18 shows findings of three studies on accommodations in writing assessments. The majority of the findings ($n=2$) pertain to construct validity, converging to indicate that accommodations did not change the writing constructs assessed (Cook et al., 2010; Stone et al., 2010). One study (Lovett et al., 2010) compared scores of students with disabilities who tested with accommodations to those who did not do so. The result of this study indicated that students with disabilities showed no improvement when using accommodations. (See Appendix F, Table F-15 for more detailed explanation of findings of each study.)

Table 18. Summary of Research Findings on Accommodations in Writing Assessments (from 3 studies)

Study Findings	Number of Studies
VALIDITY	2
The accommodations DID NOT change the construct/s	2
PERFORMANCE	1
Students with Disabilities	1
Students with disabilities who used accommodations did NOT perform significantly better than those who did not use accommodations	1

The fewest findings were reported about accommodations used in social studies assessments (see Table 19). Both of the studies (Freeland et al., 2010; Kingston, 2009) reporting these findings were not solely focused on analyzing data from social studies tests, but rather had included this content area along with assessment scores from tests in math, reading, and science, among others. Accommodations did not support students with disabilities to improve their scores over when they had taken the test without accommodations – in fact, students with visual impairments and students with total blindness scored higher without access technologies than with them (Freeland et al., 2010). Pertaining to construct validity, the other study – a meta-analysis of two studies with social studies scores – found that test-takers scored higher on computer-administered tests than the tests presented in a standard administration, meaning that these assessments were testing qualitatively different academic constructs, but with a low effect size (Kingston, 2009). (See Appendix F, Table F-16 for more detailed explanation of findings of each study.)

Table 19. Summary of Research Findings on Accommodations in Social Studies Assessments (from 2 studies)

Study Findings	Number of Studies
PERFORMANCE	1
Students with Disabilities	1
Students with disabilities who used accommodations did NOT perform significantly better than those who did not use accommodations	1
VALIDITY	1
The accommodations changed the construct/s	1

Across the academic content areas, accommodations research from 2009 through 2010 supported a few consistent findings. Regarding construct validity, the literature indicated that accommodated tests were not different from non-accommodated tests as far as the nature of the content being tested, as supported by 20 out of 21 findings. Regarding the impact of accommodations on assessment outcomes, the areas of convergence in the findings did not seem to cross academic content areas, at least beyond mathematics and reading. An exception to this pattern was that students with disabilities did not perform significantly better when provided accommodations than when not provided them for assessments on other language arts, writing, and social studies; however, these findings were reported by relatively few studies ($n=3$), so these are not necessarily strong conclusions. Alternately, most of the findings were narrowed to content areas, and were affected by limited numbers of studies. Findings about perceptions of accommodations varied, and only three academic content areas were studied – mathematics, reading, and other language arts. Research areas that had limited findings included accommodations decision making by

educators – represented by only one study (Cawthon, 2010) and incidence of accommodations use, which addressed only mathematics ($n=2$) and reading ($n=1$).

Limitations and Future Research

As is often the case in research, many of the studies reviewed discussed limitations in order to provide context for the results that were observed ($n=38$). As seen in Table 20, limitations were summarized under five broad categories. A study was counted for a given category when it provided at least one limitation under that category. A more comprehensive description of limitations for each individual study is available in Appendix G.

The most commonly cited category of limitations in the research was methodology, where frequently the use of bundled (vs. individually administered) accommodations and non-random sampling of participants were referenced. Many authors also identified sample characteristics as a limitation to the research. Specifically, common limitations were sample size and the representativeness of the samples obtained on variables such as age, grade level, and race. More detailed information regarding specific limitations of each study is also available in Appendix G-1.

Table 20. Categorized Limitations Identified by Authors

Limitation Category	Number of Studies ^a
Methodology	29
Sample Characteristics	22
Results	12
No Limitations Listed	10
Test/Test Context	8
Other	6

^aTwenty-six studies included more than one category of limitations, represented in 2 to 4 limitations categories.

As would be expected, methodology and sample characteristics were also often highlighted as areas that needed to be addressed in future research—as seen in Table 21. However, we found that researchers recognized more instances where the test or test context used in the study led to implications for future research than was the case when identifying limitations (Table 21). More detailed information about suggestions for future research is available in Appendix G-2.

Table 21. Categorized Areas of Future Research Identified by Authors

Future Research	Number of Studies ^a
Methodology	26
Sample Characteristics	15
Test/Test Context	15
No Future Directions Listed	9
Other	6
Results	5

^aTwenty studies listed directions for future research that fit into multiple categories.

Discussion

Several themes are evident in the research studies published in 2009 and 2010, especially in relation to the research studies from 2007 and 2008, which were reported in the previous NCEO accommodations research review (Cormier et al., 2010). We address here themes in terms of purposes, research designs, assessment types, study participant characteristics, accommodations, academic content areas and research findings associated with them, and study limitations and future research directions. We conclude with several comments on promising trends overall.

Research Purposes

The nature of the research literature on accommodations has continued to change. Many of the studies in 2009-2010 combined the effect of accommodations on performance and their effect on assessment constructs. Many also combined quantitative and qualitative research on the impact of accommodations on students with disabilities, in that they examined accommodations' effects on test scores as well as their effects on perceptions of test takers. There were several differences between the purposes identified in the 2007-2008 and the purposes in the 2009-2010 studies. First of all, there was a much lower proportion of studies focused on comparing scores in the current set of studies: 63% in 2007-2008 and 31% in 2009-2010. About one-fourth (23%) of the current set of studies was focused on examining perceptions and preferences on use, a much larger proportion than the 13% of the 2007-2008 studies. The proportion of studies that described implementation practices and accommodations use was 20% of 2007-2008 studies, but a much lower 6% in 2009-2010 studies. Test validity was the purpose for a similarly low proportion in both reports: 6% for 2009-2010 and 3% for 2007-2008.

Research Types and Data Collection Sources

The research studies in 2009-2010 were mostly experimental (6%) or quasi-experimental (52%), which was a larger proportion than in 2007-2008. On the other hand, there was a much smaller proportion of studies using a descriptive quantitative design (21%) compared with 2009-2010 (55%). Further, the source of data in 2007-2008 was reported to be just over one-half from primary sources – that is, collected by researchers rather than drawn from extant data – whereas in 2009-2010, the data came from primary sources for over two-thirds of the studies.

Data Collection Methods

Data collection methods generally were quite different between studies published in 2007-2008 and 2009-2010. With multiple purposes, there often was more than one data collection method and more than one instrument used. Over one-third of the 2009-2010 studies used more than one data collection method. Although the most common data collection method was content testing in both 2007-2008 and 2009-2010, there was a large difference in the use of surveys, from about one-fifth of 2007-2008 studies to over half of 2009-2010 studies. This shift seemed to be related to researchers' efforts to uncover students' and educators' experiences during the implementation of accommodations. Other methods used often in 2009-2010 included interviews and observations.

Participants

Grade Level

Research on accommodations has varied in terms of the focus on different grade level clusters – elementary, middle school, and high school – and the 2009-2010 studies differ from the 2007-2008 studies on this variable as well. First, a larger proportion of 2009-2010 published research analyzed accommodations across more than one grade level cluster than in 2007-2008. Second, although the proportion of high school and postsecondary participants were each about the same across the two periods, there was a larger proportion of studies published in 2009-2010 with elementary participants and with middle school students than in the research published in 2007-2008.

Disability Categories

The disability categories of study participants with disabilities were also somewhat different 2009-2010 compared to 2007-2008. The overall proportion of participants in many disability categories increased. The studies with participants with learning disabilities increased in proportion from 38% in 2007-2008 to 54% in 2009-2010. Similar increases occurred for participants

with attention problems: from 8% in 2007-2008 to 23% in 2009-2010. Additional increases are reported here in descending order of difference: for blindness/visual impairment, from 6% in 2007-2008 to 21% in 2009-2010; for deafness/hearing impairment, from 5% to 19%; for emotional behavioral disability, from 10% to 23%, and for intellectual disabilities, from 5% to 17%. Some of these increases might be due to researchers providing data about their participants' disability categories; a smaller proportion of studies in the current review failed to specify participant disability categories. Another possible source of the increase is that a larger proportion of individual participants were identified as having more than one disability, 12% in 2007-2008 and 17% in 2009-2010. The increases in the proportion of participants' disabilities did not seem to be due to changes in the proportion of studies using large secondary data sets because fewer studies (31%) in 2009-2010 used this type of data, in comparison with 45% of the 2007-2008 studies. More studies both collected disability data and also utilized comparative procedures to measure the impact of accommodations use by participants with various disabilities, yielding more findings about the effects of specific accommodations for students with specific disabilities.

Accommodations

The 2009-2010 studies included 10 specific accommodations, in four of the five accommodation categories. In the presentation category, read-aloud, braille, and large-print were represented. In the equipment/materials category, computerized administration, calculator, and sign-language recording were included. In the response category, partial-scribe, word-processing, and virtual manipulative were represented. In the timing/scheduling category, extended-time was the focus of research. In comparison, in 2007-2008 studies, four specific accommodations were examined: read-aloud and segmenting text (presentation), computerized administration (equipment/materials), and extended-time (timing/scheduling).

The specific accommodations were examined through a higher number of studies using primary data sources in 2009-2010 (33 of 48 studies – 69%), compared to 2007-2008 (22 of 40 studies – 55%). There seemed to be some shifts in attention to specific accommodations. The read-aloud accommodation and computerized administration both maintained the same proportion of studies from 2007-2008 to 2009-2010, at 23% and 15% respectively. Examination of extended-time decreased from 25% of the 40 studies in 2007-2008 to 10% of the 48 studies in 2009-2010. Aggregated or bundled accommodations were studied less frequently, decreasing from 5 studies (13%) in 2007-2008 to 2 studies (4%) in 2009-2010.

Content Areas and Associated Research Findings

Accommodations for mathematics and reading continued to be the most commonly examined in 2009-2010 studies, yet attention to accommodations for science assessments seemed to be increasing. The researchers of the 2009-2010 studies showed more interest in investigating

accommodations used during science tests, and somewhat more interest in mathematics accommodations, than those involved with 2007-2008 studies. This difference might be related to the increase in attention to the performance of students with disabilities on statewide science assessments during the 2007-2008 school year, which is the federally-required timeline of implementing science tests, and reporting data on this performance (Thurlow, Rogers, & Christensen, 2010). On the other hand, slightly fewer of the studies reported on accommodations for reading assessments. Another difference in the studies published in 2009-2010 was that a larger number, and a slightly higher proportion, of them examined accommodations used in more than one content area.

When examining the findings by specific accommodation, some interesting comparisons and contrasts can be observed for the 2009-2010 studies compared to the 2007-2008 studies. In 2009-2010, three findings indicated that read-aloud provided a differential benefit for students with disabilities, and two findings indicated that all students benefited when taking tests using read-aloud. An identical number of study findings in 2007-2008 reported these results. A chief difference between these sets of findings was that only one study (Temple, 2007) involved reading assessments in 2007-2008, whereas most of the 2009-2010 studies (all except Lindstrom, 2010) involved reading.

Findings on the impact of the use of computerized administration received new attention in studies published in 2009-2010, with 3 of the 4 relevant studies finding that this accommodation benefited students with disabilities. In 2007-2008, no studies examined the comparative impact of computerized administration. The 2007-2008 studies focused primarily on analyses of potential effects of computerized administration on construct validity, with 5 of 6 relevant studies indicating no problematic effects on construct validity. The 2009-2010 published studies included a meta-analysis that found computerized delivery changed the academic constructs involved (Kingston, 2009); and another study found that this accommodation changed the constructs of the intelligence test (Arce-Ferrer & Guzman, 2009).

Impact of the calculator response accommodation was studied more often in 2009-2010 (three studies) than in 2007-2008 (one study – Sharoni & Vogel, 2007). The findings tended to be more negative in 2009-2010, with none of the three studies indicating differential benefits for students with disabilities, and only one study indicating any benefit for students with disabilities (Bouck, 2010).

The 2009-2010 studies yielded contested benefits for students with disabilities. Three studies measuring the impact of extended-time – on introductory psychology course exams (Lee et al., 2010), a literature review with many academic content areas (Lovett, 2010), and a writing assessment (Lovett et al., 2010) found that students with disabilities did not benefit from extended time. Two studies indicated that students with disabilities did differentially benefit from

extended-time: on a math assessment (Lindstrom, 2010), and in undergraduate medical course examinations (Ricketts et al., 2010). These studies were generally in contrast to those published in 2007-2008, where effects were generally minimal, but more often found on K-12 assessments.

In 2009-2010, there seemed to be increased research attention to the potential for problematic effects of accommodated tests on construct validity. In 2007-2008, there were 8 study findings relevant to construct validity, and in 2009-2010, there were 21 relevant findings. In 2007-2008, at least four findings (about half) indicated that accommodations – including computer administration and read-aloud – offered on math and reading tests affected the construct being tested. In 2009-2010, the studies' results showed that various accommodations did not affect the academic constructs being assessed. That is, the 2009-2010 studies indicated that accommodations were not associated with construct validity concerns. This was the case across academic content areas, including mathematics, reading, science, writing, and a majority of studies in the other content areas. In fact, accommodations were found only to change the constructs in 2 of the 21 findings examining construct validity. These two findings focused on the same accommodation – computerized administration – in the same study (Kingston, 2009) with the academic constructs of other language arts and social studies. Another study (Arce-Ferrer & Guzman, 2009) found that computerized administration did not change the constructs measured on an intelligence test. Further, the read-aloud accommodation was found not to alter the construct being tested in mathematics, reading, and science. A growing set of studies in academic content areas examined perceptions about using accommodations during testing. In comparison with only 12.5% of all studies published in 2007-2008, perceptions were investigated in 25% of the mathematics studies, 17% of the reading studies, and 20% of the other language arts studies in 2009-2010. Further, all of the 2007-2008 studies examined educators' perceptions of accommodations, whereas about half of the 2009-2010 studies identified student test-takers' perceptions.

Limitations

The most noticeable difference between the accommodations research published in 2007-2008 and that published in 2009-2010 is the increase in researchers identifying methodological issues as limitations. Although identifying sample characteristics has remained the same between the two sets of years method choices such as having no control group or engaging in non-random sampling has been increasingly noted as a limitation. Researchers have pointed out that the unit of analysis has been the classroom rather than the individual student. Random assignment of research participants to differing conditions – such as testing with accommodations or testing without accommodations – has not occurred by participant, but rather has sometimes been implemented at the classroom or school level. Further, researchers note that accommodations have been implemented differently across conditions. These decisions indicated that studies are not true experiments but rather have used quasi-experimental designs.

Other limitations noted more often by researchers whose work was published in 2009-2010 included test and test context. Researchers commented in some studies that the test used was different somehow from tests typically used in the participants' school or district, or that the test segment presented to participants did not use typical administration conditions. Test context issues also included inconsistency of tests across grade levels, different test forms being used in different accommodated conditions, participants running out of time in test administration sessions, more than typical incidence of missing data, and in some cases, suspicions that participants did not respond honestly to survey questions.

Researchers also reported more results-oriented limitations. For example, some studies used results that were not truly independent, such as when study participant scores from both academic years were linked to one another. Another concern pertained to analyses in which the effects of accommodations were difficult to distinguish from the effects of students' disabilities. Several limitations from studies published in 2009-2010 did not seem to fit into categories used in previous reports. The "other" category of limitations included that students' prior knowledge was not reported through alternative data sources, which could have helped to clarify any issues with the test and accommodations used. Another limitation was that researchers could not pinpoint all of the potential sources of differential item functioning (DIF). Finally, well more than twice as many studies in the current report ($n=26$) cited limitations that could be described as fitting more than one limitations category. This compared to the limitations of the 10 studies reported in studies published in 2007 to 2008.

Future Research

There were a few differences in the potential future research directions that researchers identified in the 2009-2010 studies compared to 2007-2008. First, a larger proportion of the 2009-2010 studies indicated a need for more research with improved methodology, such as investigating impact and functionality of accommodations through single-subject designs, and inquiring about practitioners' knowledge and perceptions of accommodations. Second, a smaller proportion of the studies indicated need for more research involving improvements in results. An example of results improvements that have decreased is the need to replicate the results in order to demonstrate their validity or generalizability. This change may be related to a larger proportion of studies focused on validity of accommodations in 2009-2010. Finally, more than twice as many studies ($n=20$) in 2009-2010 identified future research directions, compared to the nine studies in 2007 to 2008 doing so.

Trends

Some themes we recognized in the literature included a steady rise in investigating accommodations for *science assessments*, *increased activity in collecting data simultaneously across*

grade level clusters – elementary, middle school, and high school – and increased examination of secondary large data sets, at the district and state levels. Another trend was that researchers crafted multi-purpose study designs – that is, test data were collected to measure the impact of accommodations, and survey and interview data were collected about students’ experiences in using accommodations. The literature paid continued attention in the current review to students with low-incidence disabilities – including perceptual impairments in seeing and hearing. Additionally, we observed fewer studies on the extended-time accommodation, as well as a small increase in examining response accommodations.

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Appendix A

Research Purposes

Table A-1. Purpose Category: Compare Scores from Standard/Nonstandard Administration Conditions

Author/s	Stated Research Purpose	Also
Only students with disabilities		
Finch et al. (2009)	Investigate the effects of accommodations on the performance of students with disabilities, in comparison with not using accommodations; also, identify possible negative impacts of accommodations use on test results.	A-5, A-6
Fletcher et al. (2009)	Examine the impact of using a bundle of accommodations -- read-aloud questions (without passage) + multiple-day scheduling -- on performance on a reading test for students with reading disability.	N/A
Freeland et al. (2010)	Investigate the effect of receiving training in access technologies for students with partial visual impairment to total blindness taking a broad battery of content tests using access technologies.	A-3
Lee et al. (2010)	Examine the benefits of computer-based administration and response, along with extended-time, on the performance of college students with attentional difficulties on an introductory psychology course exam.	A-2
Peltenburg & van den Heuvel-Panhuizen (2009)	Examine effects of a unique virtual manipulative tool for students with math-related learning disabilities on a subset of items from a large-scale mathematics test.	A-3
Russell et al. (2009a)	Examine the impact for students with multiple disabilities (including LD and attention difficulties) of a set of accommodations offered through the computer administration of a set of released items from the New Hampshire grade 10 mathematics test, and report on student perspectives on the accommodations experience.	A-2

Russell et al. (2009b)	Examine the impact of a unique accommodation of a virtual avatar using American Sign Language (ASL) and a recorded human ASL interpreter for students with deafness and hearing impairments who completed released items from the National Assessment of Educational Progress for mathematics, and report on student perspectives on the accommodations experience.	A-2
Schoch (2010)	Examine effects of a series of accommodations, including tactile and large print, for students with visual impairments who completed a set of publicly-available sample mathematics items from four statewide assessments, and report about differing accommodations practices	A3, A4
Snyder (2010)	Examine the influence of audio recording on results of reading and math tests developed from items drawn from an item bank for students with various disabilities.	A-5
Only students without disabilities		
Lovett et al. (2010)	Examine the impact of word-processing response and extended-time on an essay-based exam for college students without disabilities, and investigate the associations of results with results on other achievement tests.	A-3, A-8
Both students with disabilities and students without disabilities		
Anjorin (2009)	Examine differential item functioning (DIF) based on learning disability group membership on a state mathematics exit assessment, to discern potential biases toward receiving or not receiving accommodations.	A4, A5
Bouck (2009)	Compare item-level and overall performance of students with disabilities and without disabilities on math test using and not using graphing calculator accommodation.	A-5
Bouck (2010)	Compare performance of students with and without disabilities on math test using two different calculators -- four-function and graphing -- as accommodations; also, inquire about students' perspectives about accommodations.	A-2
Cook et al. (2009)	Examine the impact of using a unique read-aloud accommodation on the constructs of comprehension; additionally, compare performance of students with and without learning disabilities when using and not using this accommodation.	A-5, A-6
Elliott et al. (2009)	Compare effects of IEP-specified accommodations and also an aggregated group of accommodations on the performance of students with and without disabilities on math and science tests, and also report on validity and fairness of accommodations usage patterns.	A-2

Elliott et al. (2010)	Examine the effects of modifications on performance of students with and without disabilities on math and reading tests, compare the test forms by items, and also evaluate the appropriateness of identifying students with disabilities for modified assessments.	A-5, A-8
Kim & Huynh (2010)	Compare effects of mode of administration (paper-and-pencil vs. computerized) on the performance of students with learning disabilities using item-level analyses.	A-5
Kingston (2009)	Synthesize 81 grade-subject combinations in 14 studies between 1997 and 2007 that investigated the comparability of computer-administered and paper-administered tests.	A-2, A-3
Laitusis (2010)	Compare effects of oral administration / read aloud accommodation using a CD recording for students with and without learning disabilities on several reading evaluations, including describing the differential boost for students with disabilities, as well as validating construct (using teacher survey) and confirming research methods (using student survey).	A-2, A-8
Parks (2009)	Compare effects of calculator use for students without disabilities and students with specific disabilities (LD and ADHD) on a math skill assessment, and analyze possible influence of math anxiety.	A-3
Randall & Engelhard (2010)	Compare effects of oral administration and resource guide modifications for students without disabilities, and students with disabilities who were and were not eligible for a modified version of a statewide reading assessment.	N/A
Ricketts et al. (2010)	Compare effects of extra time and modified format (colored paper or filters) for undergraduate medical students without disabilities and students with a specific disability (SLD/dyslexia) on course exam results.	N/A
Roach et al. (2010)	Compare effects of a set of modifications for students without disabilities, and students with disabilities who were and were not eligible for a modified version of statewide reading and mathematics assessment, through a series of studies utilizing quantitatively- and qualitatively-derived data.	A-2, A-3

Roxbury (2010)	Compare effects of accommodations as a whole for students with and without disabilities on statewide mathematics, reading, and science assessments, and analyze differential item functioning (DIF) to determine the degree to which bias has occurred despite that no clarity would be found due to research specific item effects.	A-4, A-7
Stone et al. (2010)	Analyze test items from a statewide English-language arts test for differential item functioning (DIF) pertaining to the performance of students with visual impairments and students without disabilities.	A-5

Table A-2. Purpose Category: Study or Compare Perceptions of Accommodation Use

Author/s	Stated Research Purpose	Also
Arce-Ferrer & Guzman (2009)	Examine the effect of administration mode (paper-and-pencil vs. computer-based) on accuracy, distribution, and meaning of performance scores by a general education population where the number of students with disabilities was unreported.	A-5, A-6
Barnard-Brak & Sulak (2010)	Compare attitudes of college students with disabilities about requesting accommodations in online and in-person learning settings.	N/A
Barnard-Brak et al. (2009)	Investigate predictive factors related to attitudes about and behavior of requesting accommodations by college students with disabilities.	N/A
Barnard-Brak et al. (2010)	Demonstrate the stability of a measure of attitudes about and behavior of requesting accommodations by college students with disabilities.	N/A
Bouck (2010)	Compare performance of students with and without disabilities on math test using two different calculators -- four-function and graphing -- as accommodations; also, inquire about students' perspectives about accommodations.	A-1
Bublitz (2009)	Explore perspectives of special educators regarding accommodations; specifically, relationships among training, knowledge, attitudes, and decision-making accuracy.	N/A
Byrd (2010)	Investigate university faculty attitudes about accommodations for students with disabilities; also, inquired about students' perceptions of faculty attitudes based on their interactions with faculty members.	A-3, A-6

Elliott et al. (2009)	Compare effects of IEP-specified accommodations and also an aggregated group of accommodations on the performance of students with and without disabilities on math and science tests, and also report on validity and fairness of accommodations usage patterns.	A-1
Jordan (2009)	Comparatively analyze content of surveys and interviews with teachers, parents, and students regarding experience of statewide math and reading tests; specifically, report on perspectives about dictated response/scribing accommodations.	A-3
Kingston (2009)	Synthesize 81 grade-subject combinations in 14 studies between 1997 and 2007 that investigated the comparability of computer-administered and paper-administered tests.	A-1, A-3
Laitusis (2010)	Compare effects of oral administration / read aloud accommodation using a CD recording for students with and without learning disabilities on several reading evaluations, including describing the differential boost for students with disabilities, as well as validating construct (using teacher survey) and confirming research methods (using student survey).	A-1, A-8
Lee et al. (2010)	Examine the benefits of computer-based administration and response, along with extended-time, on the performance of college students with attentional difficulties on an introductory psychology course exam.	A-1
Logan (2009)	Investigate self-efficacy of high school students with learning disabilities using extended-time on a reading task.	N/A
Mariano et al. (2009)	Investigate special educator accommodations decision-making processes, including application of two different models.	A-3
Mastergeorge & Martinez (2010)	Examine test scorer bias for rating performance assessments completed by students with and students without disabilities.	N/A
Roach et al. (2010)	Compare effects of a set of modifications for students without disabilities, and students with disabilities who were and were not eligible for a modified version of statewide reading and mathematics assessment, through a series of studies utilizing quantitatively- and qualitatively-derived data.	A-1, A-3
Russell et al. (2009a)	Examine the impact for students with multiple disabilities (including LD and attention difficulties) of a set of accommodations offered through the computer administration of a set of released items from the New Hampshire grade 10 mathematics test, and report on student perspectives on the accommodations experience.	A-1

Russell et al. (2009b)	Examine the impact of a unique accommodation of a virtual avatar using American Sign Language (ASL) and a recorded human ASL interpreter for students with deafness and hearing impairments who completed released items from the National Assessment of Educational Progress for mathematics, and report on student perspectives on the accommodations experience.	A-1
Zhang et al. (2010)	Investigate the knowledge base of university faculty pertaining to accommodations practices, and the relationship of factors predictive of their use of accommodations practices.	N/A

Table A-3. Purpose Category: Discuss Issues Related to Accommodations

Author/s	Stated Research Purpose	Also
Altman et al. (2010)	Investigate the thinking process of special educators statewide about the nature of making and implementing accommodations decisions.	A-4
Bayles (2009)	Investigate the similarities (if any) among educators and parents regarding need for and fairness of accommodations use for students with disabilities on a state exit assessment.	A-4
Byrd (2010)	Investigate university faculty attitudes about accommodations for students with disabilities; also, inquired about students' perceptions of faculty attitudes based on their interactions with faculty members.	A-2, A-6
Cawthon (2010)	Investigate accommodations practices for students with deafness and hearing impairments, in terms of how teachers gather evidence of effectiveness of accommodations in science assessments.	A-4
Freeland et al. (2010)	Investigate the effect of receiving training in access technologies for students with partial visual impairment to total blindness taking a broad battery of content tests using access technologies.	A1
Jordan (2009)	Comparatively analyze content of surveys and interviews with teachers, parents, and students regarding experience of statewide math and reading tests; specifically, report on perspectives about dictated response/typing accommodations.	A-2
Kim et al. (2009a)	Compare effects of specific accommodations and accommodations in general for students with and without disabilities on statewide science assessment, as well as analyze factor structure and interpret meaning of achievement scores.	A-7

Kingston (2009)	Synthesize 81 grade-subject combinations in 14 studies between 1997 and 2007 that investigated the comparability of computer-administered and paper-administered tests.	A-1, A-2
Lazarus et al. (2009)	Analyze information collected by the National Center on Educational Outcomes to report how state accommodations policies changed across time between 1993 and 2005.	A-4, A-6
Lindstrom (2010)	Synthesize results of 11 studies from between 2000 and 2009 which investigated the impacts of both individual accommodations and groups of accommodations specifying the viability of the "differential boost hypothesis."	A-6
Lovett (2010)	Synthesize results of 20 studies which investigated the influence of the extended-time accommodation on construct validity of various large-scale assessments, as well as other implementation issues.	A-6
Lovett et al. (2010)	Examine the impact of word-processing response and extended-time on an essay-based exam for college students without disabilities, and investigate the associations of results with results on other achievement tests.	A-1, A-8
Mariano et al. (2009)	Investigate special educator accommodations decision-making processes, including application of two different models.	A-2
Parks (2009)	Compare effects of calculator use for students without disabilities and students with specific disabilities (LD and ADHD) on a math skill assessment, and analyze possible influence of math anxiety.	A-1
Peltenburg & van den Heuvel-Panhuizen (2009)	Examine effects of a unique virtual manipulative tool for students with math-related learning disabilities on a subset of items from a large-scale mathematics test.	A-1
Roach et al. (2010)	Compare effects of a set of modifications for students without disabilities, and students with disabilities who were and were not eligible for a modified version of statewide reading and mathematics assessment, through a series of studies utilizing quantitatively- and qualitatively-derived data.	A-1, A-2
Salend (2009)	Summarize research and report on the breadth of accommodations practices in technology-supported assessments, offer guidance in evaluating technology, and discuss issues such as student motivation and student and teacher preparation.	A-4, A-6
Schoch (2010)	Examine effects of a series of accommodations, including tactile and large print, for students with visual impairments who completed a set of publicly-available sample mathematics items from four statewide assessments, and report about differing accommodations practices	A1, A4

Table A-4. Purpose Category: Report on Implementation Practices and Accommodations Use

Author/s	Stated Research Purpose	Also
Altman et al. (2010)	Investigate the thinking process of special educators statewide about the nature of making and implementing accommodations decisions.	A-3
Anjorin (2009)	Examine differential item functioning (DIF) based on learning disability group membership on a state mathematics exit assessment, to discern potential biases toward receiving or not receiving accommodations.	A-1, A-5
Bayles (2009)	Investigate the similarities (if any) among educators and parents regarding need for and fairness of accommodations use for students with disabilities on a state exit assessment.	A-3
Cawthon (2009)	Examine accommodations practices by special educators for students with deafness and hearing impairments, including exploring relationships among instructional factors and the use of accommodations.	A-9
Cawthon (2010)	Investigate accommodations practices for students with deafness and hearing impairments, in terms of how teachers gather evidence of effectiveness of accommodations in science assessments.	A-3
Johnstone et al. (2009)	Explore perspectives of special educators of students with visual impairments regarding accommodations; specifically, discern any differences in use of assistive technology tools based on teaching and learning setting.	N/A
Lazarus et al. (2009)	Analyze information collected by the National Center on Educational Outcomes to report how state accommodations policies changed across time between 1993 and 2005.	A-3, A-6
Roxbury (2010)	Compare effects of accommodations as a whole for students with and without disabilities on statewide mathematics, reading, and science assessments, and analyze differential item functioning (DIF) to determine the degree to which bias has occurred despite that no clarity would be found due to research specific item effects.	A-1, A-7
Salend (2009)	Summarize research and report on the breadth of accommodations practices in technology-supported assessments, offer guidance in evaluating technology, and discuss issues such as student motivation and student and teacher preparation.	A-3, A-6

Schoch (2010)	Examine effects of a series of accommodations, including tactile and large print, for students with visual impairments who completed a set of publicly-available sample mathematics items from four statewide assessments, and report about differing accommodations practices	A1, A3
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Table A-5. Purpose Category: Compare Test Items across Assessment Formats

Author/s	Stated Research Purpose	Also
Anjorin (2009)	Examine differential item functioning (DIF) based on learning disability group membership on a state mathematics exit assessment, to discern potential biases toward receiving or not receiving accommodations.	A-1, A-4
Bouck (2009)	Compare item-level and overall performance of students with disabilities and without disabilities on math test using and not using graphing calculator accommodation.	A-1
Cook et al. (2009)	Examine the impact of using a unique read-aloud accommodation on the constructs of comprehension; additionally, compare performance of students with and without learning disabilities when using and not using this accommodation.	A-1, A-6
Elliott et al. (2010)	Examine the effects of modifications on performance of students with and without disabilities on math and reading tests, compare the test forms by items, and also evaluate the appropriateness of identifying students with disabilities for modified assessments.	A-1, A-8
Finch et al. (2009)	Investigate the effects of accommodations on the performance of students with disabilities, in comparison with not using accommodations; also, identify possible negative impacts of accommodations use on test results.	A-1, A-6
Kim & Huynh (2010)	Compare effects of mode of administration (paper-and-pencil vs. computerized) on the performance of students with learning disabilities using item-level analyses.	A-1
Kim et al. (2009b)	Compare effects of oral administration / read aloud accommodation for students with and without disabilities on statewide science assessment, as well as analyze factor structure and interpret meaning of achievement scores.	A-7
Snyder (2010)	Examine the influence of audio recording on results of reading and math tests developed from items drawn from an item bank for students with various disabilities.	A-1
Stone et al. (2010)	Analyze test items from a statewide English-language arts test for differential item functioning (DIF) pertaining to the performance of students with visual impairments and students without disabilities.	A-1

Table A-6. Purpose Category: Summarize Research Literature about Accommodations

Author/s	Stated Research Purpose	Also
Arce-Ferrer & Guzman (2009)	Examine the effect of administration mode (paper-and-pencil vs. computer-based) on accuracy, distribution, and meaning of performance scores by a general education population where the number of students with disabilities was unreported.	A-2, A-7
Byrd (2010)	Investigate university faculty attitudes about accommodations for students with disabilities; also, inquired about students' perceptions of faculty attitudes based on their interactions with faculty members.	A-2, A-3
Cook et al. (2009)	Examine the impact of using a unique read-aloud accommodation on the constructs of comprehension; additionally, compare performance of students with and without learning disabilities when using and not using this accommodation.	A-1, A-5
Finch et al. (2009)	Investigate the effects of accommodations on the performance of students with disabilities, in comparison with not using accommodations; also, identify possible negative impacts of accommodations use on test results.	A-1, A-5
Lazarus et al. (2009)	Analyze information collected by the National Center on Educational Outcomes to report how state accommodations policies changed across time between 1993 and 2005.	A-3, A-4
Lindstrom (2010)	Synthesize results of 11 studies from between 2000 and 2009 which investigated the impacts of both individual accommodations and groups of accommodations specifying the viability of the "differential boost hypothesis."	A-3
Lovett (2010)	Synthesize results of 20 studies which investigated the influence of the extended-time accommodation on construct validity of various large-scale assessments, as well as other implementation issues.	A-3
Salend (2009)	Summarize research and report on the breadth of accommodations practices in technology-supported assessments, offer guidance in evaluating technology, and discuss issues such as student motivation and student and teacher preparation.	A-3, A-4

Table A-7. Purpose Category: Evaluate Test Structure

Author/s	Stated Research Purpose	Also
Arce-Ferrer & Guzman (2009)	Examine the effect of administration mode (paper-and-pencil vs. computer-based) on accuracy, distribution, and meaning of performance scores by a general education population where the number of students with disabilities was unreported.	A-2, A-6
Cook et al. (2010)	Discern the possible effects of IEP-specified accommodations and also the read-aloud accommodation on the measurement of ELA constructs (reading and writing).	N/A
Kim et al. (2009a)	Compare effects of specific accommodations and accommodations in general for students with and without disabilities on statewide science assessment, as well as analyze factor structure and interpret meaning of achievement scores.	A-3
Kim et al. (2009b)	Compare effects of oral administration / read aloud accommodation for students with and without disabilities on statewide science assessment, as well as analyze factor structure and interpret meaning of achievement scores.	A-5
Roxbury (2010)	Compare effects of accommodations as a whole for students with and without disabilities on statewide mathematics, reading, and science assessments, and analyze differential item functioning (DIF) to determine the degree to which bias has occurred despite that no clarity would be found due to research specific item effects.	A-1, A-4

Table A-8. Purpose Category: Investigate Test Validity under Accommodated Conditions

Author/s	Stated Research Purpose	Also
Elliott et al. (2010)	Examine the effects of modifications on performance of students with and without disabilities on math and reading tests, compare the test forms by items, and also evaluate the appropriateness of identifying students with disabilities for modified assessments.	A-1, A-5
Laitusis (2010)	Compare effects of oral administration / read aloud accommodation using a CD recording for students with and without learning disabilities on several reading evaluations, including describing the differential boost for students with disabilities, as well as validating construct (using teacher survey) and confirming research methods (using student survey).	A-1, A-2
Lovett et al. (2010)	Examine the impact of word-processing response and extended-time on an essay-based exam for college students without disabilities, and investigate the associations of results with results on other achievement tests.	A-1, A-3

Table A-9. Purpose Category: Identify Predictors of the Need for Test Accommodation/s

Author/s	Stated Research Purpose	Also
Cawthon (2009)	Examine accommodations practices by special educators for students with deafness and hearing impairments, including exploring relationships among instructional factors and the use of accommodations.	A-4

Appendix B

Research Characteristics

Table B-1. Reference Types, Research Types, Research Designs, Data Collection Sources, and Collection Instruments

Authors	Reference Type	Research Type	Research Design	Data Collection Source	Collection Instrument
Altman et al. (2010)	Report	Quantitative	Descriptive Quantitative	Primary	Survey
Anjorin (2009)	Dissertation	Quantitative	Quasi-Experimental	Secondary	Test
Arce-Ferrer & Guzman (2009)	Journal	Quantitative	Quasi-Experimental	Primary	Survey, Test
Barnard-Brak & Sulak (2010)	Journal	Quantitative	Descriptive Quantitative	Primary	Survey
Barnard-Brak et al. (2009)	Journal	Quantitative	Descriptive Quantitative	Primary	Interview Protocol, Survey
Barnard-Brak et al. (2010)	Journal	Quantitative	Descriptive Quantitative	Primary	Survey
Bayles (2009)	Dissertation	Qualitative	Descriptive Qualitative	Primary	Interview Protocol, Survey
Bouck (2009)	Journal	Quantitative	Experimental	Primary	Test
Bouck (2010)	Journal	Quantitative	Quasi-Experimental	Primary	Survey, Test
Bublitz (2009)	Dissertation	Quantitative	Descriptive Quantitative	Primary	Survey
Byrd (2010)	Dissertation	Mixed	Descriptive Qualitative	Primary	Interview Protocol, Survey
Cawthon (2009)	Journal	Mixed	Correlation / Prediction	Secondary	Survey
Cawthon (2010)	Journal	Mixed	Descriptive Qualitative	Primary	Survey
Cook et al. (2009)	Journal	Quantitative	Quasi-Experimental	Primary	Test
Cook et al. (2010)	Journal	Quantitative	Experimental	Secondary	Test
Elliott et al. (2009)	Journal	Quantitative	Quasi-Experimental	Primary	Observations, Survey, Test

Authors	Reference Type	Research Type	Research Design	Data Collection Source	Collection Instrument
Elliott et al. (2010)	Journal	Quantitative	Experimental	Primary	Survey, Test
Finch et al. (2009)	Journal	Quantitative	Quasi-Experimental	Secondary	Test
Fletcher et al. (2009)	Journal	Quantitative	Quasi-Experimental	Primary	Test
Freeland et al. (2010)	Journal	Mixed	Quasi-Experimental	Secondary	Survey, Test
Johnstone et al. (2009)	Journal	Quantitative	Descriptive Quantitative	Primary	Survey
Jordan (2009)	Dissertation	Qualitative	Descriptive Qualitative	Primary	Interview Protocol, Survey
Kim & Huynh (2010)	Journal	Quantitative	Quasi-Experimental	Secondary	Test
Kim et al. (2009a)	Journal	Quantitative	Quasi-Experimental	Secondary	Test
Kim et al. (2009b)	Journal	Quantitative	Quasi-Experimental	Secondary	Test
Kingston (2009)	Journal	Quantitative	Meta-analysis	Secondary	Survey, Test
Laitusis (2010)	Journal	Quantitative	Quasi-Experimental	Primary	Survey, Test
Lazarus et al. (2009)	Journal	Expository / Opinion	Descriptive Quantitative	Secondary	Survey
Lee et al. (2010)	Journal	Mixed	Quasi-Experimental	Primary	Interview Protocol, Survey, Test
Lindstrom (2010)	Journal	Expository / Opinion	Descriptive Qualitative	Secondary	Articles
Logan (2009)	Dissertation	Quantitative	Descriptive Quantitative	Primary	Survey
Lovett (2010)	Journal	Expository / Opinion	Descriptive Qualitative	Secondary	Articles
Lovett et al. (2010)	Journal	Quantitative	Quasi-Experimental	Primary	Test
Mariano et al. (2009)	Report	Quantitative	Descriptive Quantitative	Primary	Survey
Mastergeorge & Martinez (2010)	Journal	Quantitative	Descriptive Quantitative	Primary	Survey
Parks (2009)	Dissertation	Quantitative	Quasi-Experimental	Primary	Test

Authors	Reference Type	Research Type	Research Design	Data Collection Source	Collection Instrument
Peltenburg & van den Heuvel-Panhuizen (2009)	Journal	Quantitative	Quasi-Experimental	Primary	Observations, Test
Randall & Engelhard (2010)	Journal	Quantitative	Quasi-Experimental	Secondary	Test
Ricketts et al. (2010)	Journal	Quantitative	Quasi-Experimental	Secondary	Test
Roach et al. (2010)	Journal	Mixed	Quasi-Experimental	Primary	Interview Protocol, Survey, Test
Roxbury (2010)	Dissertation	Quantitative	Quasi-Experimental	Secondary	Test
Russell et al. (2009a)	Journal	Mixed	Quasi-Experimental	Primary	Focus Group, Observations, Test
Russell et al. (2009b)	Journal	Mixed	Quasi-Experimental	Primary	Focus Group, Survey, Test
Salend (2009)	Journal	Expository / Opinion	Descriptive Qualitative	Secondary	Articles
Schoch (2010)	Dissertation	Mixed	Quasi-Experimental	Primary	Interview Protocol, Test
Snyder (2010)	Dissertation	Quantitative	Quasi-Experimental	Primary	Test
Stone et al. (2010)	Journal	Quantitative	Quasi-Experimental	Primary	Test
Zhang et al. (2010)	Journal	Quantitative	Correlation / Prediction	Primary	Survey

Appendix C

Instrument Characteristics

Table C-1. Instrument Types and Specific Instruments Used, and their Sources

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Altman et al. (2010)	Survey for educators				
Anjorin (2009)				Unspecified state's grade 10 mathematics test	
Arce-Ferrer & Guzman (2009)		Raven Standard Progressive Matrices test [general intelligence] (Raven, 2000; Raven et al., 1993)			
Barnard-Brak & Sulak (2010)					Attitudes Toward Requesting Accommodations (ATRA; Barnard et al., 2008)
Barnard-Brak et al. (2009)	Phone interview protocol for students				Attitudes Toward Requesting Accommodations (ATRA; Barnard et al., 2008)
Barnard-Brak et al. (2010)					Attitudes Toward Requesting Accommodations (ATRA; Barnard et al., 2008)

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Bayles (2009)	Interview protocol and/or survey for parents and educators				
Bouck (2009)					Classroom-based math assessment based on number and operation strands of Principles and NCTM standards for school mathematics document (National Council of Teachers of Mathematics, 2000)
Bouck (2010)					Classroom-based math assessment based on number and operation strands of Principles and NCTM standards for school mathematics document (National Council of Teachers of Mathematics, 2000)

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Bublitz (2009)	Three surveys measuring pre-service educators on knowledge of, attitudes toward, and decision-making accuracy about accommodations; a measure of amount of training based on number of training hours				
Byrd (2010)	Attitudinal surveys for educators, and interview protocol for students				
Cawthon (2009)					Educators' reported uses of accommodations with their students, as measured by the "Third Annual Survey of Assessment Accommodations for Students who are Deaf or Hard of Hearing" (Cawthon & The Online Research Lab, 2006)

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Cawthon (2010)	Educators' survey on accommodations use and evidence of effectiveness				
Cook et al. (2009)			Gates MacGinitie Reading Test (GMRT), subtest on comprehension (MacGinitie et al., 2000)		
Cook et al. (2010)				Unspecified state's grade 4 English-language arts test	
Elliott et al. (2009)	Assessment Accommodations Checklist (AAC) for educators			Wisconsin Student Assessment System (WSAS) grade 4 performance tests on mathematics and science	
Elliott et al. (2010)					Reading and mathematics tests developed by drawing 39 items in computer-based format from Discovery Education Assessment national item pool (Haladyna et al., 2002; Rodriguez, 2005)

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Finch et al. (2009)			National norm-referenced achievement test (TerraNova Multiple Assessment Battery) on language arts and mathematics (CTB/McGraw-Hill, 1997)		
Fletcher et al. (2009)				Experimental version of the Texas Assessment of Knowledge and Skills grade 7 reading test	
Freeland et al. (2010)			Woodcock Johnson III Tests of Academic Achievement (Woodcock et al., 2001)		
Johnstone et al. (2009)	Survey for educators				
Jordan (2009)	Survey and interview protocol for students, parents, and educators				

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Kim & Huynh (2010)				Unspecified state's statewide English language arts 9th-grade end-of-course exam, addressing five content areas which included: Reading I - Understanding and Using Literary Texts, Reading II - Understanding and Using Informational Texts, Reading III – Building Vocabulary, Writing– Developing Written Communications, and Researching – Applying the Skills of Inquiry and Oral Communication	
Kim et al. (2009a)				South Carolina Palmetto Achievement Challenge Test (PACT) in science at grades 3, 4, and 5	
Kim et al. (2009b)				South Carolina Palmetto Achievement Challenge Test (PACT) in science at grades 6, 7, and 8	

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Kingston (2009)	Meta-analysis approach developed for these 81 grade-subject combinations in 14 studies which used various content tests and surveys				
Laitusis (2010)	Survey for educators, survey for students	2 fluency screening tests included: Woodcock-Johnson III Diagnostic Reading Battery (WJ-III DRB) Reading Fluency subtest (Woodcock et al., 2004); Test of Silent Word Reading Fluency (TOSWRF; Mather et al., 2004) / 4th graders also received two other subtests of WJ-III DRB on letter-word identification and word attack (Woodcock et al., 2004)	Gates-McGinitie Reading Tests (GMRT) Fourth Edition subtest on comprehension (MacGinitie et al., 2000)		
Lazarus et al. (2009)					

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Lee et al. (2010)	Participants' views of their testing experiences as reported on a survey and in a follow-up interview				Course exam in introductory psychology [unpublished]
Lindstrom (2010)					
Logan (2009)			Nelson-Denny Reading Test, Comprehension section (Brown et al., 1993)		3 included those of positive emotions, negative emotions, and self-efficacy as measured by participant self-rating scales: Achievement Goal Questionnaire (Elliot & McGregor, 2001; Cury, Elliot, DaFonseca, & Moller, 2006), Test Emotions Questionnaire (Pekrun et al., 2004, 2006), and Motivated Strategies for Learning Questionnaire (Pintrich et al., 1991, 1993).
Lovett (2010)					

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Lovett et al. (2010)	One-minute sample of writing to measure handwriting and typing speed		2 tests: Test of Written Language, Third Edition (TOWL-3), Form B (Hammill & Larsen, 1996); Woodcock-Johnson Tests of Achievement, Third Edition, Form A (WJ-III), writing fluency subtest (Woodcock et al., 2001)		
Mariano et al. (2009)	Survey for educators				
Mastergeorge & Martinez (2010)	Survey for educators				Standards Test to Evaluate the Performance of Students (STEPS; Mastergeorge & Martinez, 2010)
Parks (2009)			Kaufman Test of Educational Achievement, Second Edition (KTEA-II) subscale on Math Concepts and Applications (Kaufman & Kaufman, 2004)		Abbreviated Math Anxiety Scale (AMAS; Hopko et al., 2003)

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Peltenburg & van den Heuvel-Panhuizen (2009)					Items drawn from CITO Monitoring Test for Mathematics End Grade 2 (Janssen et al., 2005)
Randall & Engelhard (2010)				Georgia Criterion Reference Competency Tests (GA CRCT) in Reading at the fourth grade and seventh grade	
Ricketts et al. (2010)					Four content-based multiple-choice tests of 125 items given as status checks across course [unpublished]
Roach et al. (2010)	Survey for students; cognitive lab interview protocol			Unspecified state's field test of an Alternate Assessment based on Modified Achievement Standards (AA-MAS)	
Roxbury (2010)				Unspecified state's grade 8 test for mathematics, reading, and science	

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Russell et al. (2009a)					Two pilot tests with items drawn from released items of the NH state 10th-grade math test, for separate participant groups [unpublished]
Russell et al. (2009b)	Survey for students; focus group protocol				Released-items drawn from grade 8 National Assessment of Educational Progress (NAEP) for mathematics
Salend (2009)					
Schoch (2010)	Interview protocol for educators				Released-items were drawn from four states' mathematics tests
Snyder (2010)					Mathematics and reading items drawn from the Measures of Academic Progress (MAP) item bank (Northwest Evaluation Association, 2009)
Stone et al. (2010)				Unspecified state's English language arts test	

Authors	Non-Academic Protocols or Surveys Developed by Study Author/s	Norm-referenced Cognitive Ability Measures	Norm-referenced Academic Achievement Measures	State Criterion-referenced Assessment	Surveys or Academic Tests Developed by Professionals or Researchers Using Sources Outside of Current Study
Zhang et al. (2010)	Educator survey measuring multiple constructs, including Level of Comfort with Students with Disabilities, Knowledge of Legal Responsibilities, Personal Beliefs Regarding the Education of Students with Disabilities, Perceived Institutional Support, and Provision of Accommodations to Students with Disabilities				
TOTAL (number of studies)	19	2	8	11	17

Table C-2. Content Areas Assessed

Author/s	Math	Reading	Writing	Other LA	Science	Social Studies	Intelligence Test	Psychology	Not Specific	N
Altman et al. (2010)										0
Anjorin (2009)	•									1
Arce-Ferrer & Guzman (2009)							•			1
Barnard-Brak & Sulak (2010)										0
Barnard-Brak et al. (2009)										0
Barnard-Brak et al. (2010)										0
Bayles (2009)										0
Bouck (2009)	•									1
Bouck (2010)	•									1
Bublitz (2009)										0
Byrd (2010)										0
Cawthon (2009)										0
Cawthon (2010)	•	•			•					3
Cook et al. (2009)		•								1
Cook et al. (2010)		•	•							2
Elliott et al. (2009)	•				•					2
Elliott et al. (2010)	•	•								2
Finch et al. (2009)	•			• ¹						2
Fletcher et al. (2009)		•								1
Freeland et al. (2010)	•	•			•	•				4
Johnstone et al. (2009)										0
Jordan (2009)	•	•								2

Author/s	Math	Reading	Writing	Other LA	Science	Social Studies	Intelligence Test	Psychology	Not Specific	N
Kim & Huynh (2010)		• ²	• ²	• ²						3
Kim et al. (2009a)					•					1
Kim et al. (2009b)					•					1
Kingston (2009)	•	• ³		• ³	•	•				5
Laitusis (2010)		•								1
Lazarus et al. (2009)										0
Lee et al. (2010)								•		1
Lindstrom (2010)	•									1
Logan (2009)		•								1
Lovett (2010)										0
Lovett et al. (2010)			•							1
Mariano et al. (2009)										0
Mastergeorge & Martinez (2010)	•		• ⁴	• ⁴						3
Parks (2009)	•									1
Peltenburg & van den Heuvel-Panhuizen (2009)	•									1
Randall & Engelhard (2010)		•								1
Ricketts et al. (2010)										0
Roach et al. (2010)	•	•								2
Roxbury (2010)	•	•			•					3
Russell et al. (2009a)	•									1
Russell et al. (2009b)	•									1
Salend (2009)										0

Author/s	Math	Reading	Writing	Other LA	Science	Social Studies	Intelligence Test	Psychology	Not Specific	N
Schoch (2010)	•									1
Snyder (2010)	•	•								2
Stone et al. (2010)		•	•							2
Zhang et al. (2010)										0
Total	20	16	5	4	7	2	1	1	0	

¹ Other LA = a subset of items from the TerraNova test were used; unspecified areas of “language arts” were tested

² Other LA = one researching section

³ Other LA = in this meta-analysis of 81 studies, the language-related content areas were specified by the researcher to include reading as well as language arts, but not including writing

⁴ Other LA = performance test in language arts, in addition to writing component

Appendix D

Participant and Sample Characteristics

Table D-1. Unit of Analysis, Total Sample Sizes, Grade/Education Level, and Types of Disabilities

Authors	Unit of Analysis	Sample Size	Percent of Sample with Disabilities	Grade / Education Level	Disability Categories Included in Sample
Altman et al. (2010)	educators	2,336	N/A	N/A	N/A
Anjorin (2009)	students	61,270	11%	10	LD
Arce-Ferrer & Guzman (2009)	students	300	no info	High School	Not Specified
Barnard-Brak & Sulak (2010)	students	83	100%	Postsecondary	LD, Mult, PD
Barnard-Brak et al. (2009)	students	156	100%	Postsecondary	EBD, HI, LD, Mult, PD, S/L, VI
Barnard-Brak et al. (2010)	students	276	100%	Postsecondary	EBD, LD, PD
Bayles (2009)	educators / parents	27	N/A	N/A	N/A
Bouck (2009)	students	40	33%	7	AP, EBD, LD, None
Bouck (2010)	students	108	23%	8	AP, EBD, LD, None
Bublitz (2009)	educators	38	N/A	N/A	N/A
Byrd (2010)	educators / students	126	5%	Postsecondary (Undergrad & Grad)	AP, EBD, HI, LD, Mult, PD, VI
Cawthon (2009)	educators	389	N/A	N/A	N/A
Cawthon (2010)	educators	290	N/A	N/A	EBD, HI, ID, LD, Mult, VI

Authors	Unit of Analysis	Sample Size	Percent of Sample with Disabilities	Grade / Education Level	Disability Categories Included in Sample
Cook et al. (2009)	students	2,028	45%	4, 8	LD
Cook et al. (2010)	students	2,000	75%	4	LD
Elliott et al. (2009)	students	218	33%	4	LD
Elliott et al. (2010)	students	755	64%	8	AP, A, EBD, HI, ID, LD, PD, S/L, VI, None
Finch et al. (2009)	students	3,550	100%	3 thru 8	AP, A, EBD, HI, ID, LD, PD, S/L, VI
Fletcher et al. (2009)	students	359	47%	7	S/L
Freeland et al. (2010)	students	168	100%	Age: 13-21	VI
Johnstone et al. (2009)	educators	197	N/A	N/A	N/A
Jordan (2009)	educators/parents / students	21	29%	3, 4, 7	LD
Kim & Huynh (2010)	students	14,966	6%	9	LD
Kim et al. (2009a)	students	21,332	50%	6, 7, 8	A, EBD, HI, ID, LD, Mult, PD, S/L, VI, None
Kim et al. (2009b)	students	20,101	70%	3, 4, 5	A, EBD, HI, ID, LD, Mult, PD, S/L, VI
Kingston (2009)	meta-analysis	N/A	N/A	K thru 12	Not Specified
Laitusis (2010)	students	2,028	45%	4, 8	LD
Lazarus et al. (2009)	N/A	N/A	N/A	N/A	N/A
Lee et al. (2010)	students	31	100%	Postsecondary	AP

Authors	Unit of Analysis	Sample Size	Percent of Sample with Disabilities	Grade / Education Level	Disability Categories Included in Sample
Lindstrom (2010)	N/A	N/A	N/A	Elementary & Secondary	AP, ID, LD
Logan (2009)	students	90	100%	9 thru 12	LD
Lovett (2010)	N/A	N/A	N/A	N/A	Not Specified
Lovett et al. (2010)	students	140	0%	Postsecondary	None
Mariano et al. (2009)	educators	38	N/A	N/A	N/A
Master-george & Martinez (2010)	educators	12	N/A	N/A	Not Specified, None
Parks (2009)	students	45	67%	Middle School	AP, LD, None
Peltenburg et al. (2009)	students	37	100%	Ages: 8-12; grades 3-6	ID
Randall & Engelhard (2010)	students	1,940	46%	4, 7	AP, A, EBD, HI, ID, LD, Mult, PD, S/H, VI, None
Ricketts et al. (2010)	students	1,604	6%	Postsecondary	LD
Roach et al. (2010)	students	1,412	64%	8	Not Specified, None
Roxbury (2010)	students	15,274	16	8	AP, LD, None
Russell et al. (2009a)	students	40	100%	10th grade-level test items	AP, LD, Mult
Russell et al. (2009b)	students	96	100%	8 thru 11	HI
Salend (2009)	N/A	N/A	N/A	N/A	Not Specified
Schoch (2010)	educators / students	20	50%	9 thru 12	VI
Snyder (2010)	students	624	no info	3 thru 6	Not Specified

Authors	Unit of Analysis	Sample Size	Percent of Sample with Disabilities	Grade / Education Level	Disability Categories Included in Sample
Stone et al. (2010)	students	60,473	<1%	4, 8	VI, None
Zhang et al. (2010)	educators	206	N/A	N/A	N/A

AP: Attention Problem ID: Intellectual Disability RD: Reading Disability
A: Autism LD: Learning Disability S/L: Speech/Language Disability
EBD: Emotional/Behavioral Disability Mult: Multiple Disability V/I: Visual Impairment / Blindness
HI: Hearing Impairment / Deafness PD: Physical Disability None: Students without Disabilities

Appendix E

Accommodations Studied

Table E-1. Presentation Accommodations Itemized by Study

Author/s	Braille	Clarify directions	Computer administration	Cueing	Dictionary	Examiner familiarity	Format	Interpreter	Interpreter for instructions
Anjorin (2009)	0	1	0	0	0	1	0	1	1
Arce-Ferrer & Guzman (2009)	0	0	1	0	0	0	0	0	0
Cawthon (2009)	0	0	0	0	0	0	0	0	0
Cawthon (2010)	0	0	0	0	0	0	0	1	1
Cook et al. (2009)	0	0	0	0	0	0	0	0	0
Cook et al. (2010)	0	0	0	0	0	0	0	0	0
Elliott et al. (2009)	0	1	0	0	0	1	0	0	0
Fletcher et al. (2009)	0	0	0	0	0	0	0	0	0
Johnstone et al. (2009)	1	0	1	0	0	0	0	0	0
Jordan (2009)	0	0	0	0	0	0	0	0	0
Kim & Huynh (2010)	0	0	1	0	0	0	0	0	0
Kim et al. (2009a)	0	0	0	0	0	0	0	0	0
Kim et al. (2009b)	0	0	0	0	0	0	0	0	0
Kingston (2009)	0	0	1	0	0	0	0	0	0
Laitusis (2010)	0	0	0	0	0	0	0	0	0
Lazarus et al. (2009)	0	0	0	0	0	0	0	1	0
Lee et al. (2010)	0	0	1	0	0	0	0	0	0
Lindstrom (2010)	0	0	0	0	0	0	0	0	0
Peltenburg & van den Heuvel-Panhuizen (2009)	0	0	1	1	0	0	0	0	0
Randall & Engelhard (2010)	0	0	0	0	0	0	0	0	0
Ricketts et al. (2010)	0	0	0	0	0	0	1	0	0

Author/s	Braille	Clarify directions	Computer administration	Cueing	Dictionary	Examiner familiarity	Format	Interpreter	Interpreter for instructions
Roxbury (2010)	1	0	0	0	1	0	0	0	0
Russell et al. (2009a)	0	0	1	0	0	0	0	0	0
Russell et al. (2009b)	0	0	1	0	0	0	0	0	0
Salend (2009)	1	0	1	1	1	0	1	0	0
Schoch (2010)	1	0	0	0	0	0	0	0	0
Snyder (2010)	0	0	0	0	0	0	0	0	0
Stone et al. (2010)	1	0	0	0	0	0	0	0	0
TOTAL	5	2	9	2	2	2	2	3	1

Table E-1. [Continued]

Author/s	Large print	Paraphrasing	Read aloud	Read directions	Signed administration	Simplified language	Student read aloud	Visual cues	TOTAL
Anjorin (2009)	0	0	1	1	1	0	0	0	7
Arce-Ferrer & Guzman (2009)	0	0	0	0	0	0	0	0	1
Cawthon (2009)	0	0	1	1	1	0	0	0	3
Cawthon (2010)	0	0	1	0	0	0	0	0	3
Cook et al. (2009)	0	0	1	0	0	0	0	0	1
Cook et al. (2010)	1	0	1	0	0	0	0	0	2
Elliott et al. (2009)	1	1	1	1	0	1	1	0	8
Fletcher et al. (2009)	0	0	1	0	0	0	0	0	1
Johnstone et al. (2009)	1	0	1	0	0	0	0	0	4
Jordan (2009)	0	0	1	1	0	0	1	0	3
Kim & Huynh (2010)	0	0	0	0	0	0	0	0	1
Kim et al. (2009a)	0	0	1	0	1	0	0	0	2
Kim et al. (2009b)	0	0	1	0	0	0	0	0	1

Author/s	Large print	Paraphrasing	Read aloud	Read directions	Signed administration	Simplified language	Student read aloud	Visual cues	TOTAL
Kingston (2009)	0	0	0	0	0	0	0	0	1
Laitusis (2010)	0	0	1	0	0	0	0	0	1
Lazarus et al. (2009)	0	0	1	0	0	0	0	0	2
Lee et al. (2010)	0	0	0	0	0	0	0	0	1
Lindstrom (2010)	0	0	1	0	0	0	0	0	1
Peltenburg & van den Heuvel-Panhuizen (2009)	0	0	1	0	0	0	0	0	3
Randall & Engelhard (2010)	0	0	1	0	0	0	0	0	1
Ricketts et al. (2010)	0	0	0	0	0	0	0	0	1
Roxbury (2010)	1	0	1	0	1	0	0	0	5
Russell et al. (2009a)	0	0	1	0	0	0	0	0	2
Russell et al. (2009b)	0	0	0	0	1	0	0	0	2
Salend (2009)	1	0	1	1	1	0	0	1	10
Schoch (2010)	1	0	0	0	0	0	0	0	2
Snyder (2010)	0	0	1	0	0	0	0	0	1
Stone et al. (2010)	1	0	0	0	0	0	0	0	2
TOTAL	7	1	20	5	6	1	2	1	71

Table E-2. Equipment Accommodations Itemized by Study

Author/s	Audio cassette	Computer administration	Physical supports	Screen display	Technological aid	TOTAL
Arce-Ferrer & Guzman (2009)	0	1	0	0	0	1
Cook et al. (2010)	1	0	0	0	0	1
Johnstone et al. (2009)	1	1	0	1	0	3
Kim & Huynh (2010)	0	1	0	0	0	1
Kingston (2009)	0	1	0	0	0	1
Lee et al. (2010)	0	1	0	0	0	1
Peltenburg & van den Heuvel-Panhuizen (2009)	0	1	0	0	0	1
Russell et al. (2009a)	0	1	0	1	0	2
Russell et al. (2009b)	0	1	0	0	0	1
Salend (2009)	0	1	1	1	1	4
TOTAL	2	9	1	3	1	16

Table E-3. Response Accommodations Itemized by Study

Author/s	Calculator	Computer administration	Dictated response	Interpreter	Mark answer in test booklet	Speech recognition system	Tape recorder	Signed response	Spell-checker	Word-processor	TOTAL
Anjorin (2009)	1	0	0	1	0	0	0	0	0	0	2
Arce-Ferrer & Guzman (2009)	0	1	0	0	0	0	0	0	0	0	1
Bouck (2009)	1	0	0	0	0	0	0	0	0	0	1
Bouck (2010)	1	0	0	0	0	0	0	0	0	0	1
Cawthon (2009)	0	0	0	0	0	0	0	1	0	0	1
Cawthon (2010)	0	0	0	1	0	0	0	0	0	0	1
Cook et al. (2010)	0	0	1	0	1	0	1	1	0	1	5
Johnstone et al. (2009)	0	1	0	0	0	0	0	0	0	0	1
Jordan (2009)	0	0	1	0	0	0	0	0	0	1	2
Kim & Huynh (2010)	0	1	0	0	0	0	0	0	0	0	1
Kingston (2009)	0	1	0	0	0	0	0	0	0	0	1
Lazarus et al. (2009)	1	0	0	1	0	0	0	0	1	0	3
Lee et al. (2010)	0	1	0	0	0	0	0	0	0	0	1
Parks (2009)	1	0	0	0	0	0	0	0	0	0	1
Peltenburg & van den Heuvel-Panhuizen (2009)	0	1	0	0	0	0	0	0	0	0	1

Authors	Calculator	Computer administration	Dictated response	Interpreter	Mark answer in test booklet	Speech recognition system	Tape recorder	Signed response	Spell-checker	Word-processor	TOTAL
Roxbury (2010)	0	0	1	0	0	0	0	0	0	1	2
Russell et al. (2009a)	1	1	0	0	0	0	0	0	0	0	2
Russell et al. (2009b)	0	1	0	0	0	0	0	0	0	0	1
Salend (2009)	0	1	1	0	0	1	0	1	1	1	6
TOTAL	6	9	4	3	1	1	1	3	2	4	34

Table E-4. Scheduling Accommodations Itemized by Study

Author/s	Extended time	Multiple day	Test breaks	TOTAL
Byrd (2010)	1	0	0	1
Cawthon (2009)	1	0	0	1
Cawthon (2010)	1	0	0	1
Cook et al. (2010)	1	1	1	3
Elliott et al. (2009)	1	0	0	1
Fletcher et al. (2009)	0	1	0	1
Jordan (2009)	1	0	1	2
Laitusis (2010)	1	0	0	1
Lazarus et al. (2009)	1	0	0	1
Lee et al. (2010)	1	0	0	1
Lindstrom (2010)	1	0	0	1
Logan (2009)	1	0	0	1
Lovett (2010)	1	0	0	1
Lovett et al. (2010)	1	0	0	1
Ricketts et al. (2010)	1	0	0	1
Roxbury (2010)	1	1	1	3
TOTAL	15	3	3	21

Table E-5. Setting Accommodations Itemized by Study

Author/s	Individual	Small group	Specialized setting	TOTAL
Anjorin (2009)	0	1	1	2
Byrd (2010)	0	0	1	1
Cawthon (2009)	1	1	0	2
Cawthon (2010)	0	1	1	2
Cook et al. (2010)	0	0	1	1
Elliott et al. (2009)	0	0	1	1
Jordan (2009)	0	1	0	1
Parks (2009)	1	0	0	1
Roxbury (2010)	1	1	1	3
TOTAL	3	5	6	14

Appendix F

Research Findings

Table F-1. Findings for Studies Examining Oral Presentation Accommodations

Authors	Findings
	<i>The read-aloud accommodation DID NOT alter the construct being tested</i>
Cook et al. (2009) ¹	Exploratory and confirmatory analyses both indicated that the Gates MacGinitie Reading Test comprehension subtest “measures the same underlying constructs when administered with and without a read-aloud test change” (from Abstract).
Cook et al. (2010)	This study compared English language arts test results for grade 4 students without disabilities taking the standard test administration, students with learning disabilities under standard test administration, students with learning disabilities who used IEP or 504 plan-specified accommodations, and students with disabilities using read-aloud accommodation. Single and multi-group confirmatory factor analysis (CFA) supported a single underlying construct for all groups on both reading and writing tests, but additional statistics did not present as clear-cut a picture. The authors nevertheless conclude that there is evidence for equality of factor structure across the four groups.
Kim et al. (2009)	The study examines the meaning of the state test results for students receiving the oral administration accommodation. The analysis of the assessment’s factor structure yields that the factors were invariant with one another; that is, the meaning of the science test scores for the students with disabilities receiving accommodations was the same as the scores for the students without disabilities not receiving accommodations.
Kim et al. (2009)	The study examined the factor structure for a statewide science assessment, including scores of students receiving an oral administration (read-aloud) accommodation, non-setting accommodations as a whole, and accommodations in general. The analysis of the assessment’s factor structure yields that the factors were invariant with one another; that is, the meaning of the science test scores for the students receiving oral accommodations is the same as the scores for the students not receiving accommodations.
Snyder (2010)	The accommodation examined was the addition of an audio recording of items for the reading and math tests. Under study was whether the addition of audio recording modified (or re-calibrated) the difficulty level of printed items. The findings include that there is no significant difference between the initial item calibration and the calibration of the items in the audio presentation modification, for the reading test and for the math test as a whole. Reviewed individually, some of the items became more difficult, others became easier, and some remained unchanged -- but notable is that these differences in difficulty were neutralized across the item groups as a whole.

	<i>The read-aloud accommodation provided a differential boost for scores of students with disabilities compared to those of students without disabilities</i>
Laitusis (2010)	The audio presentation accommodation ² -- using CD and headset -- was offered along with recording answers in test booklet instead of on answer sheet and 150% extended-time. In addition to finding lower test scores for students with reading disabilities than for students without disabilities, a differential boost was identified for students with LD who received the audio presentation accommodation at both the fourth and eighth grade levels -- although the boost was determined to be larger in the lower than the higher grade.
Lindstrom (2010)	This review of research literature summarizes studies conducted from 2000 forward which pertain to oral administration, extended-time, and multiple accommodations. Of the 11 studies featured, 3 of them supported the "differential boost hypothesis." The article goes on to offer recommendations on determining appropriate accommodations, and presents a discussion of implications for practice.
Randall & Engelhard (2010) ³	The use of the read-aloud modification produced a differential boost for students with disabilities for students completing the Georgia Criterion Reference Competency Test (CRCT) in Reading at the fourth grade level.
	<i>The read-aloud accommodation improved the assessment performance of all students</i>
Cook et al. (2009) ¹	The achievement pattern for participants demonstrates that students without disabilities who received the read-aloud accommodations scored higher than the group without disabilities who did not receive the accommodation. Both of the groups without disabilities scored higher than the group of students with disabilities receiving accommodations, who scored higher than the students with disabilities not receiving accommodations.
Randall & Engelhard (2010) ³	The use of the read-aloud modification by seventh grade students with disabilities did not demonstrate an increase on the Georgia Criterion Reference Competency Test (CRCT) in Reading greater than that of students without disabilities.
	<i>The read-aloud accommodation improved the assessment performance of students with disabilities</i>
Jordan (2009)	The students expressed in interviews that the having the test read aloud by a test administrator was helpful for comprehending test items.

¹ This study included test content analysis as well as score comparisons.

² This read-aloud accommodation was bundled in the "naturalistic" manner with the other accommodations, and presented as a study finding for

the effects of read-aloud alone.

³ In this study, findings varied by grade level.

Table F-2. Findings for Studies Examining Computerized Accommodations

Authors	Findings
	<i>The computerized administration accommodation improved the assessment performance of students with disabilities</i>
Lee et al. (2010)	The results yielded that participants (college students with ADHD) performed significantly better on the computer-based exam than those completing the exam in paper-and-pencil format. As the study also examined the extended-time accommodation, there was a small and non-significant interaction effect: participants with extended-time on the computer-based exam scored better than participants with extended-time on the paper-and-pencil exam.
Peltenburg et al. (2009)	The results indicated that most students with LD improved their scores when using computer presentation including the virtual manipulative tool. Moreover, the availability of the tool and even partial-use of the tool benefited students in solving subtraction problems requiring borrowing. Data were also reported for those who did not demonstrate improved performance when using the accommodation.
Russell et al. (2009a)	In the first pilot test, observations and student feedback provided various information with which to improve the accessibility and use of online computerized accommodations tools. In the second pilot test, comparing students' scores on the paper-and-pencil test and the computerized version with NimbleTools accommodations -- including read-aloud tool, magnification tool, talking calculator, and masking tool -- students scored higher at a statistically significant level.
	<i>The computerized administration accommodation DID NOT improve the assessment performance of students with disabilities</i>
Kim & Huynh (2010)	First of all, the students without disabilities on average scored slightly better on the paper-and-pencil form, yet still at a level of statistical significance. The students with learning disabilities scored similarly on both test forms, with no statistically significant difference in mean scores. Some differences in the content areas, with small effect sizes, were noted. There were no differences in difficulty level for the online and paper-and-pencil groups for either the students with or without learning disabilities. Finally, there were none to mild DIF results on the item-level analyses; however, at the bundle (content area) level, the DIF results were significant but minimal in magnitude. In summary, the test administration modes demonstrated comparable results for both groups -- that is, students without disabilities scored similarly on both online and paper versions of the test, as did students with learning disabilities.
	<i>The computerized administration accommodation changed the construct being tested</i>
Kingston (2009)	According to this meta-analytic study, some factors seemed to have an effect on the comparability of computer-administered and paper-administered tests, while others did not. Content area affected comparability, such that students (not specifically students with disabilities) scored higher on computer-administered English language arts and social studies test, with small effect sizes (0.11 and 0.15, respectively); students scored higher on paper-administered mathematics tests, with small effect size (-0.06). Grade level appeared to have no effect on comparability.

	The computerized administration accommodation DID NOT change the construct being tested
Arce-Ferrer & Guzman (2009)	Results comparing computer-based assessments and paper-and-pencil formats show a lack of test mode effect on distribution, accuracy, and meaning of raw scores.
	Two different computerized administration accommodations DID NOT benefit students with disabilities more in comparison to one another
Russell et al. (2009b)	There were no significant differences in performance between the two versions of the computer-based ASL accommodation -- video of human signing and avatar signing -- even when examining participants' scores at varying performance levels.

Table F-3. Findings for Studies Examining Extended-time Scheduling Accommodations

Authors	Findings
	The extended-time accommodation DID NOT improve the assessment performance of students with disabilities
Lee et al. (2010)	The results yielded that participants (college students with ADHD) performed no better with the extended-time accommodation than those completing the test without extended-time. As the study also examined computer accommodations, there was a small and non-significant interaction effect: participants with extended-time on the computer-based exam scored better than participants with extended-time on the paper-and-pencil exam.
Lovett (2010)	This literature review sought and offered answers to various issues including how extended-time influences construct validity and the possibility of benefits of extended-time for students without disabilities.
Lovett et al. (2010)	The results of the comparisons between accommodation conditions, and across the interactions, were complex across the performance tasks. The extended-time accommodation was associated with an increase in essay length, but only when produced with word processing, not handwriting. The length of essays was not related to their quality when handwritten, but longer word-processed essays scored higher.
	The extended-time accommodation provided a differential boost for scores of students with disabilities compared to those of students without disabilities

Lindstrom (2010)	This review of research literature summarizes studies conducted from 2000 forward which pertain to oral administration, extended-time, and multiple accommodations. Of the 11 studies featured, 3 of them supported the "differential boost hypothesis." The article goes on to offer recommendations on determining appropriate accommodations, and presents a discussion of implications for practice.
Ricketts et al. (2010)	Accommodations on course-based progress check tests included extra time, which was specified as an extra 20 minutes per hour of test time. No significant score differences were found across UK undergraduate medical student participants' demographic groups -- neither based on ethnicity, sex, nor disability status; that is, all student groups performed equivalently to one another on the tests. Students with disabilities, therefore, were concluded to have benefited sufficiently from accommodations such that the multiple-choice tests were considered fair to students with learning disabilities.

Table F-4. Findings for Studies Examining Calculator Response Accommodations

Authors	Findings
	The calculator accommodation provided a differential boost for scores of students without disabilities compared to those of students with disabilities
Bouck (2009)	Students with disabilities who used a graphing calculator on the post-assessment after not using one on the pre-assessment made gains across these two test conditions. Students without disabilities performed statistically significantly better on the post-assessment than did students with disabilities; they also improved more than students with disabilities. The results indicate that the graphing calculators provided limited benefit to students with disabilities.
	The calculator accommodation DID NOT improve the assessment performance of students with disabilities
Parks (2009)	Results of this comparison among students with learning disabilities (LD), students with attention deficit hyperactivity disorder (ADHD), and students without disabilities showed that the scores in math problem-solving skills of students with LD and those with ADHD were significantly lower than the scores of those without disabilities. Further, there were no significant effects on the scores of either disability group for those receiving the calculator accommodation compared to students with disabilities who did not use calculators. Additionally, the use of the calculator accommodation had no significant effect on the math anxiety of any group, including students with LD and students with ADHD. However, students in both disability groups did experience significantly higher math anxiety than students without disabilities. The author noted that, in fact, some students with disabilities actually experienced higher math anxiety when using the calculator accommodation, and recommended that teachers ought to be careful about the fit of this accommodation to specific students with LD and with ADHD.

Two different calculator accommodations DID NOT benefit students with disabilities more in comparison to one another	
Bouck (2010)	In this study, students with disabilities and students without disabilities completed two tests -- one with a four-function calculator and one with a graphing calculator. The results indicate that students with disabilities and students without disabilities performed equally well in both calculator accommodations conditions, meaning that students with disabilities did not receive a differential impact or boost from the accommodations in comparison to students without disabilities. Further, neither accommodation benefitted either group in an enhanced manner over the other.

Table F-5. Findings for Studies Examining Aggregated Accommodations

Authors	Findings
An aggregated set of accommodations had mixed effects on performance of students with disabilities	
Fletcher et al. (2009)	The bundled accommodations package studied included the structured extension of testing into two parts on successive days (instead of two days of unlimited time), the reading aloud of proper nouns, and the reading aloud of stems and of answer choices to the comprehension stems, at the conclusion of students reading the passages. First of all, the expected interaction effect between ability group and score did not occur -- which means that both the students with disabilities and the students without disabilities benefited from the accommodation package. Specifically, scores were higher for students without disabilities who participated in the 1-day and 2-day administrations in comparison with the standard administration. However, students with disabilities did benefit differentially from the read-aloud accommodation in comparison to the students without disabilities.
An aggregated set of accommodations had a positive effect on scores for students without disabilities	
Elliott et al. (2009)	Accommodations included those specified by the IEPs of students with disabilities -- which included extended-time, read-aloud directions, examiner familiar to student, and re-reading instructions on subtasks, among others -- as well as others recommended by teachers for student with and students without disabilities. A comparison condition was included for students without disabilities which involved a "standard package" of accommodations -- including read-aloud directions, paraphrase directions, verbal encouragement, and extended-time. Results of data analyses yielded that most students receiving accommodations -- both those with (78%) and without disabilities (55%) -- scored better on the performance tasks. However, students without disabilities did not score differently in the recommended-accommodations condition or the "standard package" condition.

Table F-6. Findings for Studies Examining Unique Accommodations

Authors	Findings
Partial scribing accommodation, a unique response accommodation	
Jordan (2009)	This study was built upon the recognition from initial surveying of teachers that partial scribing accommodation needed examination. Data drawn from interviewing teachers, students, and parents provided insight about student-dictated response. The difference between classroom scribing practices and the state's current allowances for student-dictated response during state testing, termed the "partial scribe" method, were elaborated. The findings of the study overall pertained to attitudes and feelings about accommodations by the study participants, including students, parents, and teachers. For instance, students indicated relative comfort and familiarity with their being offered accommodations as they are similar in instruction and assessment settings, teachers indicated mixed understanding of students' perspectives yet full awareness of accommodations provided, and parents had mixed levels of understanding about accommodations provided to their children.
Word-processing accommodation for writing essays on exams, a unique response accommodation	
Lovett et al. (2010)	This study examined effects of word-processing and extended-time accommodations for college students on essay exams. The results of the comparisons between accommodation conditions, and across the interactions, were complex across the performance tasks. Not surprisingly, students typed more words in the essay and speed tasks than they handwrote; however, there were no differences in quality between handwritten and word-processed responses. The extended-time accommodation was associated with an increase in essay length, but only when produced with word processing, not handwriting. The length of essays was not related to their quality when handwritten, but longer word-processed essays scored higher.
Virtual manipulative accommodation for math performance tasks, a unique response accommodation	
Peltenburg et al. (2009)	This study of students with mathematics-related learning disabilities, in special education schools in the Netherlands, who were completing basic math performance tasks, examined the effects of the "100 board" -- a manipulative tool provided through a computer platform. The results indicated that most students with LD improved their scores when using the virtual manipulative tool. Moreover, the availability of the tool and even partial-use of the tool benefitted students in solving subtraction problems requiring borrowing. Data were also reported for those who did not demonstrate improved performance when using the accommodation.
Resource guide modification for statewide reading assessment, a unique modification to test presentation	
Randall & Engelhard (2010)	In this study comparing performance on statewide elementary and middle school reading assessments which used the read-aloud accommodation, the resource guide modification, and the standard assessment administration, data from both students with disabilities and students without disabilities were analyzed. The information in the resource guide was seen as providing scaffolded support -- such as terminology definitions and examples -- by which students may arrive at answers. The use of the resource guide modification produced a decline in performance for all grade 4 students, and also a decline for grade 7 students with disabilities and a slight increase in performance for students without disabilities. This finding was seen as suggesting that this support may have been a distraction for students with disabilities.

	<i>Sign language accommodation provided by a computer-generated avatar on a mathematics assessment, a unique presentation accommodation</i>
Russell et al. (2009b)	In this study, the presentation of the middle school and high school mathematics assessment was administered using a computer platform, using an American Sign Language (ASL) accommodation, presented either with a recorded image of a human interpreter or through an avatar signing. The findings showed no significant differences in performance between the two versions of the ASL accommodation, even when examining participants' scores at varying performance levels. Also, about 2/3 of the participants indicated a preference for the human recording and the other 1/3 for the avatar.
	<i>Braille and large-print accommodation, a not-frequently-studied presentation accommodation</i>
Stone et al. (2010)	In this study comparing English language arts (ELA) test scores for grades 4 and 8 students without disabilities and students with blindness and visual impairments using large print or braille accommodations, the test items comprising reading and writing standards were analyzed for comparability across condition using the Mantel-Haenszel differential item functioning (DIF) method. Overall, out of the 75-item test, 5 reading and 5 writing items indicated DIF in grade 4, and 8 reading and 2 writing items indicated DIF in grade 8. More specifically, only 1 item in each grade level -- in grade 4 writing and grade 8 reading -- were reported to have shown large degree of DIF, which favored students without disabilities in both cases. All of this suggests that the use of these accommodations did not affect the validity of the constructs being measured. In looking at the complex pattern of items displaying intermediate DIF, some additional observations may be made. For the grade 4 students with blindness and visual impairments, there were more writing items on which they scored worse, and more reading items on which they scored better, than the students without disabilities. However, for the grade 8 students with blindness and visual impairments, there were more reading items on which they scored worse, and more writing items on which they scored better, than the students without disabilities.

Table F-7. Findings for Studies Examining Perceptions about Accommodations

Authors	Findings
	<i>The most common accommodation on state assessments involved small group administration</i>
Altman et al. (2010)	According to this statewide educator survey study, the most-used accommodation is small group or individual administration (67% of respondents), and the least-used is "templates" (2% of respondents).
Anjorin (2009)	On this statewide grade 10 mathematics test, accommodations were given either individually or in packages/combinations as stated in student's IEP. The most common packages were: small group/read aloud directions/sign interpret directions/clarity directions; small group/calculator; calculator/number chart/manipulatives; small group alone.

Cawthon (2010)	Study participants, who were educators from throughout 38 states and DC, teaching students who are deaf or hard of hearing, identified various test accommodations for mathematics, reading, and science assessments. The most commonly-offered accommodations were reported to be individual or small group administration, the extended-time accommodation, as well as the test directions interpreted.
Cawthon (2009)	Study participants, comprising a national sample of educators for students who are deaf or hard-of-hearing, reported about use of various test accommodations for either or both reading and math assessments. More than two-thirds of participants used the following accommodations: small group administration, extended-time, and interpreting test directions, read-aloud test items, and interpreting test items. However, only small group administration, extended time, and interpreting test directions were used most often, and a majority of the time, for students on both assessments. Further, the students signing response was not used by at least 70% of participants for their students. Addressing predictors of accommodations use, none of the factors examined -- including educational setting, language of instruction, and grade level -- had significant predictive value related to accommodations use.
Roxbury (2010)	In this analysis of statewide incidence of accommodations use, the most commonly-used accommodations on the grade 8 assessments in mathematics, reading, and science, included small group administration, extended-time, and checking comprehension of directions, among others.
	<i>Common accommodations for students with visual impairments on reading assessments included audio recordings, enlarged print or page, read-aloud by teacher, and magnification tools, as well as tactile graphics on mathematics assessments</i>
Johnstone et al. (2009)	The results of this study examining the accommodation practices reported by educators of students with visual impairments yielded that many assistive technology tools were in common use in classrooms, depending on the school setting type, as well as during administration of tests. Commonly used accommodations for reading by students with visual impairments included audio recordings as well as computerized oral accommodations like JAWS for Windows, read-aloud by teacher, and computer-based or technology-based magnification tools.
Schoch (2010)	Findings regarding this combination of verbal input with enlarged print and tactile graphics accommodations, provided for students with visual impairments, included comments from both educators and students. Interviews with teachers revealed that they provided more support to students using tactile graphics than they did to students using large print. Although there were no item design differences between type of math graphic, students made the most errors on problems with circle graphs.
	<i>Accommodations presented through computer-based platforms have had variations in their implementation</i>
Salend (2009)	The results of this literature review and expository report on technology-based tests yielded description of numerous accommodations, as well as guidance on principles of universal design, lists of exemplary resources, and categorization of many aspects of test design and administration. Additional issues such as student motivation and preparation, teacher preparation, and high-tech cheating were discussed, and guidance in evaluating technology was presented.

	<i>The read-aloud accommodation has had variations in its implementation</i>
Lazarus et al. (2009)	Throughout the 1990s, state accommodations policies often sought to level the playing field for students with disabilities. In recent years, more emphasis has been placed on seeking to ensure that the accommodations permit valid measurement of test constructs. Accommodations that involve the use of technology and the extended-time accommodation are generally better accepted now than in the past. There continues to be no consensus across states about how several accommodations, including read aloud questions, as well as calculator, sign interpret questions, and spell-checker, should be included in the policies, and states may want to consider focusing on the creation of high-quality, universally designed assessments that minimize the need for accommodations.
	<i>Educators have had varying degrees of familiarity with accommodations, depending in part on school grade level</i>
Bayles (2009)	The degree of detail in the information available to professionals varied based on educational level, with high school educators having most familiarity with details pertaining to students with disabilities; there was inconsistent communication among the participant groups at the elementary and middle school levels. Findings were reflected in some themes related to accountability and standardized curriculum, as well as teacher effectiveness in using accommodations, although there was different application of core curriculum materials for their students with disabilities. Most teachers noted that the use of specially selected and appropriate supplemental materials allowed their students to access the standardized curriculum. Additional details of the use of accommodations were reported by the professionals.

Table F-8. Findings for Studies Examining the Implementation of Accommodations

Authors	Findings
	<i>The most common accommodation on state assessments involved small group administration</i>
Altman et al. (2010)	According to this statewide educator survey study, the most-used accommodation is small group or individual administration (67% of respondents), and the least-used is "templates" (2% of respondents).
Anjorin (2009)	On this statewide grade 10 mathematics test, accommodations were given either individually or in packages/combinations as stated in students' IEP. The most common packages were: small group/read aloud directions/sign interpret directions/clarify directions; small group/calculator; calculator/number chart/manipulatives; small group alone.

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Schoch (2010)	Findings regarding this combination of verbal input with enlarged print and tactile graphics accommodations, provided for students with visual impairments, included comments from both educators and students. Interviews with teachers revealed that they provided more support to students using tactile graphics than they did to students using large print. Although there were no item design differences between type of math graphic, students made the most errors on problems with circle graphs.
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	<i>The read-aloud accommodation has had variations in its implementation</i>
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	<i>Educators have had varying degrees of familiarity with accommodations, depending in part on school grade level</i>
Bayles (2009)	The degree of detail in the information available to professionals varied based on educational level, with high school educators having most familiarity with details pertaining to students with disabilities; there was inconsistent communication among the participant groups at the elementary and middle school levels. Findings were reflected in some themes related to accountability and standardized curriculum, as well as teacher effectiveness in using accommodations, although there was different application of core curriculum materials for their students with disabilities. Most teachers noted that the use of specially selected and appropriate supplemental materials allowed their students to access the standardized curriculum. Additional details of the use of accommodations were reported by the professionals.

Table F-9. Findings for Studies Examining Accommodations in Postsecondary Settings

Authors	Findings
	<i>University student perceptions</i>
Barnard-Brak & Sulak (2010)	University students with disabilities did not have significantly different attitudes about requesting accommodations in the face-to-face learning environment in comparison to the online learning environment. When focusing in on students with visible and hidden disabilities, attitudes differed: students with visible disabilities had significantly more positive attitudes about seeking accommodations in the online setting over the in-person setting when compared to students with hidden disabilities -- whose attitudes about requesting accommodations were similar for both learning environments.
Barnard-Brak et al. (2009)	Of the college student participants, about 54% requested accommodations and 46% reported that they did not request accommodations. Model fit analysis yields that, of all the possible factors identified, only two appear predictive of the decision to request accommodations: university characteristics (small and private, and large public) and their Attitudes Toward Requesting Accommodations (ATRA) scale scores.

Barnard-Brak et al. (2010)	The results of this study provided support for the stability of the Attitudes Toward Requesting Accommodations (ATRA) measure, yet also provide detail about the aspects of the attitude of college students with disabilities regarding seeking accommodations. The ATRA had a maximum possible raw score of 160, indicating a high degree of negative perceptions about seeking accommodations. To this end, this group of participants scored an overall mean of about 87 points, with a range of 34 to 116. Additionally, all four of the subscales contributed relatively evenly to either a lower or higher ATRA score.
Byrd (2010) ¹	Content analysis of student participants' interview responses yields that they perceived faculty members' attitudes about accommodations to be generally positive, yet included details about a student's negative experience. Student expectations about personal characteristics which are associated with positive professor attitudes are confirmed by the study data. Students suggested ways to better inform university faculty of accommodations information, and also noted that a possible source of resolution is increased use of technology, including alternate/computerized formats of course materials.
	<i>University student performance</i>
Lee et al. (2010)	The results yielded that university student participants performed significantly better on the computer-based exam than the paper-and-pencil format, and participants receiving the extended-time accommodation performed no better than those completing the test without extended-time. There was a small and non-significant interaction effect: participants with extended-time on the computer-based exam scored better than participants with extended-time on the paper-and-pencil exam. Participants' testing preferences included a quiet room with minimal furnishings and minimal activity, with natural light, calming music, moderate temperature, and comfortable seating and space, among others. Participants also indicated that quiet setting and extended-time were the most important accommodations. More preferred paper-and-pencil format over computerized format, and indicated that their desired item layout was one-item-at-a-time, if computerized format was necessary.
Lovett et al. (2010)	The results of the comparisons between accommodation conditions, and across the interactions, were complex across the performance tasks. Not surprisingly, college student participants typed more words in the essay and speed tasks than they handwrote; however, there were no differences in quality between handwritten and word-processed responses. The extended-time accommodation was associated with an increase in essay length, but only when produced with word processing, not handwriting. The length of essays was not related to their quality when handwritten, but longer word-processed essays scored higher.
Ricketts et al. (2010)	For these participants, who were undergraduate medical students taking multiple choice course exams, no significant score differences were found across demographic groups -- neither based on ethnicity, sex, nor disability status; that is, all student groups performed equivalently to one another on the tests. Students with disabilities, therefore, were concluded to have benefited sufficiently from accommodations such that the multiple-choice tests were considered fair to students with learning disabilities.

University faculty perceptions	
Byrd (2010) ¹	Survey analysis results indicated that faculty members expressed agreement that test accommodations are necessary for student success, at a rate of 78% of respondents. When identifying specific accommodations, 85% agreed/strongly agreed with comfort allowing extended-time, and 92% with low-distraction setting. Regarding test alterations, 47% indicated comfort with altering the exam, and 87% with provided an alternate answer sheet.
Zhang et al. (2010)	First of all, there were no systematic significant differences in demographics related to the ways that participants scored on the survey. That is, university faculty members did not vary significantly in their scores on each of the constructs measured by the survey, based on their demographic characteristics. There are analyses of findings relative to the other constructs measured by the survey. Focusing on the construct of Provision of Accommodations to Students with Disabilities, participants scored a mean of 3.11 (SD = 0.63), indicating that faculty members did not fully support the provision of accommodations to their students with disabilities. Further, scores on Personal Beliefs Regarding the Education of Students with Disabilities was confirmed as the most influential factor on the faculty members' provision of accommodations. The personal beliefs construct includes the faculty members' perceptions of students' needs for accommodations, the efficacy of those accommodations, and other factors. Additionally, an association was found between faculty members' Knowledge of Legal Responsibilities and Perceived Institutional Support predicting the variance in the Personal Beliefs construct, indicating an influence of these factors on their personal beliefs.

¹ In this study, student perceptions and faculty perceptions were both analyzed.

Table F-10. Findings for Studies Examining Accommodations Decision Making

Authors	Findings
	Researchers factored out considerations best influencing and not influencing accommodations selection decisions
Bublitz (2009)	Teachers' knowledge about accommodations, and not their attitudes about accommodations or training on accommodations, had an influence on accuracy of accommodations decision-making. In contrast, attitudes about accommodations and training on accommodations did not have an influence on accuracy of decisions.
Lovett (2010)	This literature review addressed issues associated with accommodations decision-making, among other areas. One conclusion reached after some discussion is that there is insufficient support for making accommodations decisions based on identified disabilities, as diagnosis of disabilities, especially those of high-incidence, are limited in reliability and validity. Further, the researcher suggested that accommodations decisions overall have limited reliability and validity.

Mariano et al. (2009)	The results include a comparison of the accommodations recommendations made by participant groups using two different decision-making models: the manual published by the Council of Chief State School Officers (CCSSO) and the interactive online Assessment Decision-making Support System (ADSS). The overall number of accommodations, as averaged for each case example (students named Sarah and Daniel), did not differ between the manual and the online guides. However, the types of accommodations recommended differed, in that the group using the online model recommended significantly more presentation accommodations on average than the group using the print manual model. Additionally, the average amount of time that each group took to complete the decision-making process for each student did not differ significantly between models. The implications of the findings are detailed, including indicating that teachers need more training and additional tool development for improving familiarity of accommodations.
	Educators reported about considerations in making accommodations selection decisions
Altman et al. (2010)	The findings of this study surveying special educators include that the most commonly-endorsed consideration for making assessment accommodations decisions in instruction is students' characteristics, whereas the most often-endorsed consideration in assessment is success in use of the accommodation in the classroom.
Cawthon (2010)	Study participants, who were educators of students who are deaf or hard-of-hearing, reported about making decisions about selecting accommodations for either or both reading and math assessments. In response to an open-ended item, they indicated that they used many different pieces of evidence to determine effectiveness of accommodations -- including whether the accommodation was named on the IEP, whether students were satisfied with their assessment experience, the test score, and the relative success on other classroom assessments when using the accommodation(s).

Table F-11. Findings for Studies Examining Accommodations for Mathematics Assessments

Authors	Findings
PERFORMANCE	
All Students	
	The accommodations and modifications DID NOT provide a differential boost for mathematics scores of students with disabilities as compared to those of students without disabilities; all students benefited from the accommodations
Bouck (2010)	The results indicated that students with disabilities and students without disabilities performed equally well in both accommodations conditions -- four-function calculator and graphing calculator -- in comparison with the assessment without accommodations, meaning that students with disabilities did not receive a differential impact or boost from the accommodations.

Elliott et al. (2010)	The group of students without disabilities scored higher including on math than the students with disabilities not eligible for the AA-MAS, whose scores were higher than the scores of the students with disabilities eligible for the AA-MAS. All three groups scored higher in the modified condition – including text segmentation, removal of least plausible distractor, and bolding important words, among others – than in the non-modified condition. Further, no group, as a whole, differentially benefited from the modifications; however, slightly more students eligible for AA-MAS scored better in the modified condition.
	The accommodations provided a differential boost for mathematics scores of students without disabilities as compared to those of students with disabilities as a whole; NOT all students with disabilities benefited from the accommodations
Bouck (2009)	Students did not use a graphing calculator on the math pre-assessment but approximately half (52.5%) had access to a graphing calculator on the post-assessment. The results indicate that students with disabilities (LD, OHI, & EBD) made gains from pre-assessment to post-assessment. Students without disabilities performed statistically significantly better on the post-assessment than did students with disabilities, $F(1, 35) = 4.322, p = 0.045$. The results indicate that graphing calculators provided limited benefit to students with disabilities, and raised concern about the validity of these accommodations for students with disabilities.
	The accommodations provided a differential boost for mathematics scores of students with disabilities as compared to those of students without disabilities; all students benefited from the accommodations
Elliott et al. (2009)	Participants who received accommodations – including extended time, read-aloud directions, examiner familiar to student, and re-reading instructions on subtasks – on the math performance tasks scored better than those who did not. For students with disabilities, those who used accommodations scored about 1 standard deviation higher on average than those who did not. For students without disabilities, those receiving a standard accommodations package – including read-aloud directions, paraphrase directions, verbal encouragement, and extended time – scored about 1/2 standard deviation higher than those who did not, and those receiving teacher-recommended accommodations scored about 1/2 standard deviation higher on average than those who did not. Also, the expert reviewers' perceptions of the accommodations provided during the math performance tasks for both students with disabilities and students without disabilities were rated as valid and fair, with rare exception. Further, the accommodations that were recommended by teachers were rated as more valid and fair than those provided in a standard package not individualized to student needs.
	Students with disabilities and students without disabilities who used the accommodations on the mathematics test experienced mixed results in comparison to one another and in comparison to those who did not use accommodations
Lindstrom (2010)	The accommodations of interest included oral administration, extended time, and multiple accommodations. Of the 11 studies featured, published between 2000 and 2007, 3 of them supported the “differential boost hypothesis”; however, in 5 studies, both students with disabilities and students without disabilities benefited similarly, and in 2 studies, students without disabilities benefited more than students with disabilities (one study lacked an experimental group of students without disabilities, so a comparison could not be made).

	Students with disabilities and students without disabilities who used accommodations on the mathematics test did NOT perform significantly better than those who did not use accommodations
Parks (2009)	The comparison of the scores of the three groups -- students with LD, students with ADHD, and students without disabilities -- on the math skills test yielded complex results. The scores in math problem-solving skills of students with LD and those with ADHD were significantly lower than the scores of those without disabilities. The calculator accommodation had no significant effects on the scores of students with LD and students with ADHD compared to the scores of each group of students with disabilities who did not use calculators.
	Students with Disabilities
	Students with disabilities who used the accommodations on the mathematics test performed significantly better than those who did not use the accommodations
Peltenburg et al. (2009)	The results indicated that most grade 3 through grade 6 students with LD improved their math scores when using the virtual manipulative tool, called the “100 board,” in comparison to their performance on a standard pencil-and-paper test format. Moreover, the availability of the tool and even partial-use of the tool benefited students in solving subtraction problems requiring borrowing.
Roach et al. (2010)	Study 1: Performance on an item subset from the state Alternate Assessment based on Modified Achievement Standards (AA-MAS) differed by student group. In mathematics, students without disabilities tended to score higher on the unmodified items, while both groups of students with disabilities scored higher on the modified items, which used bold-font vocabulary or key terms, visuals and other graphics, changing analogy formats, and reduced number of answer choices. The relative size of this sample may not permit generalizability. Study 2: The performance results indicated that the largest effect sizes were in the AA-MAS-eligible students with disabilities when using the accommodations from Study 1 along with voice recording reading item directions and stems.
Russell et al. (2009a)	In the second pilot test, students with disabilities scored higher at a statistically significant level on the computerized version of the math test with Nimble Tools – read-aloud, magnification, talking calculator, and masking accommodations – than they did on the paper-and-pencil test.
	Students with disabilities using two different accommodations on the mathematics test benefited from neither accommodation more in comparison to the other
Bouck (2010)	Neither calculator type -- four-function and graphing -- benefited either students with disabilities or students without disabilities in an enhanced manner over the other calculator type.
Russell et al. (2009b)	There were no significant differences in performance for students who were deaf between the two versions of the ASL accommodation, delivered by recorded human and by avatar, even when examining students' scores at varying performance levels.

	Students with disabilities who used the accommodations on the mathematics test DID NOT perform significantly better than those who did not use accommodations
Freeland et al. (2010)	Results of analyses include descriptive data on performance by group (sex, age, ethnicity, etc.) and by content of subtest, as well as whether participants had low vision or total blindness. Performance of students with disabilities when using accommodations were not statistically different than performance when not using accommodations. Students with total blindness who did not use access technologies typically scored better on the applied problems and mathematic calculation subtests than those who used access technologies. Students with low vision, who generally scored higher than those with total blindness, also had the same pattern of performing better without access technologies than with them.
	PERCEPTIONS
	Students' and other participant groups' perceptions differed or were mixed regarding the accommodations on the mathematics test
Jordan (2009)	The findings of the study pertained to attitudes and feelings about accommodations offered during the course of administration of a statewide test on reading and mathematics. Inquiry was made about these perceptions of the test as a whole. Consequently, there were no separate findings for reading and math. Students indicated relative comfort and familiarity with their being offered accommodations as they are similar in instruction and assessment settings, teachers indicated mixed understanding of students' perspectives yet full awareness of accommodations provided, and parents had mixed levels of understanding about accommodations provided to their children.
Parks (2009)	The comparison of the scores of the three groups -- students with LD, students with ADHD, and students without disabilities -- on the math anxiety scale yielded complex results. Students in both disability groups experienced significantly higher math anxiety than students without disabilities. The use of the calculator accommodation had no significant effect on the math anxiety of any participant group, including students with LD and students with ADHD. The researcher noted that, in fact, some students with disabilities actually experienced higher math anxiety when using the calculator accommodation, and recommended that teachers ought to be careful about the fit of this accommodation to specific students with LD and with ADHD.
	Students with disabilities expressed preference for one version of an accommodation over another on the mathematics tests
Russell et al. (2009a)	In the first pilot test, observations and feedback from participants, who were students with disabilities, helped to improve the accessibility and use of accommodations tools, including the ease of use of the read-aloud tool and the addition of tutorial directions to clarify use of the magnification tool. Further, students indicated consistently positive remarks about the computer-based test in comparison with previous testing experiences. In the second pilot test, students indicated in focus group discussions their preference for the computer-based assessment with accommodations, and offered specific feedback about their experiences.

Russell et al. (2009b)	Comparing two versions of the ASL accommodation, about 2/3 of the students who were deaf indicated a preference for the human recording and the other 1/3 for the avatar. The students provided additional comments about aspects of each version of the ASL accommodation. Further, students expressed positive reactions to the computer-based delivery of the items and the accommodations. Additional analyses checking for correlations between survey responses and test performance indicated no patterns based on the version of the accommodation.
	Students with disabilities and students without disabilities indicated similar benefits when using accommodations on the mathematics test
Bouck (2010)	Both students with and students without disabilities reported through the survey that they had similar calculator preference patterns, that is, there was no preference difference based on disability status.
	Educators evidenced no bias in rating mathematics scores of students with disabilities in comparison with scores of students without disabilities
Mastergeorge & Martinez (2010)	The results of this bias and reliability study, involving a set of mathematics and language arts performance assessments, the Standards Test to Evaluate the Performance of Students (STEPS), indicate that teachers did not introduce bias into the ratings of students with disabilities who had received various (unspecified) accommodations, in comparison with students without disabilities not receiving accommodations. Rating reliability decreased when raters were made aware that test scores were those of students with disabilities receiving accommodations, in comparison to when raters were not aware of this fact. In mathematics, students with disabilities scored consistently lower on average than students without disabilities, with scores of both groups in seventh grade being most similar and in third grade being most different. In terms of generalizability theory, the interaction of person by task was large for math for students without disabilities, yet smaller for students with disabilities, which may have indicated less benefit of accommodations. Further, main effects by rater are minimal, indicating equally rigorous evaluation of all student work; also, raters indicated their view that teachers should not permit differing treatment of test results from students with disabilities receiving accommodations.
	Students with disabilities indicated benefits when using accommodations on the mathematics test
Roach et al. (2010)	Study 1: Students eligible for an AA-MAS expressed that the modifications of adding visuals and using bold type were helpful and that removing an answer choice was not especially helpful. Study 2: The perception of most of this same group of students was that the two modified conditions were positive or helpful, and that the second condition which had modifications along with reading support (recorded read-aloud of directions and item stems) was especially helpful -- yet performance was not particularly improved with reading support added.

VALIDITY	
The accommodations DID NOT change the mathematics construct/s being tested	
Anjorin (2009)	Descriptive statistics revealed that mean scores for students without disabilities (SWOD) were 10+ points higher than for students with specific learning disabilities (SLD). When examining the level of DIF in performance between SWOD and students with SLD, 62% of the items exhibited no DIF, and 38% of items exhibited variable DIF favoring either group (19% favored SWOD, 19% favored SLD students). The items that favored students with SLD were most often items on which they could use a calculator, which was one of the most commonly provided accommodations for this state math test. Items that favored students with SLD also were found to be more difficult to compute. More DIF items were found to favor the SWOD group.
Finch et al. (2009)	The mathematics test demonstrated more uniform than non-uniform DIF; that is, students with disabilities not receiving accommodations scored higher on more items with DIF than students with disabilities receiving accommodations. The accommodations included read-aloud directions and questions, alternate test setting, and extended-time, among others. There seemed to be no pattern in uniform DIF results related to content of individual math items. For the non-uniform DIF items identified, low-performing students with disabilities not receiving accommodations scored higher than students with disabilities receiving accommodations. However, for highly-performing students with disabilities, the reverse was true: those receiving accommodations were favored over those not receiving accommodations. An unexpected finding was that DIF did not always favor students receiving accommodations: for items requiring heavy navigational load -- such as charts and maps -- it is suspected that accommodations may have involved distraction or interference.
Kingston (2009)	According to this meta-analytic study which included analysis of 12 mathematics content-related studies, various factors seemed to have mixed effects on the score comparability of computer-administered and paper-administered math tests. Grade level appeared to have no significant effect on comparability for math test scores. However, considering only math test scores, there was a significant effect related to academic subject, such that students (not specifically students with disabilities) scored higher on paper-administered mathematics tests, with weighted mean effect size of -0.06. Overall, socioeconomic factors did not affect comparability, including race/ethnicity, gender, and socioeconomic status (SES) -- with the exception of one study using a math computing skills test, which favored paper-and-pencil administration with low-SES students.

Roxbury (2010)	This analysis of statewide data examined performance on the mathematics statewide test by grade 8 students using accommodations (N=2,227) and students not using accommodations (N=12,694), and offer information about the functioning, by academic subject, of the test regarding fairness for students with disabilities. Accommodations varied and included those which were offered within a state for all test-takers, including many within each category: timing, setting, presentation, and response. The most common were small group administration, extended-time, and checking comprehension of directions. Findings include that, on the math test, students who used accommodations scored significantly lower than students who did not use accommodations, with a small effect size (0.137). Performance level differences were also reported for the mathematics test. Analysis of dimensionality for the math test indicated one or possibly two dimensions, for both students using, and students not using, accommodations. Differential item functioning (DIF) analyses were performed, indicating in part that out of 32 math items, 22 did not favor either students without or students with disabilities; 4 favored students without disabilities, and 7 favored students with disabilities. In other words, the math test appeared to validly measure ability difference and not some other factor, such as the use or non-use of accommodations. It must be noted that limitations of the research design do not allow clear conclusions as to whether DIF is accounted for by bias or impact.
Snyder (2010)	The findings include that there is no significant difference between the initial item calibration and the calibration of the items in the audio presentation condition, for the math test as a whole. Reviewed individually, some of the items became more difficult, others became easier, and some remained unchanged -- but it is notable that these differences in difficulty were neutralized across the math items as a whole.
INCIDENCE OF USE	
Students with and without disabilities reported similar use patterns on the mathematics test	
Bouck (2010)	Both students with disabilities and students without disabilities reported through the survey that they had similar calculator use patterns, except that students with disabilities tended to use calculators routinely on tests in comparison to students without disabilities.
Educators and students reported about their use patterns on the mathematics test	
Schoch (2010)	Findings regarding this combination of verbal input with enlarged print and tactile graphics accommodations, provided for students with visual impairments, included comments from both educators and students. Interviews with teachers revealed that they provided more support to students using tactile graphics than they did to students using large print. Although there were no item design differences between type of math graphic, students made the most errors on problems with circle graphs.

DECISION-MAKING	
Educators reported about their decision-making processes and accommodations practices for assessments, including mathematics	
Cawthon (2010)	Educators of students who are deaf or hard-of-hearing reported in a survey that more than half of them offered specific accommodations during mathematics assessments: small group/individual administration (73%), extended-time (65%), and test directions interpreted (60%); other accommodations -- test items read aloud and test items interpreted -- were offered by about 1/2 of teachers. Further, teachers reported in response to an open-ended item that they used many different pieces of evidence to determine effectiveness of accommodations -- including whether the accommodation was named on the IEP, whether students were satisfied with their assessment experience, the test score, and the relative success on other classroom assessments when using the accommodation(s). Teachers also commented on the validity of the accommodated test scores, and factors considered when selecting accommodations for students.

Table F-12. Findings for Studies Examining Accommodations for Reading Assessments

Authors	Findings
PERFORMANCE	
All Students	
	The modifications and accommodations assisted students with disabilities and students without disabilities in improving reading assessment performance
Cook et al. (2009)	Students without disabilities who received the read-aloud accommodations scored higher than those without disabilities who did not receive the accommodation. Both of the groups without disabilities scored higher than the group of students with disabilities receiving accommodations, who scored higher than the students with disabilities not receiving accommodations.
Elliott et al. (2010)	The group of students without disabilities scored higher including on reading than the students with disabilities not eligible for the AA-MAS, whose scores were higher than the scores of the students with disabilities eligible for the AA-MAS. All three groups scored higher in the modified condition than in the non-modified condition. Further, no group, as a whole, differentially benefited from the modifications; however, slightly more students eligible for AA-MAS scored better in the modified condition.

Randall & Engelhard (2010)	The use of the resource guide modification produced a decline in state reading assessment performance for students with disabilities and a slight increase in performance for students without disabilities. The use of the read-aloud modification produced a differential boost for students with disabilities completing the CRCT at the lower grade level, yet seventh grade students with disabilities did not demonstrate an increase greater than that of students without disabilities.
Roach et al. (2010)	Study 1: Performance on an item subset from the state Alternate Assessment based on Modified Achievement Standards (AA-MAS) differed by student group. In reading, students without disabilities and students with disabilities not eligible for an AA-MAS tended to score similarly across the unmodified and modified items, and the students with disabilities eligible for an AA-MAS scored higher in the modified condition compared to the unmodified condition. The relative size of this sample may not permit generalizability. Study 2: The performance results indicated that the largest effect sizes were in the AA-MAS-eligible students with disabilities. That is, this group of student test-takers improved in score the most in comparison with the others.
	Two different accommodation conditions on the reading test had mixed effects, in that one aggregated accommodations condition benefited students with disabilities more in comparison to the other, and the same accommodations package provided a differential boost for scores of students with disabilities as compared to those of students without disabilities
Fletcher et al. (2009)	The bundled accommodations package studied included the structured extension of testing into two parts on successive days (instead of two days of unlimited time), the reading aloud of proper nouns, and the reading aloud of stems and of answer choices to the comprehension stems, at the conclusion of students reading the passages. First of all, the expected interaction effect between ability group and score did not occur -- which means that both the students with disabilities and the students without disabilities benefited from the accommodation package. Specifically, scores were higher for students without disabilities who participated in the 1-day and 2-day administrations in comparison with the standard administration. However, students with disabilities did benefit differentially from the read-aloud accommodation in comparison to the students without disabilities.
	The accommodations provided a differential boost for reading scores of students with disabilities as compared to those of students without disabilities; all students benefited from the accommodations
Laitusis (2010)	In addition to finding lower reading achievement test scores for students with reading disabilities than for students without disabilities, a differential boost was identified for students with LD who received the audio presentation accommodation at both the fourth and eighth grade levels -- although the boost was determined to be larger in the lower than the higher grade. Additional analyses accounted for reading fluency and ceiling effects, excluding their potential impact on the data.

Students with Disabilities	
Students with disabilities who used accommodations did NOT perform significantly better on the reading test than those who did not use accommodations	
Freeland et al. (2010)	The performance of students with disabilities when using accommodations was not statistically different than performance when not using accommodations. Students with total blindness who did not use access technologies typically scored better on the passage comprehension and synonyms/antonyms subtests than those who used access technologies. Students with low vision, who generally scored higher than those with total blindness, also had the same pattern of performing better without access technologies than with them.
VALIDITY	
The accommodations DID NOT change the reading construct/s being tested	
Cook et al. (2009)	Exploratory and confirmatory analyses both indicated that the unitary reading construct measured by the Gates MacGinitie Reading Test's comprehension subtest was not altered when the read-aloud accommodation was included during its administration.
Cook et al. (2010)	There were three different accommodations conditions: students who received no accommodations, students who received accommodations as specified in their IEP or 504 plan, and students who received the read-aloud accommodation. This study compared English language arts score patterns for grade 4 students without disabilities taking the standard test administration, students with learning disabilities under standard test administration, students with learning disabilities who used IEP or 504 plan-specified accommodations, and students with disabilities using read-aloud accommodation. Single and multi-group confirmatory factor analysis (CFA) supported a single underlying construct for all groups on reading tests, but additional statistics did not present as clear-cut a picture. The authors nevertheless conclude that there is evidence for equality of factor structure across the four groups, and that the read-aloud support for students with disabilities on the reading test could be considered an accommodation, not a modification. ¹
Kingston (2009)	According to this meta-analytic study which included analysis of 8 reading content-related studies, various factors seemed to have mixed effects on the score comparability of computer-administered and paper-administered math tests. Grade level appeared to have no significant effect on comparability for reading test scores. Further, considering only reading test scores, there was no significant effect related to academic subject, with weighted mean effect size of -0.01. Overall, socioeconomic factors -- including race/ethnicity, gender, and socioeconomic status -- did not affect comparability.
Roxbury (2010)	Examination of the tests -- but not the items, which were not released, so not available -- yields that each content area test was unidimensional for both the accommodated and non-accommodated students. That is, the groups were not being somehow tested on different constructs, so accommodations did not change the constructs. Further, DIF analysis indicated that some items exhibited differential item functioning, although lacking the specific item texts meant that possible reasons could not be offered for the basis of the bias. The researcher concluded that the statewide reading assessment was fair for students with disabilities.

Snyder (2010)	The findings include that there is no significant difference between the initial item calibration and the calibration of the items in the audio presentation condition, for the reading test as a whole. Reviewed individually, some of the items became more difficult, others became easier, and some remained unchanged -- but it is notable that these differences in difficulty were neutralized across the reading items as a whole.
Stone et al. (2010)	In this study comparing test scores for grades 4 and 8 students without disabilities and students with blindness and visual impairments using large print or braille accommodations, the test items comprising reading standards were compared using differential item functioning (DIF). Overall, out of the 75-item test, 5 reading items indicated DIF in grade 4, and 8 reading items indicated DIF in grade 8. More specifically, only 1 reading item in grade 8 was reported to have shown large degree of DIF, which favored students without disabilities. All of this suggests that the use of these accommodations did not affect the validity of the constructs being measured. In looking at the complex pattern of items displaying intermediate DIF, some additional observations may be made. For the grade 4 students with blindness and visual impairments, there were more reading items on which they scored better than the students without disabilities. However, for the grade 8 students with blindness and visual impairments, there were more reading items on which they scored worse than the students without disabilities.
PERCEPTIONS	
Students' and other participant groups' perceptions differed or were mixed regarding the accommodations on the reading tests	
Jordan (2009)	The findings of the study pertained to attitudes and feelings about accommodations elicited during the course of administration of a statewide test on reading and mathematics. Inquiry was made about these perceptions of the test as a whole. Consequently, there were no separate findings for reading and math. Students indicated relative comfort and familiarity with their being offered accommodations as they are similar in instruction and assessment settings, teachers indicated mixed understanding of students' perspectives yet full awareness of accommodations provided, and parents had mixed levels of understanding about accommodations provided to their children. The accommodation of most attention was the partial-scribing method, yet also included read-aloud questions and small group administration, among others.
Logan (2009)	The extended-time accommodation did not bring about positive emotion and self-efficacy for those students with an approach orientation, and increased scores in negative emotion and decreases in self-efficacy, contradicting researcher expectations. Instead, the opposite interaction occurred: students provided extended-time tended not to experience such enhancements when compared to those not receiving this accommodation. Findings did affirm that students with different orientations about task completion do demonstrate different types of emotion and different degrees of self-efficacy.
Roach et al. (2010)	Study 1: Students eligible for an AA-MAS expressed that the modifications of adding visuals and using bold type were helpful and that removing an answer choice was not especially helpful. Study 2: The perception of most of the students with disabilities eligible for the AA-MAS was that the two modified conditions were positive or helpful, and that the second condition which had modifications along with reading support (recorded read-aloud of directions and item stems) was especially helpful -- yet performance was not particularly improved with reading support added.

INCIDENCE OF USE	
	Students not provided accommodations (without disabilities) performed better on the reading test than students provided accommodations (with disabilities)
Roxbury (2010)	The single-instance collection of data on the performance between accommodated and non-accommodated groups on a statewide reading assessment yielded a basic comparison. Accommodations varied and included those which were naturally provided for test-takers needing support. Students who used accommodations scored significantly lower than students (without disabilities) who did not use accommodations.
DECISION-MAKING	
	Educators reported about their decision-making processes and accommodations practices for assessments, including on reading
Cawthon (2010)	Educators of students who are deaf or hard-of-hearing reported in a survey that more than half of them offered specific accommodations during reading assessments: small group/individual administration (74%), extended-time (67%), and test directions interpreted (59%); other accommodations -- test items read aloud and test items interpreted -- were offered by about 1/3 of teachers. Further, teachers reported in response to an open-ended item that they used many different pieces of evidence to determine effectiveness of accommodations -- including whether the accommodation was named on the IEP, whether students were satisfied with their assessment experience, the test score, and the relative success on other classroom assessments when using the accommodation(s). Teachers also commented on the validity of the accommodated test scores, and factors considered when selecting accommodations for students.

Table F-13. Findings for Studies Examining Accommodations for Science Assessments

Authors	Findings
VALIDITY	
	The accommodations DID NOT change the science construct/s being tested
Kim et al. (2009a)	The analysis of the assessment's factor structure yields that the factors were invariant with one another; that is, the meaning of the science test scores for the students with disabilities receiving accommodations – including read-aloud, non-setting accommodations, and accommodations in general – was the same as the scores for the students without disabilities not receiving accommodations.

Kim et al. (2009b)	The analysis of the assessment's factor structure yields that the factors were invariant with one another; that is, the meaning of the science test scores for the students receiving oral accommodations was the same as the scores for the students not receiving accommodations.
Kingston (2009)	According to this meta-analytic study which included analysis of 4 science content-related studies, various factors seemed to have no effect on the score comparability of computer-administered and paper-administered science tests. For instance, grade level appeared to have no significant effect on comparability for science test scores. Further, considering only science test scores, there was no significant effect related to academic subject, with weighted mean effect size of 0.03. Overall, socioeconomic factors also did not affect comparability, including race/ethnicity, gender, and socioeconomic status.
Roxbury (2010)	Examination of the tests -- but not the items, which were not released, so not available -- yields that each content area test was unidimensional for both the accommodated and non-accommodated students. That is, the groups were not being somehow tested on different science constructs, so accommodations did not change the constructs. Further, DIF analysis indicated that some items exhibited differential item functioning, although lacking the specific item texts meant that possible reasons could not be offered for the basis of the bias. The researcher concluded that the statewide science assessment was fair for students with disabilities.
PERFORMANCE	
All Students	
	The accommodation/s provided a differential boost for science scores of students with disabilities as compared to those of students without disabilities; participants all benefited from accommodations in comparison to no accommodations
Elliott et al. (2009)	Participants who received accommodations on the science performance tasks scored better than those who did not. For students with disabilities, those who used accommodations scored about 1 standard deviation higher on average than those who did not. For students without disabilities, those receiving a standard accommodations package scored about 1/2 standard deviation higher than those who did not, and those receiving teacher-recommended accommodations scored less than 1/2 standard deviation higher on average than those who did not. Also, the expert reviewers' perceptions of the accommodations provided during the science performance tasks for both students with disabilities and students without disabilities were rated as valid and fair, with rare exception. Further, the accommodations that were recommended by teachers were rated as more valid and fair than those provided in a standard package not individualized to student needs.

Students with Disabilities	
	Students with disabilities who used accommodations on the science test did NOT perform significantly better than those who did not use accommodations on the same science test
Freeland et al. (2010)	Results of analyses include descriptive data on performance by group (sex, age, ethnicity, etc.) and by content of subtest, as well as whether participants had low vision or total blindness. Performance of students with disabilities when using accommodations were not statistically different than performance when not using accommodations. Students with total blindness who did not use access technologies typically scored better on the science subtest than those who used access technologies. Students with low vision, who generally scored higher than those with total blindness, also had the same pattern of performing better without access technologies than with them.
DECISION-MAKING	
	Educators reported about their decision-making processes and accommodations practices for assessments, including on science
Cawthon (2010)	Educators of students who are deaf or hard-of-hearing reported in a survey that about half of them offered specific accommodations during science assessments: small group/individual administration (55%), extended-time (48%), and test directions interpreted (46%); other accommodations -- test items read aloud and test items interpreted -- were offered by about 1/3 of teachers. Further, teachers reported in response to an open-ended item that they used many different pieces of evidence to determine effectiveness of accommodations -- including whether the accommodation was named on the IEP, whether students were satisfied with their assessment experience, the test score, and the relative success on other classroom assessments when using the accommodation(s). Teachers also commented on the validity of the accommodated test scores, and factors considered when selecting accommodations for students.

Table F-14. Findings for Studies Examining Accommodations for Other Language Arts Assessments

Authors	Findings
VALIDITY	
	The accommodations DID NOT change the language arts construct/s being tested
Finch et al. (2009)	The language test had a large proportion of items which displayed non-uniform DIF. While students did not differ in scores in sixth grade and higher regardless of receiving or not receiving accommodations, there were complex patterns at the lower grade levels. Specifically, students in early grades not receiving accommodations scored better than those not receiving accommodations. Put another way, students at lower proficiency levels in early grades seemed less able to benefit from accommodations in comparison with those who had higher proficiency. An unexpected finding was that DIF did not always favor students receiving disabilities: for items requiring heavy navigational load -- such as charts and maps -- it is suspected that accommodations may have involved distraction or interference.
Kim & Huynh (2010)	According to the differential item functioning (DIF) analysis of extant statewide English test data, when comparing paper-and-pencil and online test forms, there were none to mild DIF results on the item-level analyses. At the item bundle level -- as there were five separate sub-constructs being tested -- the DIF results were significant but minimal in magnitude. However, the net result was that the composite scores -- the only score on the test -- indicated no impact of the format on the English construct as a whole.
	The accommodations changed the language arts construct/s being tested
Kingston (2009)	According to this meta-analytic study which included analysis of 4 English language arts (ELA) content-related studies, various factors seemed to have mixed effects on the score comparability of computer-administered and paper-administered ELA tests. Grade level appeared to have no significant effect on comparability for ELA test scores. However, considering only ELA test scores, there was a significant effect related to academic subject, such that students (not specifically students with disabilities) scored higher on computer-administered ELA tests, with weighted mean effect size of 0.11. Overall, socioeconomic factors also did not affect comparability, including race/ethnicity, gender, and socioeconomic status.

PERFORMANCE	
All Students	Students with disabilities who used accommodations DID NOT perform significantly better on the language arts test than those who did not use accommodations; students without disabilities who used accommodations performed significantly better yet at a minimal increase over those who did not use accommodations
Kim & Huynh (2010)	The students with learning disabilities scored similarly on both the paper-and-pencil and online English test forms, with no statistically significant difference in mean scores. The students without disabilities on average scored slightly better on the paper-and-pencil form, yet still at a level of statistical significance. Some differences in score patterns between English content areas, with small effect sizes, were noted. There were no differences in difficulty level for the online and paper-and-pencil groups for either the students with or without learning disabilities. The researchers noted that the test administration modes demonstrated comparable results for both groups -- that is, students without disabilities scored similarly on both online and paper versions of the test, as did students with learning disabilities.
PERCEPTIONS	
	Educators evidenced no bias in rating language arts scores of students with disabilities in comparison with scores of students without disabilities
Mastergeorge & Martinez (2010)	The results of this bias and reliability study, involving a set of reading and mathematics performance assessments, the Standards Test to Evaluate the Performance of Students (STEPS), indicate that teachers did not introduce bias into the ratings of students with disabilities who had received various (unspecified) accommodations, in comparison with students without disabilities not receiving accommodations. Rating reliability decreased when raters were made aware that test scores were those of students with disabilities receiving accommodations, in comparison to when raters were not aware of this fact. In language arts (LA), students with disabilities scored consistently lower on average than students without disabilities, with scores in third grade being most similar and in seventh grade being most different. In terms of generalizability theory, the interaction of rater by person is large for LA, when the task was writing a composition, for students without disabilities, yet even larger for students with disabilities, possibly indicating wider disagreement among raters regarding the quality of work of students with disabilities. Further, main effects by rater are minimal, indicating equally rigorous evaluation of all student work; also, raters indicated their view that teachers should not permit differing treatment of test results from students with disabilities receiving accommodations.

Table F-15. Findings for Studies Examining Accommodations for Writing Assessments

Authors	Findings
VALIDITY	
	The accommodation/s DID NOT alter the ELA/writing construct being tested
Cook et al. (2010)	This study compared English language arts test results for grade 4 students without disabilities taking the standard test administration, students with learning disabilities under standard test administration, students with learning disabilities who used IEP or 504 plan-specified accommodations, and students with disabilities using the read-aloud accommodation. Single and multi-group confirmatory factor analysis (CFA) supported a single underlying construct for all groups on writing tests, but additional statistics did not present as clear-cut a picture. The authors nevertheless conclude that there is evidence for equality of factor structure across the four groups.
Stone et al. (2010)	In this study comparing test scores for grades 4 and 8 students without disabilities and students with blindness and visual impairments using large print or braille accommodations, the test items comprising writing standards were compared using differential item functioning (DIF). Overall, out of the 75-item test, 5 writing items indicated DIF in grade 4, and 2 writing items indicated DIF in grade 8. More specifically, only 1 writing item in grade 4 was reported to have shown large degree of DIF, which favored students without disabilities. All of this suggests that the use of these accommodations did not affect the validity of the constructs being measured. In looking at the complex pattern of items displaying intermediate DIF, some additional observations may be made. For the grade 4 students with blindness and visual impairments, there were more writing items on which they scored worse than the students without disabilities. However, for the grade 8 students with blindness and visual impairments, there were more writing items on which they scored better than the students without disabilities.
PERFORMANCE	
Students with Disabilities	
	Students with disabilities who used accommodations did NOT perform significantly better than those who did not use accommodations
Lovett et al. (2010)	This study examined effects of word-processing and extended-time accommodations for college students on essay exams. The results of the comparisons between accommodation conditions, and across the interactions, were complex across the performance tasks. Not surprisingly, students typed more words in the essay and speed tasks than they handwrote; however, there were no differences in quality between handwritten and word-processed responses. The extended-time accommodation was associated with an increase in essay length, but only when produced with word processing, not handwritting. The length of essays was not related to their quality when handwritten, but longer word-processed essays scored higher.

Table F-16. Findings for Studies Examining Accommodations for Social Studies Assessments

Authors	Findings
PERFORMANCE	
Students with Disabilities	
Students with disabilities who used accommodations did NOT perform significantly better than those who did not use accommodations on the social studies test	
Freeland et al. (2010)	Results of analyses include descriptive data on performance by group (sex, age, ethnicity, etc.) and by content of subtest, as well as whether participants had low vision or total blindness. Performance of students with disabilities when using accommodations were not statistically different than performance when not using accommodations. Students with total blindness who did not use access technologies typically scored better on the social studies subtest than those who used access technologies. Students with low vision, who generally scored higher than those with total blindness, also had the same pattern of performing better without access technologies than with them. Degree of visual impairment interacted with access technology use on some subtests. For instance, participants with total blindness using access technology in only one wave scored significantly lower in social studies than participants with low vision not using access technology at all.
VALIDITY	
The computer administration accommodation changed the social studies construct/s being tested	
Kingston (2009)	According to this meta-analytic study which included analysis of 1 social studies content-related studies, various factors seemed to have mixed effects on the score comparability of computer-administered and paper-administered social studies tests. Grade level appeared to have no significant effect on comparability for social studies test scores. However, considering only social studies test scores, there was a significant effect related to academic subject, such that students (not specifically students with disabilities) scored higher on computer-administered social studies tests, with weighted mean effect size of 0.15. Overall, socioeconomic factors also did not affect comparability, including race/ethnicity, gender, and socioeconomic status. It must be noted that the small number of studies related to this content area may skew these results.

Appendix G

Study Limitations and Future Research

Table G1. Study Limitations

Authors	Methodology	Sample Characteristics	Results	Test / Test Context	Other
Altman et al. (2010)	Inferential and non-parametric statistics could not be used due to the nature of the survey items and non-random sampling.				
Anjorin (2009)		Sample not randomly selected, and not representative of the U.S. school population.		<i>Mathematics test examined did not include the same standards/requirements as other high-stakes tests in the nation (107-108).</i>	<i>Unable to pinpoint all potential sources of DIF (108).</i>
Arce-Ferrer & Guzman (2009)	No limitations were provided in this document by the researchers.				
Barnard-Brak & Sulak (2010)		Volunteer sample results in limited generalizability.			
Barnard-Brak et al. (2009)		Low response rate; Homogenous sample; Students only recruited from two locations; Volunteer sample results in limited generalizability.			
Barnard-Brak et al. (2010)		Volunteer sample results in limited generalizability.			The necessity of accommodations for students in the sample (which can influence attitudes toward requesting accommodations) was unknown.

Limitations

Authors	Methodology	Sample Characteristics	Results	Test / Test Context	Other
Altman et al. (2010)	Inferential and non-parametric statistics could not be used due to the nature of the survey items and non-random sampling.				
Anjorin (2009)		Sample not randomly selected, and not representative of the U.S. school population.		<i>Mathematics test examined did not include the same standards/requirements as other high-stakes tests in the nation (107-108).</i>	<i>Unable to pinpoint all potential sources of DIF (108).</i>
Arce-Ferrer & Guzman (2009)	No limitations were provided in this document by the researchers.				
Barnard-Brak & Sulak (2010)		Volunteer sample results in limited generalizability.			
Barnard-Brak et al. (2009)		Low response rate; Homogenous sample; Students only recruited from two locations; Volunteer sample results in limited generalizability.			
Barnard-Brak et al. (2010)		Volunteer sample results in limited generalizability.			The necessity of accommodations for students in the sample (which can influence attitudes toward requesting accommodations) was unknown.

Cawthon (2009)	Survey data is anonymous, making it difficult to confirm the accuracy of the self-report data; Delay between participant taking assessment and reporting on it.				<i>Relatively high level of missing data for some survey questions (47).</i>
Cawthon (2010)	The unit of analysis used makes comparisons between subject areas difficult; Time delay between students receiving accommodations, and teachers taking the survey.		Results are only a rough estimate of actual practices; <i>Only a subset of teachers offered justifications for their ratings about accommodations implementation (198).</i>		
Cook et al. (2009)			Findings may not be generalizable beyond the test (GMRT).		
Cook et al. (2010)	No limitations were provided in this document by the researchers.				
Elliott et al. (2009)	Accommodations were tested in packages rather than individually, making it difficult to determine the effects of individual accommodations on scores; Different groups received different accommodations, making comparisons between groups difficult.		<i>Large amounts of variability were observed in the effect sizes (237).</i>		Students' prior math and science skills not assessed; Experts reviewed only one administration in math and science.
Elliott et al. (2010)	Testing accommodations were not used (though some modifications were).	Study focused only on eighth-graders.		Used short tests (as compared to typical achievement tests), which covered only a portion of content domains.	

Finch et al. (2009)	Participants were not randomly assigned to accommodations conditions; Some participants received multiple types of accommodations.	<i>Small sample sizes may have made it difficult to identify items that exhibit DIF (53).</i>			
Fletcher et al. (2009)	The experimental TAKS was administered after the state-administered test.		<i>Difficulty explaining the absence of an interaction effect (461).</i>		
Freeland et al. (2010)			<i>Large number of missing variables (180); Limited examination of confounding variables; Findings reported are unweighted results and are thus not generalizable to the larger population (180).</i>		
Johnstone et al. (2009)	No limitations were provided in this document by the researchers.				
Jordan (2009)	<i>Did not use empirically based assessments to determine appropriate accommodations (70).</i>		Single researcher collected and analyzed all data; May have led to biased interpretation.		Lack of research disseminated by the state to prove/disprove the effects of accommodations.
Kim & Huynh (2010)	<i>Students were not randomly assigned to conditions (118); Lack of control for potential confounding factors.</i>	Archival data files were used; <i>Study only had students with LD (118).</i>			
Kim et al. (2009a)	<i>Students were not randomly assigned to conditions (331); Lack of control for potential confounding factors (332).</i>	Archival data files were used.			

Kim et al. (2009b)	<i>May have been variations in how accommodations were implemented during testing (159); Most students received a combination of accommodations (160).</i>			Results of the study cannot answer questions related to specific disability type.	
Kingston (2009)	No limitations were provided in this document by the researcher.				
Laitusis (2010)	<i>Used teacher ratings as a criterion measure of performance (165); Ratings from teachers were collected early in the year and may not be as accurate as ratings collected later; The assessment used in this study may not be generalizable to state reading assessments (165).</i>	Random assignment at the school level, not at the individual student level.		<i>Some results showed that test forms interacted with the order of administration and format in some way that is not easily explained (165).</i>	
Lazarus et al. (2009)	No limitations were provided in this document by the researchers.				
Lee et al. (2010)		Small sample size limits generalizability.			
Lindstrom (2010)	No limitations were provided in this document by the researcher.				

Logan (2009)	Significance may not have been reached in part because the use of median splits may have increased error; Attempts were made to reproduce a real-life testing situation but a sense of educational or personal consequence for poor performance may have been missing.	There was no differentiation between different types of learning disabilities, so it is not known whether students with an SLD in math would respond differently than students with an SLD in reading.			
Lovett (2010)	Several methodological limitations are noted for the studies reviewed.	Small sample sizes and heterogenous disability groups in several of the studies described in this article.	Many studies could not distinguish between accommodation effects and disability effects.		Different research designs across studies makes comparisons difficult.
Lovett et al. (2010)	No group of participants with disabilities (made it difficult to explore the effects of accommodations).				
Mariano et al. (2009)	No limitations were provided in this document by the researchers.				
Mastergeorge & Martinez (2010)			<i>Residual error variance remains unaccounted for, which could suggest that important measurement facets were omitted (547).</i>		
Parks (2009)	Test-retest design may have resulted in rehearsal effects.				
Peltenburg et al (2009)	No limitations were provided in this document by the researchers.				

Randall & Engelhard (2010)	Long period of time between test administrations caused curriculum misalignment.	<i>Random assignment at the school level, not at the individual student level (92).</i>			Lack of student motivation on second administration of exam.
Ricketts et al. (2010)			<i>Results are not truly independent because of the many students present in both academic years (273).</i>		
Roach et al. (2010)	Limited support and guidance for posttest questionnaire.	Small sample size.			
Roxbury (2010)	Test items not individually available and so DIF analysis could not consider possible reasons for the basis of the bias.			Dichotomous data (however the author states that this was a manageable limitation).	
Russell et al. (2009a)	No limitations were provided in this document by the researchers.				
Russell et al. (2009b)	No comparison was made to any control group not using accommodations.	Convenience sample limits generalizability.			
Salend (2009)	No limitations were provided in this document by the researcher.				

Schoch (2010)	<i>Test was conducted in three different states, and standardized accommodations vary from state to state (88); No comparative study was completed between visually impaired students and their sighted peers (88); Videotaping students and teachers may have negatively impacted the results (88).</i>	Small sample of participants.		No pretests were given, so some items may have contained information that students hadn't been exposed to yet.	
Snyder (2010)	Timing of test could have affected teacher and student participation (<i>tests needed to occur during the fall, which is a busy time of year for students and teachers</i>) (6).				
Stone et al. (2010)	It was not always clear how accommodations were applied.	Small sample sizes; <i>There are many varieties of visual impairments, meaning that students may have had different challenges when taking the test</i> (149).		Researchers did not examine a brailled version of the test; Used DIF analysis procedures, which are limited in this research scenario.	
Zhang et al. (2010)	Survey design means participants might have answered in the way they thought was right, rather than according to their true beliefs.	<i>Small sample represents only a small portion of the faculty in the university</i> (285); Only nine universities included in study.			

*Quotations from the article appear in italics with page number in parentheses.

Table G2. Future Research

Authors	Methodology	Sample Characteristics	Test / Test Context	Other	Results
Altman et al. (2010)	No future research directions provided in this document by the researchers.				
Anjorin (2009)	No future research directions provided in this document by the researcher.				
Arce-Ferrer & Guzman (2009)	No future research directions provided in this document by the researchers.				
Barnard-Brak & Sulak (2010)					Replications are needed; <i>Examine why students with visible disabilities may have more positive attitudes toward requesting accommodations in the online vs. face-to-face learning environment</i> (87).
Barnard-Brak et al. (2009)	<i>Survey disability service providers across institutions of higher education to examine the utilization of staffing and services</i> (194); <i>Examine college choice as a function of university characteristics among students with disabilities</i> (195); <i>Examine factors that influence how a student with a disability selects his/her institution of higher education and their attitudes toward requesting accommodations</i> (195).				

Barnard-Brak et al. (2010)	Examine how the hypothesized subscales and total scale of the ATRA are associated with academic achievement as measured by GPA and degree completion among college students with disabilities (145); <i>Inquire about how attitudes toward requesting accommodations is associated with the behavior of requesting accommodations (145); Explore the interaction of demographic characteristics and attitudes toward requesting accommodations among college students with disabilities (146).</i>			<i>Consider the use of the ATRA to identify students with disabilities who are unlikely to request accommodations, and develop interventions for these students as early as possible (146).</i>	
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Bayles (2009)	Investigate the impact of a certificate of completion on the future of disabled students (vs. a diploma).	<i>Study the impact of the CAHSEE graduation requirement for students with disabilities in a district with demographics that are more representative of the overall diversity of California public schools (136); Study the impact of the CAHSEE on the population of students with disabilities who do not meet the requirements; Explore parent and general education teachers' perceptions of the CAHSEE.</i>			
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Bouck (2009)	Explore whether there a differential affect on performance for calculator use depending on the type of calculator being used (graphing vs. four function) (214); Explore how calculators/ graphing tools are used in the classroom; <i>Inquire about preservice and inservice teachers' beliefs about graphing calculators, and how their beliefs affect the use of graphing calculators in the classroom by students with disabilities</i> (214).	Involve larger sample sizes; <i>Include students with disabilities and graphing calculator use, especially at the middle grades</i> (214).			
Bouck (2010)	Explore the effects of different types of calculators, as well as the effect of calculator vs. no calculator on the performance of students with disabilities.	Use larger sample sizes when examining the relationship between calculator type and ability.	Inquire about less-common or less-frequently-studied accommodations.		

Cook et al. (2009)	No future research directions provided in this document by the researchers.				
Cook et al. (2010)	No future research directions provided in this document by the researchers.				
Elliott et al. (2009)			<i>Researchers should continue to study the effect of accommodations provided in isolation to students with and without disabilities</i> (237).		
Elliott et al. (2010)	<i>The relationship between modifications and accommodations and their effects on test scores for students with and without disabilities should be examined</i> (492).	Replications of the current study with elementary and high school students is needed.	Should use comprehensive modified tests to be compared to existing unmodified tests.		
Finch et al. (2009)	<i>Focus on identifying how changes to accommodations can be made so that young lower proficiency individuals could benefit from them</i> (44).				
Fletcher et al. (2009)	<i>Focus on older students with clearly identified disabilities and comparisons of performance on accommodated and nonaccommodated versions of tests</i> (462).				

Cook et al. (2009)	No future research directions provided in this document by the researchers.				
Cook et al. (2010)	No future research directions provided in this document by the researchers.				
Elliott et al. (2009)			<i>Researchers should continue to study the effect of accommodations provided in isolation to students with and without disabilities (237).</i>		
Elliott et al. (2010)	<i>The relationship between modifications and accommodations and their effects on test scores for students with and without disabilities should be examined (492).</i>	Replications of the current study with elementary and high school students is needed.	Should use comprehensive modified tests to be compared to existing unmodified tests.		
Finch et al. (2009)	<i>Focus on identifying how changes to accommodations can be made so that young lower proficiency individuals could benefit from them (44).</i>				
Fletcher et al. (2009)	<i>Focus on older students with clearly identified disabilities and comparisons of performance on accommodated and nonaccommodated versions of tests (462).</i>				

Freeland et al. (2010)	<i>Clearly define access technology to examine fully the quality, quantity, and specific access technology that is utilized and its impact on academic performance (181).</i>			Standardize the services provided by access technology.	Monitor academic outcomes for youths with visual impairments throughout coming years as technologies advance.
Johnstone et al. (2009)					Inquire about the benefits provided by various technologies.
Jordan (2009)			<i>Examine the construct validity, enhancing factors, and overall usefulness of the partial and full scribe accommodations (62).</i>		
Kim & Huynh (2010)	Account for confounding effects of accommodations.		<i>Examine the effects of administration mode on various types of disability (119); Data should be collected on why students choose to take tests on line vs. paper and pencil; Replications are needed.</i>		
Kim et al. (2009a)				Address the limitations discussed.	
Kim et al. (2009b)	Address how IEP teams identify needed accommodations for individual students.	Address the effects of accommodations for subpopulations of students with specific disabilities, at multiple ages.			

Kingston (2009)	Expand reporting of effect sizes and characteristics that affect the heterogeneity in effect sizes in research (i.e., item characteristics, different hardware).				
Laitusis (2010)	These data should be further analyzed in the following ways: 1) examining factors that contribute to score boost, 2) <i>the relationship between listening and reading comprehension by grade and disability status</i> , 3) <i>DIF across populations</i> (165).		<i>Collect more accurate measures of reading to use as an external criterion in the validity analyses</i> (165).		Findings from this study should be investigated in future research, due to the limited external validity of the teacher ratings.
Lazarus et al. (2009)	<i>Research less frequently studied accommodations</i> (78); <i>Research is needed on the assumptions underlying accommodations policies so states can make better decisions regarding their policies and how to include accommodations.</i>				
Lee et al. (2010)		Larger sample size.			
Lindstrom (2010)	No future research directions provided in this document by the researcher.				

Logan (2009)	<i>Continue investigating the relationship between students' achievement goals and their reactions to test accommodations in order to assist students in achieving motivation</i> (31); Expand and deepen analyses of students' beliefs and attitudes toward testing accommodations.				
Lovett (2010)	No future research directions provided in this document by the researcher.				
Lovett et al. (2010)				Examine the effects of task characteristics on the writing performance of students with and without disabilities.	
Mariano et al. (2009)	<i>Examine what specific accommodations are recommended, why teachers are recommending them, and how teachers make accommodations decisions</i> (23).				
Mastergeorge & Martinez (2010)	<i>Assess students on multiple occasions to separate rating occasion from testing occasion variance</i> (547).	The generalizability of these findings about teacher ratings needs to be investigated further.		<i>Examine reliability for different types of disabilities and whether teacher knowledge and ability to recognize disability types influences the reliability of rating scores</i> (548).	

Parks (2009)			Inquire about whether calculator type (scientific, four function) affects the problem-solving skills or anxiety levels of students with LD or ADHD; Investigate the effect of the calculator accommodation with other tests besides the KTEA-II; <i>Examine the construct validity of the math subtests of Georgia's CRCT to determine if calculators cause a differential boost for students with LD and/or ADHD</i> (96).		Determine whether the findings from the present study are due to the KTEA-II's good construct validity, or to the fact that that calculators do not have an effect on students' math anxiety and/or problem-solving abilities.
Peltenburg et al. (2009)		Expand participant population.	Extend to more mathematical content domains; Collect more data on the use of the 100 board (and other tools) and student's strategies with tool use.		
Randall & Engelhard (2010)	Qualitative research with students with and without disabilities may be needed to explore the differing effects of accommodations at different grade levels.				

Ricketts et al. (2010)	<i>Replicate current study using a sensitive statistical approach, such as repeated-measures analysis of variance</i> (273).	<i>Increase sample sizes, particularly of learning disabled students and those from ethnic minorities</i> (273).			
Roach et al. (2010)	With posttests, use forced-choice response method.	Study a broader sample of students with academic disabilities; <i>Seek to understand elementary or high school students' perceptions of test-item modifications</i> (78).			
Roxbury (2010)	<i>Look at group differences across the different types of accommodations</i> (59); <i>Explore using SEM models that purposely constrain specific items or allow previously identified suspect items to be freely estimated across groups</i> (60).				
Russell et al. (2009a)	No future research directions provided in this document by the researchers.				

Russell et al. (2009b)		Focus more narrowly on the affects of NimbleTools in narrowly focused age groups (a single grade or a few grades); Participating students should be pre-tested for reading proficiency and participants should be selected at various skill levels for comparison of relative benefits of using accommodations.	<i>Explore whether the use of a human or avatar as a sign interpreter differs for students at different levels of reading proficiency (17); Compare a live human, a recorded human, an avatar, and no accommodations conditions.</i>	Examine the cost-effectiveness of different types of interpreters (i.e.: live vs. avatar); Examine the consistency of live human interpreters.	
Salend (2009)	No future research directions provided in this document by the researcher.				
Schoch (2010)	<i>Address styles and approaches teachers may use when providing verbal and physical assistance to students using tactual graphics, and what type of teaching style best helps students without altering the psychometric properties of the test (90).</i>	Use larger sample sizes.	<i>In the area of tactile and large print math graphics, determine why students are scoring low on these types of problems (89); In the area of verbal description of math graphics, inquire whether verbal descriptions improve math scores; Examine the feasibility of an alternate test for visually impaired students when the test items on the regular test is considered 'too visual.'</i>		

Snyder (2010)	Calculate RIT (Rasch unIT-an equal interval scale used for interpreting student achievement and growth over time) scores for English and Spanish audio items.	Expand participant population.	Investigate Spanish audio accommodations; Examine the calibration between English and Spanish items (both print and audio).		
Stone et al. (2010)			Investigate larger numbers of each type of item; Study the responses to the same items across multiple administrations of the test used in this research.		
Zhang et al. (2010)	<i>Attempt to collect more objective data; Develop innovative programs and interventions and investigate the effects of them on faculty members' provision of accommodations to students with disabilities (285).</i>	Use a national sample with a larger sample size.			

*Quotations from the article appear in italics with page number in parentheses.

COLLEGE OF EDUCATION
+ HUMAN DEVELOPMENT

UNIVERSITY OF MINNESOTA

NCEO is an affiliated center of the Institute on Community Integration