Exploring the Test Construct Equivalence of the 2006, 2007, and 2008 Missouri Assessment Program in Communication Arts and Mathematics for English Language Learners, Students with Disabilities, Accommodated Students

Karla L. Egan
M. Christina Schneider
CTB/McGraw-Hill

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Exploring the Equivalence of the Test Construct for Various Subgroups on the Missouri Assessment Program[1]

Karla L. Egan
M. Christina Schneider

The comparability of standardized test scores has historically been assured by requiring the test to be administered to test takers under the same conditions. For K–12 summative assessments, this meant that test administrators used prescribed amounts of time, test administration order, and setting conditions for administering tests to students, If a student was not administered the test in the prescribed manner, then his/her test score was invalidated. Over the past decade, federal guidelines and laws began to require the inclusion of test scores from students who receive testing accommodations. Student use of accommodations enables student knowledge and skills in a content area to be measured rather than the student's disability (Thurlow, McGrew, Tindal, Thompson, Ysseldyke, and Elliott, 2000; Willingham, 1989). The use of an accommodation(s) is not meant to provide unfair advantage; rather, it should improve how well a test is able to measure student knowledge. In doing so, the accommodation should enhance the comparability of the score of the non-accommodated and accommodated student. So, as the measurement field moves away from strict standardization of conditions under which a test is administered, the question becomes how comparable are the scores of the accommodated students to those of the non-accommodated students?

The scores of the accommodated and non-accommodated student should represent the same underlying construct. This idea is of particular import for English-language learners (ELL) and students with disabilities (SWD). Both are groups from which students are more likely to require an accommodation in order to have access to the test. A SWD may need to have a Mathematics test read aloud in order to demonstrate his or her Mathematics ability and not be unduly hampered by his or her Reading skills. An ELL may need to have the same Mathematics test translated in order to demonstrate his or her Mathematics ability. In both cases, the accommodation allows the test to measure the intended construct (Mathematics ability) as opposed to extraneous information such as poor Reading skills or poor English skills.

The comparability of test scores is, at its core, a validity question. In studying whether or not the test scores of accommodated and non-accommodated students are comparable, we are collecting evidence to support (or disconfirm) construct-related validity. Sireci (2004) suggests four questions that should guide research on accommodations. These questions are:

1. Does providing a particular accommodation to a particular student improve measurement of the student's knowledge, skills, and abilities?
2. Does providing a particular accommodation to some, but not all, students unfairly advantage the students who receive the accommodation?
3. Does providing a particular accommodation change the construct the test is measuring?
4. Are scores from accommodated and standard test administrations comparable?

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An affirmative answer to questions 1 and 4 and a negative answer to questions 2 and 3 provide support for construct-related validity.

The current research will undertake answering questions 3 and 4 for the Missouri Assessment Program by analyzing test data from 2006 to 2008, exploring the underlying test construct measured by MAP for accommodated students, SWD, and ELL. Addressing questions 1 and 2 is beyond the scope of the current research project.

Missouri Assessment Program

The Missouri Assessment Program (MAP) was originally designed as grade-span tests to measure Missouri's Show-Me Standards. These standards were adopted by the Missouri State Board of Education in 1996. As Missouri changed its testing program to comply with the requirements of the No Child Left Behind legislation (NCLB, 2002), Missouri's Show-Me Standards have been further refined to better delineate Content Standards, Process Standards, and Content Strands/Grade-Level Expectation. Starting in 2006, the state began administering grade-level Communication Arts tests, Grades 3 through 8 and 11, and grade-level Mathematics tests in Grade 3 through 8 and 10. In 2008, grade-span tests were administered in Science in Grades 5, 8, and 11.

Currently there are 17 allowable accommodations on the MAP. Regular education students do not receive testing accommodations. Test accommodations may be used with students who qualify under IDEA and have an individualized education program (IEP), who qualify under Section 504 of the Americans' with Disabilities Act and have a 504 plan, or who are identified as an ELL. Specific accommodations must be specified by the qualifying IEP or 504 plans, and they must be consistent with the accommodations used during daily classroom instruction and testing. The use of any accommodation must be indicated on the student information sheet at the time of test administration.

The grade-specific MAP *Examiner's Manual* contains the list of accommodations permissible for the MAP assessments. Table 1 shows accommodations for ELL while Table 2 shows accommodations for SWD. If a specific accommodation is not on the list of accommodations in the *Examiner's Manual*, the accommodation may still be permitted; however, for accountability purposes, the oral administration of Communication Arts or paraphrasing any test will invalidate a student's test results. Braille and large print forms are provided to students with vision disabilities.

The MAP accommodations may be put into four categories: administration, timing, response, and setting. Only the norm-referenced portion of MAP is a strictly timed test. For all other sections of MAP, the *Examiner's Manual* provides timing guidelines for MAP administration. Table 3 shows state permitted accommodations by category. These categories follow those used by Thompson, Blount, and Thurlow (2002) in their review of the literature. Administration accommodations include any adjustment that is made in the standardized method of administering the MAP, such as orally administering MAP as opposed to having the student read the MAP. Timing conditions include any accommodation that allows for extra time to finish the MAP above and beyond what is recommended by the testing agency. Response accommodations are those tools used to assist a student in answering the MAP test items, such as using a bilingual

dictionary and/or calculator on the Mathematics MAP. Setting accommodations allow the student to take the MAP in a different location from the general education students. Students are allowed to have more than one category of accommodation on the test, and students may have multiple accommodations within a category.

Past Accommodations Research

There is a burgeoning body of research in the area of accommodations. Most of this research has been conducted on administration and/or timing accommodations for SWD (Thompson, Blount, and Thurlow, 2002; Chiu and Pearson, 1999; Sireci, Li, and Scarpati, 2003; Zenisky and Sireci, 2007). Much of this research focuses on how accommodations affect the test scores and performance of SWD. There are relatively fewer studies on accommodations directed at ELL (Sireci et al., 2003; Rivera and Collum, 2004).

Within this area, past research does not provide clear- cut answers on how accommodations affect test performance. Often-, different studies provide contradictory answers, and/or their samples are too small to be generalizable. Another area of inexactitude is that there are not federal regulations on how accommodations should be defined or administered. States are allowed to create and define their own lists of accommodations, which limit the comparability of accommodations across states. More importantly, though, the studies of the impact of accommodations on test fairness and results do not address the more serious challenge of construct validity. An accommodation may improve test scores, while, at the same time, change the construct being measured.

In order to directly compare test scores of accommodated and non-accommodated students, it is necessary that those scores measure the same underlying construct. If those scores measure different constructs, then the scores are not comparable. While much of the past research examines the effects of individual accommodations on test scores, only a handful of studies address whether the same underlying construct is being measured for accommodated students, non-accommodated students, ELL, non-ELL, SWD, and non-SWD.

In these studies, researchers have used two approaches to explore whether the underlying factor structure is the same across subgroups, with one conducted at an item level and the other conducted at the test level. The item-level studies use differential item functioning (DIF) statistics to explore if the items function in the same manner for the different subgroups. Items that function differentially between groups may do so because they measure different constructs for the groups being compared. The test-level studies generally use confirmatory factor analytic (CFA) techniques to compare the factor structure of the assessment across subgroups. In this section, we will examine studies that employed DIF and CFA techniques to explore the comparability of scores across different subgroups. We will also overview the results from studies that have investigated the effect of accommodations on test performance.

Studies Investigating Differential Item Functioning

Few studies investigate DIF for SWD or ELL. The investigations of DIF have conflicting results for SWD. Barton and Finch (2004) conducted DIF analyses on items from a national-level, large-scale Mathematics and Language achievement test administered to students in Grades 3, 5, and 8.

Using the Simultaneous Item Bias Test (SIBTEST) method, the DIF analysis revealed minimal bias. Results from DETECT, a program used to investigate test dimensionality, suggest unidimensionality across groups for each form. In a more detailed study, Finch, Barton, and Meyer (in press) used SIBTEST and logistic regression methods to examine potential DIF in Language and Mathematics items. They found uniform and non-uniform DIF could be expected between SWD who received accommodations and SWD who received no accommodations. Non-uniform DIF was more common in lower grade levels (below 6th grade). Accommodations appeared more likely to favor disabled students at higher proficiency levels, but not those with lower proficiencies.

When investigating DIF for ELL students Sireci, Wells, and Dunn (2008) and Young and his colleagues (2008) found negligible DIF when investigating the behavior of items of ELL students.

Studies Investigating Factor Structure

The studies that investigated the comparability of the underlying construct being measured tended to focus on the read-aloud accommodation. The read-aloud is typically considered a presentation accommodation because it changes how the test is given to a student. It is most controversial for Reading tests; however, the research is not conclusive on whether it changes the construct being measured. For example, Bielinski, Thurlow, Ysseldyke, Freidebach, and Freidebach (2001) concluded the Reading construct may be different for students with disabilities because 25% of the items on the test they investigated flagged for DIF functioned for SWD who took the test with no accommodations, and 50% of the items flagged for SWD who took the test with the read-aloud accommodation. Huynh and Barton (2006), however, found that the oral administration of an untimed high school Reading test did not substantially change the test's internal structure, and they concluded the major construct underlying the test remained intact with the accommodation.

Read-Aloud Accommodation for Students with Disabilities

Huynh, Meyer, and Gallant (2004) investigated the oral administration accommodation on an untimed high school exit exam for Mathematics. The internal structure of the test was compared for three groups of students: SWD who were administered the test with the oral accommodation, SWD who were administered the test with no accommodations, and students without disabilities who were administered the test without accommodations. The internal structure of the test appeared to be stable across groups, and this finding is consistent with Kosciolek and Ysseldyke (2000) and Meloy, et al. (2000). When Grade 8 Mathematics and Reading scores, gender, race, and disability status were taken into account, Huynh, Meyer, and Gallent (2004) found that disabled students who were provided an oral administration performed better than their disabled peers who took the regular form, supporting Sireci, Scarpati, and Li (2005).

Kim, Schneider, and Siskind (in press a) compared the underlying factor structure for three groups (any accommodation, any accommodation excluding setting, and oral accommodations) to scores of regular students under the standards administration for an untimed statewide Science assessment in Grades 3, 4, and 5. Results indicated that the factor structure, factor loadings, and error variances of the Science test were similar across the regular and accommodation groups. The authors, however, did not investigate if SWD who took an accommodated test performed higher than a matched group that did not. In a similar study, Kim, Schneider, and Siskind (in

press b) compared the underlying factor structure for three groups (SWD who received an oral administration, SWD who received no accommodations, and regular students who received no accommodations for an untimed statewide Science assessment in Grades 6, 7, and 8. The factor loadings and error variances were found to be invariant across groups; however, for the oral administration and general education groups in Grade 8, only partial invariance in error variances was supported.

Read-Aloud Accommodation for English Language Learners

Sireci, Wells, and Dunn (2008) investigated the comparability of test scores for ELL students who were administered a video-based, read-aloud accommodation for a Mathematics assessment. Three groups were investigated: Standard administration no video, English video, and Spanish video. Sireci, Wells, and Dunn (2008) concluded the scores obtained from video-based, read-aloud accommodation could be aggregated with those scores obtained under the standard administration.

Comparability Studies for English Language Learners

Abedi, Lord, Hofstettler, and Baker (2000) compared the structural relationships among items and between items and total test scores in Reading and Mathematics for ELL and non-ELL students. Fit indices were compared for both groups. The authors found minor differences in factor loadings between groups, although they were consistently lower for the ELL group. Similarly, Young and his colleagues (2008) investigated the internal structure and DIF on Science and Mathematic assessments for Grade 5 and Grade 8 students for one state's assessments for ELL students compared with their non-ELL peers. The tests were found to be essentially unidimensional for both groups of students, and CFA results confirmed a single factor model fit the data for each subgroups.

Rivera and Stansfield (2004) compared the test scores of items that were linguistically simplified for LEP students and for English-speaking students with those scores from LEP and English-speaking students that were derived from the typical presentation. Too few LEP students were available to have an adequate sample size in the study; however, they found no significant differences between the scores of English- speaking students on the typical or simplified versions.

Studies Investigating Effect on Test Performance

As mentioned earlier, the majority of articles in the field focus on the effect that the accommodation has on test performance buy they have not produced clear cut answers on the effectiveness and fairness of the accommodations studied. This literature has been extensively reviewed by Sireci, Li, and Scarpati (2003); Rivera and Collum (2004); Zenisky and Sireci (2007); Thompson, Blount, and Thurlow (2002); and Johnstone, Altman, Thurlow, and Thompson (2006). The interested reader is referred to one of these reviews for a thorough treatment of the studies and findings. Within this section, we will summarize previous research results on the effect of accommodations on test performance within the categories of accommodations utilized on the MAP. For the most part, the findings summarized in this portion of the paper are based on the literature reviews previously mentioned and not on a new analysis of the research. No literature was found for the setting accommodations; therefore, only timing, administration, and response accommodations are addressed below.

Timing Accommodations

Timing accommodations may refer to permitting extended time on the test, allowing the test to be administered over extra periods or days, or by some other means where extra time is allotted to complete the test. In this section, we overview past studies for SWD and ELL.

Students with Disabilities

Sireci, et al. (2003) state that a timing accommodation (alone and combined with other accommodations) is the most frequently granted accommodation for SWD. They further note that it is the most frequently studied accommodation for SWD. In a detailed review of the literature, Sireci and his colleagues (2003) conclude that the effect of a timing accommodation on test results helps all students, not just SWD.

Past research examines subjects that range from elementary school students to adults. Reading and Mathematics are the most frequently studied subject areas. The general conclusion of some studies is that a timing accommodation benefits both SWD and their non-disabled counterparts (Mandinach, 2005; Elliot and Marquart, 2004; Zuriff, 2000). Other studies conclude that while both groups are benefited, SWD show greater gains than non-SWD (Schulte, Elliott, and Kartochwill, 2001). Some studies found that a timing accommodation provides more benefit to SWD as compared to non-disabled students (Camara, Copeland, and Rothchild, 1998; Ziomeck and Andrews, 1998; Lesaux, Pearson, and Siegel, 2006; Huesman and Frisbie, 2000). Elliott and Marquart (2004) surveyed the students who participated in their study and found both SWD and non-SWD preferred the accommodated condition where they had extra time to the non-accommodated condition.

English Language Learners

The effect of extra time on the test performance of ELL is unclear (Sireci, et al., 2003). Some researchers concluded that ELL performed better when allotted extra time (Abedi, Courtney, and Leon, 2003; Abedi, Hofstetter, Baker, and Lord, 2001; Haffner, 2000), while others concluded that ELL did not benefit from extra time (Castellon-Wellington, 2000). Given the limited amount of research, firm conclusions cannot be drawn.

Administration Accommodations

Administration conditions may refer to administration of a Braille or large print edition of the test, an oral administration of the test where the test is read aloud, or any other way in which the administration of the test is altered. In this section, we overview past studies for SWD and ELL.

Students with Disabilities

Within this accommodation grouping, the oral-administration of Mathematics tests has been the most frequently studied. Typically, an oral administration for a Reading test invalidates the score (Sireci, et al. 2003); nonetheless, several studies investigated the effect of an oral administration on Reading tests (Elbaum, Arquelles, Campbell, and Bardawil, 2004; Weston, 2002; McKevitt and Elliott, 2003; Meloy, Devill, and Frisbie, 2000; Helwig and Tindal, 2003).

The results of the various studies are mixed. Several researchers concluded that the oral accommodation of a test has no impact on the scores of SWD as compared to students without disabilities on Mathematics test (Schnirman, 2005) or on a Reading test (Elbaum, Arquelles, Campbell, and Bardawil, 2004; McKevitt and Elliott, 2003). Meloy, Devill, and Frisbie (2000)

found both SWD and non-SWD benefited from oral administration and recommended against the general use of an oral accommodation.

Other researchers, however, found that SWD benefited more from an oral accommodation of a Mathematics test than did students without disabilities (Johnson, 2000; Weston, 2002; Tindal, Heath, Hollenbeck, Almond, and Harniss, 1998; Kosciolek and Ysseldyke, 2000) or from the oral accommodation of a Reading test (Weston, 2002). In a meta analysis, Elbaum (2007) found that an oral accommodation of a Mathematics test benefited learning disabled elementary students more than their non-learning disabled counterparts; however, the converse was true in middle school and high school.

Interestingly, a few of the researchers surveyed teachers for their feedback on oral accommodations and again the results were mixed. Weston (2002) found that teachers were in favor of the oral accommodation for students with learning disabilities while McKevitt and Elliott (2003) found that teachers thought the oral accommodation was not valid. After asking teachers to identify which students would benefit from an oral accommodation, Helwig and Tindal (2003) concluded that teachers could not predict what students would benefit from the oral accommodation.

<u>English Language Learners</u>

Studies of administration accommodations tend to focus on the use of linguistic simplification, oral administration, and dual language or translated tests. Of these, linguistic simplification is the most often studied accommodation. Linguistic simplification is the process of revising items or directions for clarity and conciseness to enhance understandability for test users (Rivera and Collum, 2004).

Past research tends to agree that, in general, linguistic simplification benefits ELL (Abedi, 2003; Abedi, Hofstetter, Baker, and Lord, 2001; Abedi and Lord, 2001; Abedi, Lord, and Hofstetter, 1998; Abedi, Lord, and Plummer, 1997; Hofstetter, 2003; Kiplinger, Haug, and Abedi, 2000). It does appear, however, that linguistic simplification may be more beneficial for older students than elementary students (Abedi, Courtney, and Leon, 2003) and lower-proficiency students regardless of ELL status (Abedi, Lord, and Plummer, 1997; Abedi and Lord, 2001). For more advanced students, linguistic simplification may have a negative effect (Abedi and Lord, 2001; Abedi, Lord, and Plummer, 1997). For very difficult Mathematics items, all students may benefit from linguistic simplification (Kiplinger, Haug, and Abedi, 2000).

The research on administering tests in a student's native language suggests that students benefit from native language tests when they have been instructed in their native language (Hofstetter 2003). Much of the research on native language tests shows that ELL students perform more poorly on the native language test than on the English version (Abedi, Lord, and Hofstetter, 1998; Anderson, Liu, Swiezbin, Thurlow, and Bielinksi, 2000).

There is limited research available on oral presentation of the test to ELL. The current research suggests that oral presentation does not benefit ELL (Castellon-Wellington, 2000; Hafner, 2000).

Response Accommodations

Response accommodations include the use of a scribe, the use of a calculator, the use of a bilingual dictionary, and/or other response accommodations such as using a word processor to

enter an essay. There has been quantitatively less research on the effect that response accommodations have on test scores.

Students with Disabilities

Some research on the use of a scribe has shown that it has a large, positive impact on the test scores of SWD (Koretz, 1997; MacArthur and Graham1987; Fuchs, Fuchs, Eaton, Hamlett, and Karns, 2000). Other research has shown that it has a positive effect for elementary students, but not for middle and high school students (Trimble 1998). The use of a scribe for writing prompts may be especially problematic depending on what is measured by the prompt (Thurlow and Bolt, 2001). If the writing prompt is intended to measure grammar and spelling in addition to ideas, then it may be inappropriate to use a scribe (Thurlow and Bolt, 2001).

Fuchs, Fuchs, Eaton, Hamlett, and Karns (2000) found that SWD did not benefit more from calculators than did students with no disability.

English Language Learners

The use of dictionaries and glossaries tend to be the most frequently studied response accommodation for ELL, and the results from the research that examined dictionaries and glossaries tend to be inconclusive. Some studies concluded that a dictionary or glossary helped ELLs (Abedi, 2003; Kiplinger, et al., 2000; Abedi, Lord, Boscardin, and Myoshi, 2001). Other studies concluded that using a glossary alone was not as beneficial to the test performance of ELL as using a glossary and extra time (Abedi, Hofstetter, Baker, and Lord, 2001). Finally, some studies found that dictionaries or glossaries did not improve test performance (Abedi, Courtney, and Leon, 2003; Albus, et al., 2001).

Table 1: MAP Accommodations for students who are English Language Learners

Accommodations List for Students Who Are English Language Learners (ELL) The following are the **only** accommodations allowed for ELL students:			
Code	**Invalidates**	**Administration Accommodations**	**Description**
04		Oral reading of assessment *(Not permissible for Communication Arts)*	The test examiner reads items verbatim to the student in an isolated setting so that other students will not benefit or be disturbed.
11		Oral reading in native language *(Not permissible for Communication Arts)*	
		Timing Accommodations	**Description**
20		Extend time allotted to complete *TerraNova* Survey. See Note 3.	
21		Administer test using more than allotted periods	Dates for taking the MAP must occur within the MAP testing window.
22		Other: Specify	Other timing accommodations.
		Response Accommodations	**Description**
35		Use of scribe to record student response in test booklet	The student conveys verbal responses to a scribe in an isolated, individual setting so that other students cannot benefit or be disturbed. The scribe cannot suggest ideas, words, or concepts. The scribe records the student's answers verbatim. The student should indicate capitalization and punctuation if language mechanics are being assessed.
		Oral response	The student provides an oral response to the examiner.
43		Use of bilingual dictionary *(Not permissible for Communication Arts)*	
		Setting Accommodations	**Description**
50		Testing individually	The room should be free of noises, conversation, and distractions from adjoining rooms. Individual testing is appropriate when, for example, responses are given orally or questions are paraphrased.
51		Testing with small groups	The location should be free of noises, conversation, and distractions from adjoining rooms. Students may not interact with one another about questions or answers. The examiner must be present at all times. Testing in small groups is not appropriate for students who give responses orally or require paraphrasing of questions.
53		Other: Specify	Other setting accommodations.

Table 2: MAP Accommodations for Students with Disabilities

Accommodations List for Students with Disabilities			
Code	**Invalidates**	**Administration Accommodations**	**Description**
01		Braille edition of assessment	Braille editions of the assessment require special processing. Consult your Braille edition test materials for specific instructions.
02		Large Print edition of assessment	Large Print editions of the assessment require special processing. Consult your Large Print test materials for specific instructions.
04	✓	Oral reading of assessment. See Note 1.	The test examiner reads items verbatim to the student in an isolated setting so that other students will not benefit or be disturbed.
04		Oral reading of assessment to Blind/Partial Sight students. See Note 1.	The test examiner reads items verbatim to the student who cannot read Braille in an isolated setting so that other students will not benefit or be disturbed.
05		Signing	A certified sign language interpreter or deaf education instructor signs the Mathematics and/or Science test (directions and test items are allowed) and/or the directions only of the Communication Arts test to the student.
06	✓	Paraphrasing See Note 2.	The test examiner paraphrases questions to help student understanding in an isolated setting. Terms may be defined as long as they: 1) are not the actual concept or content being assessed, 2) would not give clues, or 3) would not disclose the answer.
10		**Other administration accommodations**	
		Use of assistive devices	An assistive device, which permits a student to read and/or respond to the assessment, is used. Examples of assistive devices include computers that assist students with fine-motor problems, text enlargers that enable students to independently read and answer test questions, or augmentative communication devices.
		Use of visual aids: Specify	Visual aids include any type of optical or non-optical devices used to enhance visual capability. Examples of visual aids include bold-line felt-tip markers, lamps, filters, bold-lined paper, writing guides, or other adaptations that alter the visual environment by adjusting the space, illumination, color, contrast, or other physical features of the environment.
		Timing Accommodations	**Description**
20		Extend time allotted to complete *TerraNova* Survey. See Note 3.	Extended time to complete the *TerraNova* Survey is allowed for a student whose disability may cause him/her to be unable to meet time constraints.
21		Administer assessment using more than allotted periods	Students with disabilities may need to complete the assessments over more than one test period as a result of fatigue and/or loss of concentration. Some students may require additional breaks. Dates for taking the MAP must occur within the MAP testing window.
22		Other: Specify	Other timing accommodations
		Response Accommodations	**Description**
35		Use of scribe to record student response in test booklet	The student conveys verbally or signs responses to a scribe in an isolated, individual setting so that other students cannot benefit or be disturbed. The scribe cannot suggest ideas, words, or concepts. The scribe records the student's answers verbatim. The student should indicate capitalization and punctuation if language mechanics are being assessed.
		Student taped response	The student speaks responses into a tape recorder in an isolated setting so that other students cannot benefit or be disturbed. The test examiner must be present at all times.
		Signed response	The student uses sign language to convey responses. A certified sign language interpreter or deaf education instructor records responses.
		Pointing to respond	The student points to correct responses and the administrator records responses in the MAP test booklet.
		Oral response	The student provides oral responses to the test examiner.
		Use of a Brailler	A student records responses using a Brailler. Examples of a Brailler include a Braillewriter, a slate and stylus, or an electronic Brailler note taker.
		Use of a communication device	The student uses a communication device to provide responses to the test examiner.
		Use of a computer/word processor/typewriter to respond	The student uses a computer/word processor to write the responses. (Provide a non-networked computer to avoid inappropriate use of the computer to access answers.) The student uses a typewriter to write the responses.
39		Use of a calculator/math table/ abacus	In sessions of the MAP where calculators are allowed, the accommodation code should not be marked. The use of a calculator represents an accommodation when it is used on a section of the assessment for which calculator use is not allowed. Students may use talking calculators, but only in an isolated setting. Students use tables to assist in simple addition, subtraction, multiplication, and division facts using whole numbers. Students use an abacus to perform mathematical computations by sliding beads along rods.
44		Other: Specify. See Note 4.	Other response accommodations
		Setting Accommodations	**Description**
50		Testing individually	The location should be free of noises, conversation, and distractions from adjoining rooms. Individual testing is appropriate when, for example, responses are given orally or questions are paraphrased.
51		Testing in small groups	The location should be free of noises, conversation, and distractions from adjoining rooms. Students may not interact with one another about questions or answers. The test examiner must be present at all times. Testing in small groups is not appropriate for students who give responses orally or require paraphrasing of questions.
53		Other: Specify	Other setting accommodations

Table 3: Accommodations Categorized by Type

Accommodation Type			
Administration	**Timing**	**Response**	**Setting**
Braille	Extend time – *TerraNova* session	Use of scribe to record student response in test	Testing Individually
Large Print	Administer using > allotted periods	Use of calculator, math table, etc	Testing with small groups
Oral reading	Other timing	Use of bilingual dictionary	Other setting
Signing of assessment		Other response	
Paraphrasing			
Oral reading in native language			
Other administration			

Methodology

Data

The data in this study come from the 2006, 2007, and 2008 administration of the MAP (described above) in Communication Arts and Mathematics in Grades 3, 5, 8, and high school. We also studied data from the 2008 administration of the Science MAP in Grades 5, 8, and 11. The results reported in this study are based on the census data.

We analyzed item-level, standard-level, and test-level data during the analyses for this study. The item-level data were simply 1, 0 data, reflecting whether a student correctly answered the data (1) or not (0). The standard-level data were percent correct scores (0 to 100 scale) that a student earned on each reported content standard. Table 4 shows the content standards reported for each grade and content area. For MAP, standards are only reported if they have four or more points. The test-level data were represented by the scale score that the student earned on the test. Table 5 reflects the lowest and highest obtainable scale score for each of the tests studied.

Student data were aggregated by ELL status, SWD status, accommodation status, and category of accommodation. Frequency distribution and descriptive statistics are reported for each of these aggregations.

There were changes in how student disability was reported between 2006 and 2008. In 2006 and 2007, test administrators directly recorded student disability status, ELL status, and accommodation onto the test book. This meant that this information was processed directly with the test data. In 2008, student disability and ELL status was collected in a separate file and had to be merged to the test data. There were a handful of students whose test data and demographic information could not be merged. These students were dropped from our analyses.

Table 4: Content Standards by Content Area

Communication Arts	Mathematics	Science
Speaking/Writing Standard English Reading—Fiction/Poetry/Drama Reading—Nonfiction Writing Formally and Informally Combined Reading from Standards 2 and 3	Number and Operations Algebraic Relationships Geometric and Spatial Relationships Measurement Data and Probability	Matter and Energy Force and Motion Living Organisms Ecology Earth Systems Universe Scientific Inquiry Science, Technology, and Human Activity

Table 5: LOSS and HOSS Values by Grade and Content Area

Grade	Communication Arts		Mathematics		Science	
	LOSS	HOSS	LOSS	HOSS	LOSS	HOSS
3	455	790	450	780		
5	485	840	480	830	470	855
8	530	875	525	885	540	895
10			555	910		
11	545	885			550	970

Effect Size

After computing the descriptive statistics, we then measured the magnitude of the difference using the effect size. Some believe that fairness is an issue whenever the measured ability differences between subgroups are overly large; however, a criterion for large difference is lacking. One way to evaluate the magnitude of the differences is to calculate the effect size. Cohen's D was used to calculate the effect size. Cohen's D is given by the formula:

$$d = \frac{\overline{x_a} - \overline{x_b}}{\sqrt{\frac{(n_a - 1)s_a^2 + (n_b - 1)s_b^2}{(n_a + n_b) - 2}}} \qquad (1)$$

where $\overline{x_a}$ is the mean score of group A, $\overline{x_b}$ is the mean score of group b, s_a^2 is the variance of group A, s_b^2 is the variance of group B, n_a is the number of students in group A, and n_b is the number of students in group B.

Cohen's *d*, then, expresses the difference in group means in terms of the standard deviation. For example if *d*=0.34 for two groups, then it may be interpreted as the mean difference between the two groups is 0.34 of the pooled standard deviation. Cohen (1988) offered guidelines for interpreting the meaning of the *d* statistic: *d*=0.20 is a small effect size, *d*=0.50 is a medium effect size, and *d*=0.80 is a large effect size. Even with these guidelines, caution should be used when judging the differences between the groups compared as there is debate in the measurement field regarding the appropriateness of these guidelines for standardized testing (Holland 2000).

Test Reliability

The reliability of raw scores for the subgroups on the MAP tests was evaluated using Cronbach's (1951) coefficient alpha, which is a lower-bound estimate of test reliability. The reliability coefficient is a ratio of the variance of true test scores to those of the observed scores, with the values ranging from 0 to 1. The closer the value of the reliability coefficient is to 1, the more consistent the scores, where 1 refers to a perfectly consistent test. As a rule of thumb, reliability coefficients that are equal to or greater than 0.8 are considered acceptable for tests of moderate lengths.

Cronbach's coefficient alpha was computed using the formula

$$\alpha = \frac{n}{n-1}\left[1 - \frac{\sum_{i=1}^{n} \sigma_i^2}{\sigma_X^2}\right], \qquad (2)$$

where *n* is the number of items on the test, σ_i^2 is the variance of item *i* and σ_x^2 is the variance of the total test score.

Total test reliability measures such as Cronbach's coefficient alpha and standard error of measurement consider the consistency (reliability) of performance over all test questions in a given form, the results of which imply how well the questions measure the content domain and could continue to do so over repeated administrations. The number of items in the test influences these statistics; a longer test can be expected to be more reliable than a shorter test.

Standard Error of Measurement

The reliability of reported test scores can be characterized by the standard errors associated with the scores. The standard error of measurement (SEM) may be used to determine the range within which a student's true score is likely to fall. An observed score should be regarded not as a student's true score, but as an estimate of a student's true score. It is expected that 68% of the time a student's score obtained from a single test administration would fall within one SEM of

the student's true score and that 95% of the time the obtained score would fall within approximately two standard errors of the true score. The standard error of measurement (SEM) is an index of the random variability in test scores and is defined as follows:

$$\text{SEM} = SD\sqrt{1-\hat{\alpha}}\ , \qquad (3)$$

where SD represents standard deviation of the raw score distribution, and $\hat{\alpha}$ represents Cronbach's alpha, as expressed in Equation 2. The overall SEM is expressed in scale score units and is a test level statistic.

Differential Item Functioning

It is possible for items to function differently among different population groups, and it is also possible that results for an item do not reflect student ability, but instead reflect irrelevant information influenced by demographic or other factors (e.g., gender or ethnicity). The DIF analysis studies if that possibility occurred, and to what degree, item by item for each focal group against a reference group. The *Standards* considers DIF as evidence based on internal evidence. Positive values indicate the item favors the focal group, while negative values indicate that the item disadvantages the focal group. The following shows the focal and reference groups.

- ***English Language Learners***: Focal group is ELL students. Reference group is all other students.
- ***Students with Disabilities:***: Focal group is SWD. Reference group is all other students.
- ***Accommodations***: Focal group is students who received one or more testing accommodations. Reference group is all others.

The DIF analyses are not performed for subgroups of less than 100. In these cases, the statistical procedures do not have sufficient power to detect differences should they exist.

Mantel-Haenszel Statistic

The Mantel-Haenszel statistic is computed as (Zwick, Donoghue, and Grima, 1993):

$$\text{Mantel } \chi^2 = \frac{\left(\sum_k F_k - \sum_k E(F_k)\right)^2}{\sum_k \text{Var}(F_k)}, \qquad (4)$$

where F_k is the sum of scores for the focal group at the kth level of the matching variable. Note that the Mantel-Haenszel statistic is sensitive to N such that larger sample sizes increase the value of chi square.

In addition to the Mantel-Haenszel chi-square statistic, the delta statistic (MH-D DIF) was computed for all items. Educational Testing Service (ETS) first developed the MH-D DIF statistic. To compute delta, alpha (the odds ratio) is first computed as:

$$\alpha_{MH} = \frac{\sum_{k=1}^{K} N_{r1k} N_{f0k} / N_k}{\sum_{k=1}^{K} N_{f1k} N_{r0k} / N_k}, \qquad (5)$$

where N_{r1k} is the number of correct responses in the reference group at ability level k, N_{f0k} is the number of incorrect responses in the focal group at ability level k, N_k is the total number of responses, N_{f1k} is the number of correct responses in the focal group at ability level k, and N_{r0k} is the number of incorrect responses in the reference group at ability level k. Δ_{MH} DIF is then computed as:

$$\Delta_{MH} = -2.35\ln(\alpha_{MH}) \qquad (6)$$

Items were flagged for DIF using the following criteria:

- Moderate DIF: Absolute value of the Mantel-Haenszel (Δ_{MH}) is significantly greater than zero (at the .05 level) and $-1.5 \le \Delta_{MH} \le -1$ or $1 \le \Delta_{MH} \le 1.5$.
- Large DIF: Absolute value of the Mantel-Haenszel (Δ_{MH}) that is significantly greater than zero (at the .05 level) and $|\Delta_{MH}|$ exceeds 1.5.

Standardized Mean Difference (SMD)

The SMD is an effect size index of DIF, which is relatively easy to interpret (Zwick et al., 1993). The SMD compares the mean of the reference and focal group, adjusting for the distribution of reference and focal group members on the conditioning variable (Zwick et al., 1993), which for these analyses is the CRCT raw score. SMD is computed as (Zwick et al., 1993):

$$SMD = p_{Fk}\left(\sum_k m_{Fk} - \sum_k m_{Rk}\right), \qquad (7)$$

where p_{fk} = proportion of the focal group members at the kth level of the matching variable, $m_{Fk} = 1/N_{F1k}$ and $m_{Rk} = 1/N_{R1k}$.

For constructed-response items, an effect size (ES) statistic based on the Mantel χ^2 will be used. ES is obtained by dividing the standardized mean difference (SMD) statistics by the standard deviation of the item. (A detailed description of these procedures can be found in Zwick, et al., 1993). Items are flagged using the same rules that are used in NAEP:

- Moderate DIF: If the Mantel statistic is significant ($p < .05$) and $|ES|$ is between 0.17 and 0.25
- Large DIF: If the Mantel statistic is significant ($p < .05$) and $|ES| \ge 0.25$

Expert Analysis

Once items were analyzed for DIF, any flagged item was further analyzed by a CTB Content Expert. This person analyzed items for possible biases against ELL, SWD, or accommodated students depending on for whom the item was flagged for DIF.

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was implemented using LISREL to test the factorial invariance of the non-accommodated students to other groups of interest (e.g., students receiving an accommodation). For all grades and content areas, the appropriateness of a single factor model had been established previously using principle components analysis (see 2006, 2007, and 2008 *Missouri Assessment Program Technical Report*).

For this study, we tested three models of increasing stringency.

Model 1: Invariance of factor structure.
Model 2: Invariance of the factor loadings across the groups.
Model 3: Invariance of the factor loadings and the measurement error across the groups.

If the data fit Model 2, then we assume weak invariance, and if the data fit Model 3, then we assume strong invariance of our data. Weak invariance is sufficient evidence to conclude that the tests scores measure the same construct for different groups (Little, 1997; Marsh, 1994; McArdle, 1998; Vanderberg and Lance, 2000). For the purposes of assuming that MAP measures the same underlying construct for all groups of students, then the data must fit, at least, Model 2.

There is no agreed upon criterion for testing model-data fit in multi-group CFA. Many researchers report the chi-square statistic; however, it is notoriously sensitive to large samples and will always be significant in large samples (Marsh, Balla, and McDonald, 1988; Wu, Li, and Zumbo, 2007). Given the extremely large sample size of the non-accommodated students, this statistic was deemed inappropriate.

Some researchers will extract smaller samples from census data in order to circumvent the sample size issues associated with the chi-square (and other fit indices) (e.g., Kim, et al., 2008). This approach, however, may be counterproductive in that it sacrifices the information and power of census data for the sake of a statistic. Hoelter (1983) states, “testing models with large samples is always desirable, and the question that needs to be addressed deals with how well a model *approximates* the observed data rather than whether or not the model *fits* the data” (as quoted in Marsh, Balla, and McDonald, 1988).

So, we examined several goodness-of-fit indices when determining how well the model *approximates* the data, including: the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the non-normed fit index (NNFI). All of these indices are readily available in LISREL. There is a good deal of debate in the field on the cut-off values that should be used for these indices (see Hu and Bentler, 1999; Marsh et al., 2004; Meade, Johnson, and Braddy, 2006; Cheung and Rensvold, 2002). For example, Hu and Bentler recommend that the RMSEA < 0.06; however, others suggest that RMSEA values ranging from 0.05 to 0.08 are acceptable (Hair, Anderson, Tatham, and Black, 1998).

Table 6 shows the cut off values adopted for each index *a priori* to examining the data. These values were adopted from Hu and Bentler (1999) and Cheung and Rensvold (2002). A model must meet the cut-off criteria for three of the four indices in order to show adequate fit.

Table 6: Cut off Values for Goodness of Fit Statistics

Index	Cut-Off Value
CFI	>0.95
ΔCFI	≤-0.01
NNFI	>0.95
RMSEA	<0.06

Results

In this section, we present the results from the 2008 data. The results of the 2006 and 2007 analyses are presented in Appendix A. We will comment on differences between the three years within the DIF and CFA sections. For the most part, the results of the frequency distributionos and descriptive analyses were consistent across the three years of data.

Frequency Distributions

Table 7 summarizes the total number of students in each grade as well as the percent of students who were accommodated, classified as ELL, and SWD. As shown in Table 7, nearly 10% of Missouri students receive some type of accommodation and approximately 12% to 14% have some type of disability. The percentage of ELL declines from almost 3.5% to 1.5% from Grade 3 to high school (see Table 7).

Table 7: Frequency Distribution of Accommodated Students, English Language Learners (ELL), and Students with Disabilities (SWD) for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content		Grade			
		3	5	8	HS
Communication Arts	N Count	66326	65720	67558	61357
	% Accommodated	9.32	11.40	9.76	7.81
	% ELL	3.37	3.10	2.18	1.48
	% SWD	14.73	14.01	12.46	11.38
Math	N Count	66326	65720	67558	69115
	% Accommodated	9.64	11.80	10.19	8.58
	% ELL	3.37	3.09	2.18	1.86
	% SWD	14.73	14.01	12.46	12.06
Science	N Count		65720	67558	62604
	% Accommodated		11.32	9.77	7.61
	% ELL		3.07	2.15	1.59
	% SWD		13.89	12.30	11.14

Table 8 further disaggregates the accommodations by the categories of accommodations allowed on the MAP. For all content areas, timing and setting are the most frequently used accommodations. Administration accommodations are also frequently used on the Mathematics and Science tests.

Table 8: Frequency Distribution of Categories of Accommodations for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content		Grade			
		3	5	8	HS
Communication Arts	Total	66326	65720	67558	61357
	% Accommodated	9.32	11.40	9.76	7.81
	% Admin	0.32	0.39	0.22	0.26
	% Timing	6.61	8.20	5.89	4.84
	% Response	2.96	3.01	1.32	0.53
	% Setting	9.03	11.12	9.28	7.12
Mathematics	Total	66326	65720	67558	69115
	% Accommodated	9.64	11.80	10.19	8.58
	% Admin	6.77	8.23	5.43	3.42
	% Timing	6.69	8.37	5.97	4.67
	% Response	3.85	5.02	5.60	4.50
	% Setting	9.20	11.41	9.50	7.84
Science	Total		65720	67558	62604
	% Accommodated		11.32	9.77	7.61
	% Admin		7.99	5.29	2.97
	% Timing		7.81	5.56	4.42
	% Response		3.58	3.71	1.66
	% Setting		10.91	9.18	6.92

Table 9 further disaggregates the types of accommodations used for ELL while Table 10 presents the same information for SWD. Table 9 shows that the percentage of ELL students receiving an accommodation decreases across the grades in all three content areas. Within Communication Arts, the percentage of students receiving an accommodation decreases from 33% to nearly 16% in high school. Similar declines are noted in Mathematics and Science. As with the general population, ELL students were most likely to receive setting and timing accommodations on Communication Arts. On Mathematics and Science, they were most likely to receive administration and setting accommodations.

Table 9: Frequency Distribution of Categories of Accommodations used by English Language Learners for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content		Grade			
		3	5	8	HS
Communication Arts	N Count	2237	2035	1471	911
	% Accommodated	33.30	30.07	21.96	15.81
	% Admin	0.54	0.49	0.14	0.44
	% Timing	22.62	20.00	10.13	9.44
	% Response	4.78	4.03	2.65	0.99
	% Setting	29.41	28.06	20.67	14.93
Math	N Count	2236	2033	1470	1286
	% Accommodated	42.49	40.09	28.84	18.12
	% Admin	29.65	30.00	16.73	9.18
	% Timing	26.43	24.20	12.86	7.70
	% Response	5.68	7.23	12.52	6.53
	% Setting	35.69	34.73	24.22	16.72
Science	N Count		2020	1455	994
	% Accommodated		38.66	27.97	15.39
	% Admin		29.50	16.29	8.75
	% Timing		22.08	11.55	8.65
	% Response		6.78	10.72	5.94
	% Setting		33.42	23.44	13.38

Table 10 shows the percentage of SWD receiving an accommodation both in general (% accommodated) and by category. A higher percentage of SWD receive an accommodation in Grades 5 and 8 than in Grades 3 and high school on all three content areas. In fact, approximately half of the Grade 3 students receive an accommodation on the Communication Arts and Mathematics MAP. The SWD are most likely to receive a setting accommodation on all three content areas; however, the other accommodation categories are also used frequently with this population with the exception of the administration category on the Communication Arts MAP.

Table 10: Frequency Distribution of Categories of Accommodations used by Students with Disabilities for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content		Grade			
		3	5	8	HS
Communication Arts	N Count	9770	9209	8417	6982
	% Accommodated	50.67	68.64	70.92	63.03
	% Admin	1.76	2.56	1.63	2.05
	% Timing	37.18	50.84	43.39	39.83
	% Response	17.52	19.00	9.55	4.35
	% Setting	50.05	67.64	67.78	57.75
Math	N Count	9770	9207	8416	8337
	% Accommodated	50.67	69.08	73.1	64.58
	% Admin	37.18	49.81	39.71	26.46
	% Timing	36.75	51.04	43.62	36.37
	% Response	23.08	32.01	41.25	34.65
	% Setting	49.61	68.06	68.82	59.31
Science	N Count		9131	8307	6977
	% Accommodated		66.21	70.04	62.13
	% Admin		48.30	38.82	24.72
	% Timing		47.90	40.64	36.76
	% Response		22.26	27.05	13.56
	% Setting		65.08	66.61	56.87

Finally, it is well known that students often receive more than one accommodation on a test. The next set of frequency distributions examines the combinations of accommodations that ELL and SWD receive. Table 11 shows the combinations of accommodations that ELL receives. On the Communication Arts test, timing and setting are the most frequently used combination of accommodations. Administration, timing, and setting are the most frequently used combination of accommodations for ELL students in Grades 3 and 5 Mathematics and Grade 5 Science. In Grade 8, the combination of administration and setting is the most frequently used combination for both Mathematics and Science. On the Mathematics MAP, the most frequently used accommodation was setting alone (4.35%) for ELL students. On the Grade 11 Science MAP, the utilized accommodations were fairly even distributed across the accommodation types and combinations. Table 11 clearly demonstrates that the majority of ELL receive some combination of accommodations as opposed to a single accommodation.

Table 11: Frequency Distribution of Combinations of Categories of Accommodations used by English Language Learners for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content		Grade			
		3	5	8	HS
Communication Arts	Total	2237	2035	1471	911
	% Administration				
	% Timing	3.71	1.97	0.88	0.77
	% Setting	9.48	8.94	10.27	5.49
	% Response	0.09	0.05	0.34	0.11
	%Time and Administration				
	%Admin and Setting	0.04		0.07	0.33
	%Admin and Response				
	%Time and Setting	15.15	14.94	8.09	8.23
	%Time and Response	0.04		0.07	
	%Response and Setting	0.89	1.08	1.16	0.44
	%Admin and Response and Setting	0.18			
	%Admin and Time and Setting	0.13	0.20		
	%Admin and Time and Response	0.04			
	%Time and Response and Setting	3.40	2.60	1.02	0.33
	%Admin and Response and Time and Setting	0.13	0.29	0.07	0.11
Math	Total	2236	2033	1470	1286
	% Administration	2.91	3.25	1.84	1.01
	% Timing	3.71	1.67	1.02	
	% Setting	4.79	3.94	3.88	4.35
	% Response	0.09	0.15	1.16	
	%Time and Administration	0.04	0.10	0.14	
	%Admin and Setting	6.80	6.79	4.97	2.02
	%Admin and Response		0.15	0.34	0.23
	%Time and Setting	3.62	3.89	1.84	1.71
	%Time and Response		0.05	0.07	0.16
	%Response and Setting	0.13	0.20	1.22	1.32
	%Admin and Response and Setting	1.34	1.43	2.59	1.48
	%Admin and Time and Setting	14.94	13.23	2.65	2.49
	%Admin and Time and Response	0.04		0.07	
	%Time and Response and Setting	0.49	0.20	2.93	1.40
	%Admin and Response and Time and Setting	3.58	5.07	4.15	1.94

Content		Grade			
		3	5	8	HS
Science	Total		2020	1455	994
	% Administration		3.37	2.20	0.70
	% Timing		1.29	0.69	0.20
	% Setting		3.66	4.05	2.92
	% Response		0.10	1.03	0.30
	%Time and Administration		0.30	0.14	
	%Admin and Setting		7.52	5.64	1.41
	%Admin and Response		0.10	0.34	0.40
	%Time and Setting		3.66	2.06	1.51
	%Time and Response		0.05	0.07	0.40
	%Response and Setting		0.15	0.96	0.40
	%Admin and Response and Setting		1.68	2.20	0.60
	%Admin and Time and Setting		12.08	2.47	2.72
	%Admin and Time and Response		0.05	0.07	
	%Time and Response and Setting		0.25	2.82	0.91
	%Admin and Response and Time and Setting		4.41	3.23	2.92

Table 12 shows the combinations of accommodations that SWD receive On the Communication Arts test, timing and setting are again the most frequently used combination of accommodations. On the Mathematics MAPs and the Grades 5 and 8 Science MAP, SWD most frequently receive all four categories of accommodations in combination. On the Grade 11 Science MAP, the combination of timing and setting was the most frequently used accommodation. Table 12 clearly demonstrates that the majority of SWD receive some combination of accommodations as opposed to a single accommodation.

Table 12: Frequency Distribution of Combinations of Categories of Accommodations used by Students with Disabilities for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content Area		Grade			
		3	5	8	HS
Communication Arts	Total	9770	9209	8417	6982
	% Administration	0.04	0.11	0.13	0.03
	% Timing	0.30	0.60	2.48	4.74
	% Setting	8.74	13.18	23.57	21.57
	% Response	0.13	0.07	0.30	0.11
	%Time and Administration	0.01	0.02	0.06	0.24
	%Admin and Setting	0.19	0.20	0.26	0.24
	%Admin and Response			0.01	0.03
	%Time and Setting	23.44	34.66	34.19	30.84
	%Time and Response	0.11	0.18	0.14	0.13
	%Response and Setting	4.20	4.05	3.08	1.07
	%Admin and Response and Setting	0.18	0.20	0.18	0.14
	%Admin and Time and Setting	0.42	0.87	0.67	1.02
	%Admin and Time and Response	0.02	0.02	0.01	
	%Time and Response and Setting	11.99	13.33	5.52	2.52
	%Admin and Response and Time and Setting	0.89	1.15	0.31	0.34
Math	Total	9770	9207	8416	8337
	% Administration	0.30	0.13	0.45	0.26
	% Timing	0.19	0.24	1.21	1.80
	% Setting	3.23	4.94	9.08	10.39
	% Response	0.10	0.10	1.08	0.56
	%Time and Administration	0.16	0.18	0.15	0.58
	%Admin and Setting	5.18	5.93	5.79	4.26
	%Admin and Response	0.03	0.04	0.20	0.29
	%Time and Setting	5.96	8.56	8.31	8.29
	%Time and Response	0.02	0.11	1.06	1.12
	%Response and Setting	1.11	1.31	4.80	6.36
	%Admin and Response and Setting	3.97	5.58	8.08	6.09
	%Admin and Time and Setting	12.56	17.08	6.86	4.35
	%Admin and Time and Response	0.25	0.22	0.12	0.66
	%Time and Response and Setting	2.88	4.01	7.85	9.61
	%Admin and Response and Time and Setting	14.73	20.64	18.06	9.97

Content Area		Grade			
		3	5	8	HS
Science	Total		9131	8307	6977
	% Administration		0.18	0.63	0.52
	% Timing		0.24	1.22	3.55
	% Setting		5.00	10.94	13.96
	% Response		0.05	0.72	0.14
	%Time and Administration		0.27	0.16	0.53
	%Admin and Setting		7.89	8.85	6.99
	%Admin and Response		0.05	0.11	0.03
	%Time and Setting		9.01	10.38	14.18
	%Time and Response		0.09	0.52	0.26
	%Response and Setting		0.91	2.83	1.62
	%Admin and Response and Setting		4.23	5.32	2.11
	%Admin and Time and Setting		21.36	10.82	8.84
	%Admin and Time and Response		0.25	0.08	0.23
	%Time and Response and Setting		2.61	4.61	3.70
	%Admin and Response and Time and Setting		14.07	12.86	5.48

Descriptive Statistics

Table 13, 14, and 15 report the mean scale score (mean SS), standard deviation of scale score (SD), the alpha reliability coefficient, and the standard error of measurement for non-ELL, ELL, non-disabled, and SWD for Communication Arts, Mathematics, and Science respectively. These tables also report the effect size between the means of ELL compared to non-ELL and SWD compared to non-disabled students.

For all grades and content areas, the mean MAP SS is lower for the SWD compared to the non-disabled group and for the ELL compared to the non-ELL. For SWD, the effect size indicates that this is a large difference, where SWD underperform non-disabled students in all grade/content areas except Grade 3 Mathematics and Grade 5 Science, where a medium effect size is observed.

For ELL, a medium effect size is observed in Communication Arts for all grades except Grade 8, where the effect size is large. In Mathematics, the effect size is small (Grades 3 and 5) to medium (Grades 8 and 10). In Science, a medium effect size is observed in all grades. In all grade/content areas, ELL students underperform non-ELL students.

An SEM trend is bserved only in Grades 5, 8, and 10 Mathematics and Grades 5, 8, and 11 Science, where the SEM for ELL and SWD students is slightly larger than that of their non-ELL or non-disabled counterparts.

The alpha coefficient demonstrates that the MAP test results are reliable for ELL, SWD, non-ELL, and non-disabled students.

Table 13: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for Non-English Language Learners (non-ELL), English Language Learners (ELL), Non-Disabled Students (non-SWD), and Students with Disabilities (SWD) for Grades 3, 5, 8, and 11 Communication Arts MAP

			Communication Arts				
Grade		**N**	**Mean SS**	**SD**	**ALPHA**	**SEM**	**EFFECT**
3	Non-ELL	64028	638.23	37.36	0.92	10.89	
	ELL	2148	618.86	37.92	0.94	9.40	0.52
	Non-SWD	56420	641.94	33.95	0.90	10.47	
	SWD	9756	612.53	46.41	0.93	12.05	0.82
5	Non-ELL	63599	671.98	33.55	0.91	9.98	
	ELL	1945	655.06	34.78	0.94	8.57	0.50
	Non-SWD	56351	676.32	29.06	0.90	9.41	
	SWD	9193	641.80	43.61	0.92	12.01	1.10
8	Non-ELL	65868	691.60	33.22	0.92	9.61	
	ELL	1408	664.88	39.26	0.94	9.60	0.80
	Non-SWD	58914	696.37	28.97	0.90	9.10	
	SWD	8362	653.52	39.34	0.91	11.89	1.41
11	Non-ELL	60129	713.93	35.74	0.92	9.87	
	ELL	906	689.54	37.57	0.92	10.50	0.68
	Non-SWD	54129	719.00	31.75	0.91	9.60	
	SWD	6906	671.00	37.99	0..91	11.63	1.48

Table 14: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for Non-English Language Learners (non-ELL), English Language Learners (ELL), Non-Disabled Students (non-SWD), and Students with Disabilities (SWD) for Grades 3, 5, 8, and 10 Mathematics MAP

Grade		N	Math				EFFECT
			Mean SS	SD	ALPHA	SEM	
3	Non-ELL	64017	622.11	36.79	0.92	10.47	
	ELL	2234	608.72	38.20	0.92	10.65	0.36
	Non-SWD	56503	624.81	35.26	0.91	10.48	
	SWD	9751	603.38	40.83	0.93	10.67	0.59
5	Non-ELL	63600	661.97	40.51	0.91	11.82	
	ELL	2030	644.85	43.68	0.92	12.36	0.42
	Non-SWD	56445	666.53	37.18	0.90	11.57	
	SWD	9190	630.17	47.11	0.92	13.19	0.94
8	Non-ELL	65836	701.75	39.16	0.94	12.06	
	ELL	1466	680.82	44.28	0.93	13.61	0.53
	Non-SWD	58953	706.73	35.54	0.93	11.50	
	SWD	8358	662.98	43.75	0.91	14.99	1.19
10	Non-ELL	67490	729.82	49.32	0.94	12.06	
	ELL	1281	701.32	53.23	0.93	13.61	0.58
	Non-SWD	60527	736.74	44.51	0.93	11.50	
	SWD	8244	674.61	50.35	0.91	14.99	1.37

Table 15: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for Non-English Language Learners (non-ELL), English Language Learners (ELL), Non-Disabled Students (non-SWD), and Students with Disabilities (SWD) for Grades 5, 8, and 11 Science MAP

Grade		N	Science				EFFECT
			Mean SS	SD	ALPHA	SEM	
5	Non-ELL	63562	662.31	31.13	0.91	9.33	
	ELL	2016	640.75	36.05	0.91	10.83	0.69
	Non-SWD	56492	664.86	28.96	0.90	9.01	
	SWD	9094	641.67	38.65	0.92	10.84	0.76
8	Non-ELL	65751	694.87	30.37	0.92	8.75	
	ELL	1452	671.07	34.81	0.92	10.04	0.78
	Non-SWD	58988	698.25	27.92	0.91	8.42	
	SWD	8220	666.37	34.69	0.91	10.29	1.11
11	Non-ELL	61135	722.67	39.82	0.90	12.36	
	ELL	989	692.47	46.62	0.91	14.31	0.76
	Non-SWD	55236	727.72	35.55	0.89	11.65	
	SWD	6888	677.81	46.54	0.89	15.35	1.35

Tables 16, 17, and 18 report the mean scale score (mean SS), standard deviation of scale score (SD), the alpha reliability coefficient, and the standard error of measurement for accommodated,

non-accommodated, and all categories of accommodations for Communication Arts, Mathematics, and Science respectively. These tables also report the effect size between the means of accommodated students compared to non-accommodated students.

For all grades and content areas, the mean MAP SS is lower for the aggregate accommodated group as compared to the non-accommodated students. This is also true for each category accommodation. The effect size indicates that this is a large difference, where accommodated students underperform non-accommodated students.

An SEM trend is observed only in Communication Arts where the SEM for the administration accommodation is somewhat larger than the other accommodations. In Mathematics and Science, the SEM tends to be the same size regardless of accommodation group.

The alpha coefficient demonstrates that the MAP test results are reliable for all accommodated groups.

Table 16: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for all Categories of Accommodations for Grades 3, 5, 8, and 11 Communication Arts MAP

			Communication Arts				
Grade		N	Mean SS	SD SS	ALPHA	SEM	EFFECT
3	Not accom	60000	641.97	33.81	0.90	10.46	
	Accom	6176	595.15	44.78	0.92	13.00	1.34
	Admin	208	552.53	71.13	0.94	16.87	2.63
	Timing	4382	594.52	44.66	0.92	12.98	1.37
	Response	1960	596.44	49.80	0.93	13.37	1.32
	Setting	5986	594.74	44.60	0.92	13.00	1.35
5	Not accom	58055	676.35	28.98	0.90	9.38	
	Accom	7489	633.73	42.72	0.91	12.90	1.38
	Admin	256	608.32	73.57	0.95	17.11	2.32
	Timing	5386	633.79	42.17	0.91	12.80	1.40
	Response	1977	633.95	47.44	0.92	13.08	1.42
	Setting	7302	633.39	42.58	0.91	12.93	1.39
8	Not accom	60721	695.67	29.30	0.90	9.10	
	Accom	6555	648.18	39.77	0.90	12.52	1.56
	Admin	148	600.26	70.96	0.94	16.90	3.24
	Timing	3960	646.08	41.08	0.90	12.94	1.64
	Response	876	649.45	45.75	0.93	12.45	1.56
	Setting	6233	647.67	39.43	0.90	12.56	1.58
11	Not accom	56261	717.51	32.77	0.88	11.13	
	Accom	4774	667.08	38.36	0.87	14.04	1.52
	Admin	154	598.78	66.58	0.91	19.62	3.61
	Timing	2956	667.44	39.80	0.87	14.25	1.51
	Response	323	669.71	48.47	0.90	15.01	1.45
	Setting	4351	665.66	37.25	0.86	14.02	1.57

Table 17: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for all Categories of Accommodations for Grades 3, 5, 8, and 10 Mathematics MAP

Grade		N	Mathematics				EFFECT
			Mean SS	SD	ALPHA	SEM	
3	Not accom	59870	625.01	35.21	0.91	10.48	
	Accom	6384	590.20	37.75	0.92	10.69	0.98
	Admin	4485	587.86	36.71	0.92	10.60	1.05
	Timing	4426	589.70	37.62	0.92	10.59	1.00
	Response	2547	587.45	39.06	0.92	10.79	1.06
	Setting	6091	589.92	37.62	0.92	10.68	0.99
5	Not accom	57879	666.70	37.14	0.90	11.55	
	Accom	7756	622.17	44.65	0.91	13.58	1.17
	Admin	5410	619.79	44.43	0.91	13.67	1.24
	Timing	5502	622.26	44.40	0.91	13.45	1.17
	Response	3301	618.10	45.75	0.91	13.83	1.29
	Setting	7498	621.96	44.34	0.91	13.57	1.18
8	Not accom	60450	706.13	35.90	0.92	10.28	
	Accom	6861	658.72	43.04	0.89	14.53	1.29
	Admin	3656	657.00	42.51	0.88	14.89	1.35
	Timing	4017	656.71	44.06	0.89	14.80	1.36
	Response	3769	656.12	42.96	0.88	14.73	1.38
	Setting	6396	657.99	42.94	0.88	14.70	1.31
10	Not accom	62860	734.94	45.73	0.94	11.61	
	Accom	5911	669.21	48.71	0.90	15.75	1.43
	Admin	2359	665.24	49.18	0.89	16.33	1.52
	Timing	3218	669.86	49.54	0.90	15.71	1.42
	Response	3102	663.61	49.08	0.89	16.42	1.55
	Setting	5401	668.22	48.45	0.89	15.95	1.45

Table 18: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for all Categories of Accommodations for Grades 5, 8, and 11 Science MAP

Grade		N	Science				Effect
			Mean SS	SD	ALPHA	SEM	
5	Not accom	58159	665.01	28.85	0.90	8.98	
	Accom	7427	635.26	38.37	0.91	11.43	0.99
	Admin	5245	634.65	37.21	0.91	11.31	1.02
	Timing	5127	635.15	38.00	0.91	11.35	1.01
	Response	2348	640.68	40.27	0.92	11.36	0.83
	Setting	7159	635.36	38.10	0.91	11.39	0.99
8	Not accom	60648	697.77	28.15	0.91	8.43	
	Accom	6560	662.76	34.69	0.90	10.73	1.21
	Admin	3557	662.11	33.16	0.89	10.83	1.25
	Timing	3726	660.44	35.56	0.91	10.82	1.30
	Response	2489	662.72	35.65	0.91	10.58	1.23
	Setting	6160	662.50	34.45	0.90	10.76	1.23
11	Not accom	57386	726.17	36.84	0.90	11.84	
	Accom	4738	673.94	46.32	0.88	15.96	1.39
	Admin	1852	671.86	44.61	0.86	16.50	1.46
	Timing	2754	673.37	47.51	0.89	16.02	1.41
	Response	1036	676.40	44.83	0.88	15.64	1.35
	Setting	4315	673.12	45.89	0.88	16.18	1.41

Table 19, 20, and 21 report the percent of SWD, ELL, accommodated and non-accommodated students in each MAP achievement level, plus the combined percent Proficient and Advanced for Communication Arts, Mathematics, and Science Respectively. These tables clearly demonstrate that SWD, ELL, and accommodated students underperform compared to non-accommodated students.

Table 19: Distribution of MAP Achievement Levels for Students with Disabilities (SWD), English Language Learners (ELL), Accommodated Students, and Non-Accommodated Students, Grades 3, 5, 8, and 11 Communication Arts MAP

		Grade			
	Achievement Level	**3**	**5**	**8**	**11**
SWD	Total	4950	6321	5969	4401
	No Level	0.02	0.05	0.37	0.41
	Below Basic	42.44	32.24	31.08	59.71
	Basic	49.27	57.10	61.33	36.06
	Proficient	6.53	8.86	6.57	3.14
	Advanced	1.74	1.76	0.65	0.68
	% P+A	8.26	10.62	7.22	3.82
ELL	Total	745	612	323	144
	No Level	0.54	0.16	4.02	
	Below Basic	31.14	28.10	44.89	65.28
	Basic	62.01	61.76	47.37	32.64
	Proficient	5.23	9.48	2.79	2.08
	Advanced	1.07	0.49	0.93	
	% P+A	6.31	9.97	3.72	2.08
Accommodated	Total	6181	7495	6597	4794
	No Level	0.08	0.08	0.64	0.42
	Below Basic	40.03	31.05	31.57	59.53
	Basic	51.42	57.69	60.44	35.73
	Proficient	6.65	9.33	6.61	3.50
	Advanced	1.83	1.85	0.74	0.81
	% P+A	8.48	11.18	7.35	4.32
Not Accommodated	Total	60145	58225	60961	56563
	No Level	0.24	0.29	0.39	0.53
	Below Basic	6.15	3.28	2.85	9.96
	Basic	50.07	43.50	44.28	47.24
	Proficient	27.08	35.20	35.92	29.61
	Advanced	16.45	17.73	16.55	12.65
	% P+A	43.53	52.93	52.47	42.27

Table 20: Distribution of MAP Achievement Levels for Students with Disabilities (SWD), English Language Learners (ELL), Accommodated Students, and Non-Accommodated Students, Grades 3, 5, 8, and 10 Mathematics MAP

		Grade			
	Achievement Level	**3**	**5**	**8**	**10**
SWD	Total	4950	6360	6152	5384
	No Level	0.16	0.03	0.29	0.24
	Below Basic	25.70	30.33	58.00	68.70
	Basic	61.41	57.97	33.45	24.24
	Proficient	11.43	10.22	6.97	6.43
	Advanced	1.29	1.45	1.28	0.39
	% P+A	12.73	11.67	8.26	6.82
ELL	Total	950	815	424	233
	No Level				0.43
	Below Basic	16.74	23.07	54.25	58.37
	Basic	68.42	60.00	32.55	26.61
	Proficient	12.74	14.97	9.43	11.59
	Advanced	2.11	1.96	3.77	3.00
	% P+A	14.84	16.93	13.21	14.59
Accommodated	Total	6394	7758	6886	5929
	No Level	0.16	0.03	0.36	0.30
	Below Basic	24.07	29.04	57.78	68.61
	Basic	62.17	58.25	33.10	23.87
	Proficient	12.12	11.11	7.26	6.65
	Advanced	1.49	1.57	1.50	0.57
	% P+A	13.61	12.68	8.76	7.22
Not Accommodated	Total	59932	57962	60672	63186
	No Level	0.10	0.14	0.37	0.52
	Below Basic	4.61	4.67	13.54	17.29
	Basic	48.26	44.89	38.29	32.93
	Proficient	37.47	37.57	32.53	36.89
	Advanced	9.57	12.72	15.29	12.37
	% P+A	47.03	50.30	47.81	49.27

Table 21: Distribution of MAP Achievement Levels for Students with Disabilities (SWD), English Language Learners (ELL), Accommodated Students, and Non-Accommodated Students, Grades 5, 8, and 11 Science MAP

		Grade		
	Achievement Level	**5**	**8**	**11**
SWD	Total	6046	5818	4335
	No Level	0.17	0.52	0.42
	Below Basic	32.60	54.78	71.21
	Basic	50.22	34.86	19.65
	Proficient	13.68	9.32	8.03
	Advanced	3.34	0.53	0.69
	% P+A	17.02	9.85	8.72
ELL	Total	781	407	153
	No Level		0.25	
	Below Basic	40.46	68.55	81.70
	Basic	50.19	24.82	14.38
	Proficient	8.32	5.65	3.92
	Advanced	1.02	0.74	
	% P+A	9.35	6.39	3.92
Accommodated	Total	7439	6602	4762
	No Level	0.16	0.64	0.50
	Below Basic	32.89	55.62	71.31
	Basic	50.37	33.85	19.32
	Proficient	13.38	9.32	8.11
	Advanced	3.20	0.58	0.76
	% P+A	16.57	9.89	8.86
Not Accommodated	Total	58281	60956	57842
	No Level	0.21	0.51	0.79
	Below Basic	8.46	15.41	21.16
	Basic	43.24	37.36	27.65
	Proficient	31.73	39.64	40.84
	Advanced	16.36	7.09	9.56
	% P+A	48.10	46.73	50.40

Differential Item Functioning

Table 22, 23, and 24 show the number of items that were flagged for large negative DIF, moderate negative DIF, moderate positive DIF, and large positive DIF for SWD, ELL, and accommodated students for Communication Arts, Mathematics, and Science respectively. These tables also provide the overall total number of items flagged for DIF for each grade/content area. For example, Table 22 shows that 3 items were flagged for DIF either for or against Accommodated students on the Grade 11 Communication Arts test, with one flagged for large negative DIF, one flagged for moderate negative DIF, and one flagged for moderate positive DIF.

Overall, these three tables show that relatively few items were flagged for DIF on the grade/content areas studied. Looking across Tables 22 through 24 at the total number of items flagged for DIF, it does appear that more items tend to be flagged for DIF for ELL as compared to SWD and accommodated students.

Further analysis of the flagged items by CTB Content Experts revealed that only three of the flagged items may have possible bias against ELL. None of the Communication Arts, Mathematics, or Science flagged for DIF for SWD and for accommodated students were flagged for bias in the expert analysis of these items. The Grade 5 Communication Arts item flagged for large negative DIF used an English colloquialism that may not be known to ELL. The Grade 3 Mathematics item flagged for moderate negative DIF used American units of measurement, which may be biased against ELL from countries using a metric system of measurement. The Grade 10 Mathematics item flagged for large negative DIF had a lot of text which may have measured a student's Reading ability in addition to their Mathematics ability.

Table 22: Number of Items Flagged for Large Negative DIF, Moderate Negative DIF, Moderate Positive DIF, and Large Positive DIF for or against Accommodated Students, Grades 3, 5, 8, and High School Communication Arts, Mathematics, and Science MAP

Content Area	Grade	Large Negative	Mod Negative	Mod Positive	Large Positive	Total	Total # of Items
Communication Arts	3	1	3	0	0	4	58
	5	0	0	0	0	0	56
	8	0	1	0	0	1	61
	11	1	1	1	0	3	63
Math	3	1	1	0	1	3	60
	5	0	0	1	0	1	62
	8	0	1	2	0	3	64
	10	0	0	0	0	0	58
Science	5	0	1	0	0	1	53
	8	1	0	0	0	1	58
	11	0	0	1	0	1	58

Table 23: Number of Items Flagged for Large Negative DIF, Moderate Negative DIF, Moderate Positive DIF, and Large Positive DIF for or against English Language Learners, Grades 3, 5, 8, and High School Communication Arts, Mathematics, and Science MAP

Content Area	Grade	Large Negative	Mod Negative	Mod Positive	Large Positive	Total	Total # of Items
Communication Arts	3	0	0	0	0	0	58
	5	1	1	0	0	2	56
	8	1	3	2	0	6	61
	11	1	1	1	1	4	63
Math	3	0	4	0	0	4	60
	5	0	0	0	0	0	62
	8	0	1	0	0	1	64
	10	2	2	0	0	4	58
Science	5	0	3	2	0	5	53
	8	1	2	3	0	6	58
	11	0	0	1	0	1	58

Table 24: Number of Items Flagged for Large Negative DIF, Moderate Negative DIF, Moderate Positive DIF, and Large Positive DIF for or against Students with Disabilities, Grades 3, 5, 8, and High School Communication Arts, Mathematics, and Science MAP

Content Area	Grade	Large Negative	Mod Negative	Mod Positive	Large Positive	Total	Total # of Items
Communication Arts	3	0	1	0	0	1	58
	5	0	0	0	0	0	56
	8	0	1	0	0	1	61
	11	1	2	2	0	5	63
Math	3	0	0	0	0	0	60
	5	0	0	0	0	0	62
	8	0	0	2	0	2	64
	10	0	1	0	0	1	58
Science	5	0	0	0	0	0	53
	8	1	0	0	0	1	58
	11	0	0	1	0	1	58

Confirmatory Factor Analysis

As mentioned previously, the adequacy of the one-factor model had been tested for each of the tests, using principle components analysis. These analyses showed the adequacy of a single-factor model for all grade/content area MAPs (see Chapter 9 in the *Missouri Assessment Program Technical Report 2008*).

Three models of increasing stringency were tested in which the parameters were estimated simultaneously for the following groups: accommodated and non-accommodated students; accommodated students with disabilities, non-accommodated students with disabilities, and regular education students; and accommodated ELL, non-accommodated ELL, and regular

education students. The results of these analyses are presented in Table 25 for Communication Arts, Table 26 for Mathematics, and Table 27 for Science.

Invariance between Accommodated Students and Non-Accommodated Students

The results of the invariance tests for the non-accommodated and accommodated students on the Communication Arts MAP is in the top part of Table 25. In Model 1, all fit indices except the RMSEA demonstrated good model fit, indicating that all groups have one underlying factor. Grade 5 Communication Arts results are not reported because the model was fully saturated. In Model 2, where the factor loadings were constrained to be equal across the groups, the fit indices NNFI, CFI, and Δ CFI indicated good model-data fit. This says that the two groups have invariant factor loadings on paired content standards (i.e., the factor loading of content standard 2 for accommodated students and non-accommodated students are invariant). In Model 3, where factor loadings and error variances were constrained to be equal across groups, overall model fit did not decrease significantly as indicated by the NNFI and CFI. The Δ CFI was either zero or -0.01 for all grades, except Grade 3. In Grade 3, it appears that Model 3 does not hold for the Communication Arts data, suggesting that Grade 3 accommodated and non-accommodated students have different error variances.

In 2006 and 2007, Model 3 does not hold for Grade 3 or Grade 8 Communication Arts.

The results for the invariance tests for the non-accommodated and accommodated students on the Mathematics MAP is in the top part of Table 26 and the Science MAP is in the top part of Table 27. For both of these tests, the majority of the fit indices indicated good model-fit for all three models in all three grades.

In 2006, Model 3 does not hold for Grade 5 Mathematics.

Invariance between Non-Accommodated Students with Disabilities, Accommodated Students with Disabilities, and Regular Students

The three models were again tested comparing non-accommodated SWD, accommodated SWD, and regular students. The results for these analyses may be found in the middle of Table 25 for Communication Arts, Table 26 for Mathematics, and Table 27 for Science. In all cases, except Model 3 for Grade 3 in Communication Arts, the majority of fit indices indicate good model-data fit for all models. In Grade 3 Communication Arts, the Δ CFI was -0.02 and the RMSEA was greater than 0.06; thus, Model 3 does not hold, suggesting that non-accommodated SWD, accommodated SWD, and regular students have different error variances.

In 2006 and 2007, Model 3 does not hold for Grades 3, 8, and 11 Communication Arts. In 2006, Model 3 does not hold for Grade 5 Mathematics.

Invariance between Non-Accommodated English-Language Learners, Accommodated English-Language Learners, and Regular Students

Finally, the three models were tested comparing non-accommodated ELL, accommodated ELL, and regular students. The results for these analyses may be found at the bottom of Table 25 for Communication Arts, Table 26 for Mathematics, and Table 27 for Science. In all cases, the majority of fit indices indicate good model-data fit for all models.

Table 25: Test of Invariance by Grade, Group, and Model, Communication Arts 2008

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Non-Accommodated vs. Accommodated Students								
3	1	4	626.24	0	0.99	0.07	1	
	2	7	1663.79	0	0.98	0.09	0.99	-0.01
	3	11	4357.68	0	0.96	0.13	0.97	-0.02
5	2	2	264.61	0	0.99	0.06	1	
	3	5	856.39	0	0.99	0.08	0.99	-0.01
8	1	4	63.80	0	1	0.02	1	
	2	7	950.47	0	0.99	0.06	0.99	-0.01
	3	11	2143.59	0	0.98	0.09	0.98	-0.01
11	1	4	187.55	0	1	0.04	1	
	2	7	465.59	0	0.99	0.05	1	0
	3	11	1316.38	0	0.99	0.07	0.99	-0.01
Accommodated SWD vs. Non-Accommodated SWD vs. Regular Students								
3	1	6	662.48	0	0.99	0.07	1	
	2	12	1637.97	0	0.98	0.08	0.99	-0.01
	3	20	4121.67	0	0.97	0.11	0.97	-0.02
5	2	4	257.36	0	0.99	0.05	1	
	3	10	817.55	0	0.99	0.07	0.99	-0.01
8	1	6	69.39	0	1	0.02	1	
	2	12	997.84	0	0.99	0.06	0.99	-0.01
	3	20	2323.51	0	0.98	0.08	0.98	-0.01
11	1	6	202.19	0	1	0.04	1	
	2	12	589.37	0	0.99	0.05	1	0
	3	20	1770.35	0	0.99	0.07	0.99	-0.01
Accommodated ELL vs. Non-Accommodated ELL vs. Regular Students								
3	1	6	486.36	0	0.99	0.061	1	
	2	12	637.61	0	0.99	0.05	0.99	-0.01
	3	20	841.64	0	0.99	0.05	0.99	0
5	2	4	57.04	0	1	0.03	1	
	3	10	155.32	0	1	0.03	1	0
8	1	6	62.97	0	1	0.02	1	
	2	12	191.77	0	1	0.03	1	0
	3	20	333.83	0	1	0.03	1	0
11	1	6	159.49	0	1	0.04	1	
	2	12	258.42	0	1	0.03	1	0
	3	20	370.89	0	1	0.03	1	0

Table 26: Test of Invariance by Grade, Group, and Model, Mathematics 2008

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Non-Accommodated vs. Accommodated Students								
3	1	10	220.59	0	1	0.03	1	
	2	14	276.27	0	1	0.02	1	0
	3	19	1022.30	0	1	0.04	1	0
5	1	10	419.39	0	1	0.04	1	
	2	14	760.35	0	1	0.04	1	0
	3	19	1875.69	0	0.99	0.06	0.99	-0.01
8	1	10	571.50	0	1	0.04	1	
	2	14	1373.32	0	0.99	0.06	1	0
	3	19	2295.88	0	0.99	0.06	0.99	-0.01
10	1	10	577.65	0	1	0.04	1	
	2	14	1232.60	0	0.99	0.05	1	0
	3	19	1869.01	0	0.99	0.05	0.99	-0.01
Accommodated SWD vs. Non-Accommodated SWD vs. Regular Students								
3	1	15	219.77	0	1	0.02	1	
	2	23	275.23	0	1	0.02	1	0
	3	33	926.93	0	1	0.04	1	0
5	1	15	402.05	0	1	0.03	1	
	2	23	759.36	0	1	0.04	1	0
	3	33	1818.88	0	0.99	0.05	0.99	-0.01
8	1	15	591.00	0	1	0.04	1	
	2	23	1465.35	0	0.99	0.05	1	0
	3	33	2375.45	0	0.99	0.06	0.99	-0.01
10	1	15	590.05	0	1	0.04	1	
	2	23	1476.80	0	0.99	0.05	1	0
	3	33	2220.19	0	0.99	0.05	0.99	-0.01
Accommodated ELL vs. Non-Accommodated ELL vs. Regular Students								
3	1	15	191.81	0	1	0.02	1	
	2	23	213.36	0	1	0.02	1	0
	3	33	318.94	0	1	0.02	1	0
5	1	15	351.26	0	1	0.03	1	
	2	23	404.41	0	1	0.03	1	0
	3	33	536.46	0	1	0.03	1	0
8	1	15	511.68	0	1	0.04	1	
	2	23	586.27	0	1	0.04	1	0
	3	33	688.01	0	1	0.03	1	0
10	1	15	587.75	0	1	0.04	1	
	2	23	630.32	0	1	0.04	1	0
	3	33	713.55	0	1	0.03	1	0

Table 27: Test of Invariance by Grade, Group, and Model, Science 2008

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Non-Accommodated vs. Accommodated Students								
5	1	40	1430.21	0	1	0.03	1	
	2	47	2206.76	0	0.99	0.04	1	0
	3	55	2429.86	0	0.99	0.04	0.99	-0.01
8	1	40	2062.93	0	1	0.04	1	
	2	47	2693.64	0	1	0.04	1	0
	3	55	4318.88	0	0.99	0.05	0.99	-0.01
11	1	40	1969.83	0	0.99	0.04	1	
	2	47	3233.45	0	0.99	0.05	0.99	-0.01
	3	55	4610.59	0	0.99	0.05	0.99	0
Accommodated SWD vs. Non-Accommodated SWD vs. Regular Students								
5	1	60	1457.75	0	1	0.03	1	
	2	74	2153.24	0	0.99	0.04	1	0
	3	90	2353.90	0	1	0.03	1	0
8	1	60	2129.66	0	1	0.04	1	
	2	74	2783.59	0	1	0.04	1	0
	3	90	4427.05	0	0.99	0.04	0.99	-0.01
11	1	60	2069.21	0	0.99	0.04	1	
	2	74	3553.76	0	0.99	0.05	0.99	-0.01
	3	90	5273.50	0	0.99	0.05	0.99	0
Accommodated ELL vs. Non-Accommodated ELL vs. Regular Students								
5	1	60	1311.25	0	1	0.03	1	
	2	74	1478.01	0	1	0.03	1	0
	3	90	1566.97	0	1	0.03	1	0
8	1	60	1906.71	0	1	0.04	1	
	2	74	1982.69	0	1	0.04	1	0
	3	90	2297.43	0	1	0.03	1	0
11	1	60	1937.93	0	0.99	0.04	1	
	2	74	2279.20	0	0.99	0.04	1	0
	3	90	2379.33	0	1	0.04	1	0

Categories of Accommodations

Three models of increasing stringency were tested in which the parameters were estimated simultaneously for the four students with a specific category of accommodations (administration, response, setting, and timing) and non-accommodated students. The results of these analyses are presented in Table 28 for Communication Arts, Table 29 for Mathematics, and Table 30 for Science.

The results of these analyses for all grades in all three content areas show that there is strict invariance between the students who had an administration accommodation and students who did not. The fit indices also indicate that there is strict invariance between the students who had a response accommodation and non-accommodated students in all grade/content areas.

In terms of the setting accommodation, the fit indices indicate that there is strict invariance between students receiving a setting accommodation and non-accommodated students in all grade/content areas except Grade 3 Communication Arts. In Grade 3 Communication Arts, there

was only weak invariance between students receiving a setting accommodation and non-accommodated students.

The same pattern was observed for the timing accommodation, where the fit indices indicate that there is strict invariance between students receiving a timing accommodation and non-accommodated students in all grade/content areas except Grade 3 Communication Arts. In Grade 3 Communication Arts, there was only weak invariance between students receiving a timing accommodation and non-accommodated students.

In 2006 and 2007, Model 3 does not hold when comparing students receiving a setting accommodation versus students receiving no accommodation in Grade 5 Mathematics. This Model also does not hold in 2007 for Grades 3 and 8 Communication Arts for students receiving a setting accommodation compared to students receiving no accommodation.

In 2007, Model 3 does not hold when comparing students receiving a timing accommodation versus students receiving no accommodation in Grade 3 Communication Arts.

Table 28: Test of Invariance by Grade, Group, and Model for Categories of Accommodation, Communication Arts 2008

Grade	Model	DF	Chi-Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Administration Accommodation vs. No Accommodation								
3	1	4	466.01	0	0.99	0.06	1	
	2	7	535.29	0	0.99	0.05	1	0
	3	11	717.49	0	0.99	0.06	0.99	-0.01
5	2	2	19.58	0	1	0.02	1	
	3	5	30.51	0	1	0.01	1	0
8	1	4	67.92	0	1	0.02	1	
	2	7	89.63	0	1	0.02	1	0
	3	11	114.79	0	1	0.02	1	0
11	1	4	149.25	0	1	0.04	1	
	2	7	162.82	0	1	0.03	1	0
	3	11	173.67	0	1	0.02	1	0
Response Accommodation vs. No Accommodation								
3	1	4	552.95	0	0.99	0.07	1	
	2	7	983.93	0	0.99	0.07	0.99	-0.01
	3	11	2239.03	0	0.98	0.1	0.98	-0.01
5	2	2	99.77	0	1	0.04	1	
	3	5	292.91	0	1	0.05	1	0
8	1	4	64.03	0	1	0.02	1	
	2	7	194.51	0	1	0.03	1	0
	3	11	401.35	0	1	0.04	1	0
11	1	4	154.23	0	1	0.04	1	
	2	7	206.42	0	1	0.03	1	0
	3	11	275.69	0	1	0.03	1	0
Setting Accommodation vs. No Accommodation								
3	1	4	617.82	0	0.99	0.07	1	
	2	7	1634.26	0	0.98	0.09	0.99	-0.01
	3	11	4285.50	0	0.96	0.13	0.97	-0.02
5	2	2	265.66	0	0.99	0.06	1	
	3	5	852.12	0	0.99	0.08	0.99	-0.01
8	1	4	64.03	0	1	0.02	1	
	2	7	907.75	0	0.99	0.06	0.99	-0.01
	3	11	2059.57	0	0.98	0.08	0.98	-0.01
11	1	4	189.50	0	1	0.04	1	
	2	7	460.02	0	0.99	0.05	1	0
	3	11	1267.98	0	0.99	0.07	0.99	-0.01

Timing Accommodation vs. No Accommodation								
3	1	4	608.47	0	0.99	0.07	1	
	2	7	1356.80	0	0.98	0.08	0.99	-0.01
	3	11	3381.82	0	0.97	0.12	0.97	-0.02
5	2	2	204.18	0	0.99	0.06	1	
	3	5	644.82	0	0.99	0.07	0.99	-0.01
8	1	4	62.57	0	1	0.02	1	
	2	7	681.49	0	0.99	0.06	0.99	-0.01
	3	11	1417.68	0	0.99	0.07	0.99	0
11	1	4	171.38	0	1	0.04	1	
	2	7	349.35	0	0.99	0.04	1	0
	3	11	860.34	0	0.99	0.06	0.99	-0.01

Table 29: Test of Invariance by Grade, Group, and Model for Categories of Accommodation, Mathematics 2008

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Administration Accommodation vs. No Accommodation								
3	1	10	200.06	0	1	0.02	1	
	2	14	253.86	0	1	0.02	1	0
	3	19	793.87	0	1	0.04	1	0
5	1	10	382.45	0	1	0.03	1	
	2	14	694.59	0	1	0.04	1	0
	3	19	1521.24	0	0.99	0.06	0.99	-0.01
8	1	10	533.88	0	1	0.04	1	
	2	14	1052.64	0	0.99	0.05	1	0
	3	19	1625.88	0	0.99	0.05	0.99	-0.01
10	1	10	564.80	0	1	0.04	1	
	2	14	874.03	0	1	0.04	1	0
	3	19	1191.16	0	1	0.04	1	0
Response Accommodation vs. No Accommodation								
3	1	10	175.33	0	1	0.02	1	
	2	14	212.94	0	1	0.02	1	0
	3	19	575.99	0	1	0.03	1	0
5	1	10	352.92	0	1	0.03	1	
	2	14	582.21	0	1	0.04	1	0
	3	19	1200.40	0	0.99	0.05	0.99	-0.01
8	1	10	544.61	0	1	0.04	1	
	2	14	1065.49	0	0.99	0.05	1	0
	3	19	1650.37	0	0.99	0.05	0.99	-0.01
10	1	10	571.02	0	1	0.04	1	
	2	14	994.03	0	1	0.05	1	0
	3	19	1410.67	0	1	0.05	1	0
Setting Accommodation vs. No Accommodation								
3	1	10	216.87	0	1	0.03	1	
	2	14	272.11	0	1	0.02	1	0
	3	19	1006.37	0	1	0.04	1	0
5	1	10	413.79	0	1	0.04	1	
	2	14	734.54	0	1	0.04	1	0
	3	19	1846.46	0	0.99	0.06	0.99	-0.01
8	1	10	562.66	0	1	0.04	1	
	2	14	1336.68	0	0.99	0.06	1	0
	3	19	2246.73	0	0.99	0.06	0.99	-0.01
10	1	10	571.91	0	1	0.04	1	
	2	14	1184.79	0	1	0.05	1	0
	3	19	1792.23	0	0.99	0.05	0.99	-0.01

Timing Accommodation vs. No Accommodation								
3	1	10	204.20	0	1	0.02	1	
	2	14	259.29	0	1	0.02	1	0
	3	19	836.75	0	1	0.04	1	0
5	1	10	390.68	0	1	0.03	1	
	2	14	644.59	0	1	0.04	1	0
	3	19	1441.19	0	0.99	0.05	0.99	-0.01
8	1	10	541.60	0	1	0.04	1	
	2	14	1090.15	0	0.99	0.05	1	0
	3	19	1700.41	0	0.99	0.06	0.99	-0.01
10	1	10	578.37	0	1	0.04	1	
	2	14	929.18	0	1	0.04	1	0
	3	19	1306.02	0	1	0.05	1	0

Table 30: Test of Invariance by Grade, Group, and Model for Categories of Accommodation, Science 2008

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Administration Accommodation vs. No Accommodation								
	1	40	1357.68	0	1	0.03	1	
5	2	47	2003.70	0	0.99	0.04	1	0
	3	55	2173.06	0	1	0.04	1	0
	1	40	1948.73	0	1	0.04	1	
8	2	47	2329.05	0	1	0.04	1	0
	3	55	3332.06	0	0.99	0.04	0.99	-0.01
	1	40	1892.14	0	0.99	0.04	1	
11	2	47	2598.46	0	0.99	0.04	0.99	-0.01
	3	55	3250.75	0	0.99	0.04	0.99	0
Response Accommodation vs. No Accommodation								
	1	40	1266.66	0	1	0.03	1	
5	2	47	1553.87	0	1	0.03	1	0
	3	55	1596.77	0	1	0.03	1	0
	1	40	1956.89	0	1	0.04	1	
8	2	47	2262.21	0	1	0.04	1	0
	3	55	2860.91	0	1	0.04	1	0
	1	40	1882.41	0	0.99	0.04	1	
11	2	47	2166.53	0	0.99	0.04	1	0
	3	55	2453.01	0	0.99	0.04	1	0
Setting Accommodation vs. No Accommodation								
	1	40	1420.26	0	1	0.03	1	
5	2	47	2180.82	0	0.99	0.04	1	0
	3	55	2397.64	0	0.99	0.04	0.99	-0.01
	1	40	2055.09	0	1	0.04	1	
8	2	47	2692.43	0	1	0.04	1	0
	3	55	4227.90	0	0.99	0.05	0.99	-0.01
	1	40	1942.28	0	0.99	0.04	1	
11	2	47	3215.16	0	0.99	0.05	0.99	-0.01
	3	55	4558.40	0	0.99	0.05	0.99	0
Timing Accommodation vs. No Accommodation								
	1	40	1362.59	0	1	0.03	1	
5	2	47	1893.09	0	0.99	0.04	1	0
	3	55	2033.53	0	1	0.03	1	0
	1	40	1951.80	0	1	0.04	1	
8	2	47	2416.98	0	1	0.04	1	0
	3	55	3513.49	0	0.99	0.04	0.99	-0.01
	1	40	1934.74	0	0.99	0.04	1	
11	2	47	2710.77	0	0.99	0.05	0.99	-0.01
	3	55	3525.56	0	0.99	0.04	0.99	0

Discussion

The purpose of this study was to explore the underlying test construct measured by MAP for accommodated students, SWD, and ELL. To do this, we first examined the data to understand the demographics of the population. Then we examined how the different groups performed on MAP. Next, we examined item-level information to explore if the majority of the items were measuring the same construct for students. Finally, we used CFA to determine the invariance of the factor structure across the different subgroups. We did these analyses for the 2006, 2007, and 2008 data.

The data from this study clearly show that accommodated students, SWD, and ELL are not performing as well on MAP as their counterparts. This, in and of itself, does not indicate that the test measures a different construct for the various groups. It just indicates differential performance.

When the item-level data were examined using Mantel-Haenszel DIF statistics, there were very few items that were flagged as functioning differentially between the groups. An item that is flagged for DIF may be functioning differentially because the item taps different constructs for the groups being compared. CTB Content Experts examined all flagged items, and they found only three items across all tests that may be measuring different constructs for ELL. Overall, though, the vast majority of items were not flagged for DIF, indicating that the subgroups are interacting with the item in a similar manner.

Using CFA, we explored the covariance matrices for different subgroups to compare the underlying factor structure of test data from various subgroups to assess if the test scores of the various subgroups were comparable. Overall, the CFA supported the conclusion that one underlying factor is being measured by the content-area MAP regardless of subgroup membership. In other words, the results of the CFA suggest that MAP is measuring the same construct for ELL, SWD, accommodated students, and regular students.

These analyses were completed for three years of MAP data. The results were consistent across the three years of data. The DIF analyses suggest only very few flagged items may be biased against a subgroup. The CFA analyses suggest that MAP is measuring the same construct for all subgroups of interest.

Overall, the results of this study support the idea that the content-area MAPs are measuring a single dimension. This study indicates that the MAP scores reported for ELL, SWD, accommodated students, and regular students have the same basic meaning and can be appropriately compared to one another. This study adds valuable evidence to support the construct validity of MAP scores.

Weaknesses and Future Research

There are several areas in this study that could be further explored. For example, Wu, Li, and Zumbo (2007) recommend that multi-group CFA be conducted on a mean and covariance

structure as opposed to only the covariance matrices that were explored in this study. They advocate the use of Meredith's (1993) model of measurement invariance, where strict invariance only holds if the factor loadings, intercepts, and residual variances are invariant across groups. They also argue that conclusions of factorial invariance can only be reached if strict invariance holds. In this study, we concluded that factorial invariance held so long as the models met weak invariance. Future research could use the approach advocated by Wu, Li, and Zumbo (2007) to further assess the factorial invariance of MAP.

While this study disaggregated accommodations into different categories, the analyses could be further disaggregated into specific accommodations (e.g., oral accommodation as opposed to the more general administration accommodation) or specific combinations of accommodations (e.g., oral and setting). Future studies may want to study the specific types of accommodations to explore their specific impact on the dimensionality of the MAP.

This study also did not explore the effect that the combinations of accommodations have on the underlying dimensionality of MAP. It was noted that students more frequently use a combination of accommodations as opposed to a single accommodation. It may be the case that using the accommodations in combination affects the underlying factor structure of the MAP. Future research should examine the impact of the more popular combinations of accommodations on the dimensionality of MAP.

Finally, this study only explores the test data. We cannot draw conclusions about the adequacy or appropriateness of the accommodations provided to Missouri students. We also cannot say if the MAP accommodations improve the measurement of students' knowledge, skills, and abilities or if the MAP accommodations are fair. Future research should explore these questions. In the opinion of these researchers, it is imperative to ensure that all students have the accommodations necessary to ensure access to the test.

Conclusion

Nonetheless, this study offers valuable information that supports the notion that the MAP content area tests measure a single underlying dimension regardless of the students' status as an ELL, SWD, or accommodated student. This study offers supporting evidence that MAP scores from various subgroups of students can be reasonably compared because the scores measure the same construct. In other words, this study offers evidence for construct validity. We began this study with Sireci's (2004) four questions hoping to have affirmative answers to the last two questions. We conclude this study with the following answers to those questions:

Does providing a particular accommodation change the construct the test is measuring?

MAP accommodations do not appear to change the construct that the test is measuring for students in general, for ELL, or for SWD.

Are scores from accommodated and standard test administrations comparable?

The scores from accommodated and standard MAP administrations are comparable for regular education students, SWD, and ELL.

Bibliography

Abedi, J. (2001, December). *Language accommodation for large-scale assessment in science: Assessing English language learners (Final Deliverable, Project 2.4 Accommodation).* Los Angeles, CA: National Center for Research on Evaluation, Standards, and Student Testing, University of California Los Angeles.

Abedi, J., Courtney, M., and Leon, S. (2003). *Research-supported accommodation for English language learners in NAEP.* (CSE Tech. Rep. No. 586). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing.

Abedi, J., Hofstetter, C., Baker, E., and Lord, C. (2001). *NAEP math performance and test accommodations: Interactions with student language background*. (CSE Tech. Rep.No. 536). Los Angeles, CA: National Center for Research on Evaluation, Standards, and Student Testing.

Abedi, J., and Lord, C. (2001). The language factor in mathematics tests. *Applied Measurement in Education, 14*(3), 219–234.

Abedi, J., Lord, C., Boscardin, C.K., and Miyoshi, J. (2001). *The effects of accommodations on the assessment of limited English proficient students in the National Assessment of Educational Progress*. (Publication No. NCES 2001–13), Washington, DC: National Center for Education Statistics.

Abedi, J., Lord, C., and Hofstetter, C. (1998). *Impact of selected background variables on students' NAEP math performance* (CSE Technical Report No. 478). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing.

Abedi, J., Lord, C., and Plummer, J. R. (1997). *Final report of language background as a variable in NAEP mathematics performance.* (CSE Technical Report No. 429). Los Angeles, CA: University of California, National Center for Research on Evaluation, Standards, and Student Testing.

Albus, D., Bielinski, J., Thurlow, M., and Liu, K. (2001). *The effect of a simplified English language dictionary on a reading test.* (LEP Project Rep. No. 1). Minneapolis, MN: University of Minnesota, National Center for Educational Outcomes.

American Educational Research Association, American Psychological Association, and National Council on Measurement in Education (1999). *Standards for educational and psychological tests.* Washington, DC: American Psychological Association.

Anderson, M., Liu, K., Swierzbin, B., Thurlow, M., and Bielinski, J. (2000). *Bilingual accommodations for limited English proficient students on statewide reading rests: Phase 2.* (Minnesota Rep. No. 31). Minneapolis, MN: National Center for Educational Outcomes.

Barton, K. and Finch, H. (2004). Using DIF analyses to examine assumptions of unidimensionality across groups of students with disabilities and with accommodations. In *Detecting Item Bias for Students with Disabilities and English Language Learners*, symposium conducted at meeting of the National Council on Measurement in Education, San Diego, CA.

Bielinski, J., Ysseldyke, J., Bolt, S., Friedebach, J., & Friedebach, M. (2001). Read-aloud accommodation: Effects on multiple-choice reading & math items. Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Camara, W., Copeland, T., and Rothchild, B. (1998). *Effects of extended time on the SAT I: Reasoning Test: Score growth for students with learning disabilities (*College Board Research Report 98–7*)*. New York, NY: The College Board.

Castellon-Wellington, M. (2000). *The impact of preference for accommodations: The performance of ELLs on large-scale academic achievement tests.* (Technical Report. No. 524). Los Angeles, CA: University of California, National Center for the Study of Evaluation, Standards, and Student Testing.

Cheung, G. W., and Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling*, *9*, 233–255.

Chiu, C. WT, and Pearson, P.D. (1999, June*). Synthesizing the effects of test accommodations for special education and limited English proficient students*. Paper presented at the National Conference on Large Scale Assessment, Snowbird, UT.

CTB/McGraw-Hill (2006). *Missouri Assessment Program Bookmark Technical Report 2006.* Author.

CTB/McGraw-Hill (2007). *Missouri Assessment Program Bookmark Technical Report 2007.* Author.

CTB/McGraw-Hill (2008). *Missouri Assessment Program Bookmark Technical Report 2008.* Author.

Elbaum, B. (2007). Effects of an oral testing accommodation on the mathematics performance of secondary students with and without learning disabilities. *Journal of Special Education, 40*(4), 218–229.

Elbaum, B., Arguelles, M. E., Cambpell, Y., and Saleh, M. B. (2004). Effects of a student-reads aloud accommodation on the performance of students with and without learning disabilities on a test of reading comprehension. *Exceptionality*, *12*(2), 71–87.

Elliot, S. N., and Marquart A. M. (2004). Extended Time as a Testing Accommodation: Its Effects and Perceived Consequences. *Exceptional Children*, *70* (3).

Finch, H., Barton, K., and Meyer, P (in press). Differential Item FunctioningAnalysis for Accommodated versus Non-accommodated Students. *Educational Assessment.*

Fuchs, L.S., Fuchs, D., Eaton, S.B., Hamlett, C.L., and Karns, K.M. (2000). Supplementing teacher judgments of mathematics test accommodations with objective data. *School Psychology Review, 29,* 65–85.

Hafner, A.L. (2000). *Evaluating the impact of test accommodations on test scores of LEP students and non-LEP students*. Dover, DE: Delaware Department of Education.

Hair, J. F., Anderson, R. E., Tatham, R. L, and Black, W. C. (1998). *Multivariate data analysis: Fifth edition.* Upper Saddle River, New Jersey: Prentice Hall.

Helwig, R., and Tindal, G. (2003). An experimental analysis of accommodation decisions on large-scale mathematics tests. *Exceptional Children, 69,* 211–225.

Hoelter, J. W. (1983). The analysis of covariance structures: Goodness-of-fit indices. *Sociological Methods and Research, 11,* 325–344.

Hofstetter, C.H. (2003). Contextual and mathematics accommodation test effects for English language learners. *Applied Measurement in Education, 16*(2), 159–188. Mahwah, NJ: Lawrence Erlbaum Associates.

Hu, L., and Bentler,, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6,* 1–55.

Huesman, R.L., and Frisbie, D. (2000, April). *The validity of ITBS reading comprehension test scores for learning disabled and non-learning disabled students under extended-time conditions*. Paper presented at the Annual Meeting of the National Council on measurement in Education, New Orleans, LA.

Huynh, H., & Barton, K. E. (2006). Performance of students with disabilities under regular and oral administrations of a high-stakes reading examination. *Applied Measurement in Education, 19*(1), 21–39.

Huynh, H., Meyer, J. P., & Gallant, D. J. (2004). Comparability of student performance between regular and oral administrations for a high-stakes mathematics test. *Applied Measurement in Education, 17*(1), 39–57.

Johnson, E. (2000). The effects of accommodations on performance assessments. *Remedial and Special Education, 21,* 261–267.

Johnstone, C. J., Altman, J., Thurlow, M. L., and Thompson, S. J. (2006). *A summary of research on the effects of test accommodations: 2002 through 2004* (Technical Report 45). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes. Retrieved December 2008, from http://education.umn.edu/NCEO/OnlinePubs/Tech45/.

Kim, D.H., Schneider, C., & Siskind, T. (In press). Examining the Underlying Factor Structure of the Statewide Secondary Level Science Test under Regular and Oral Administrations. *Journal of Psychoeducational Assessment.*

Kim, D.H., Schneider, C., & Siskind, T. (In press). Examining Equivalence of Accommodations on a Statewide Elementary Level Science Test. *Applied Measurement in Education*.

Kiplinger, V. L., Haug, C. A., and Abedi, J. (2000, June). *A math assessment should test math, not reading: One States' approach to the problem.* Paper presented at the 30th annual National Conference on Large-Scale Assessment, Snowbird, Utah.

Kosciolek, S., and Ysseldyke, J. E. (2000). *Effects of a reading accommodation on the validity of a reading test* (Technical Report 28). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes. Retrieved December 2008, from the: http://education.umn.edu/NCEO/OnlinePubs/Technical28.htm

Lesaux, N. K., Pearson, M. R., and Siegel, L. S. (2006). The effects of timed and untimed testing conditions on the reading comprehension performance of adults with reading disabilities. *Reading and Writing, 19,* 21–48.Unblock text

Little, T. D. (1997). Mean and covariance structures analyses of cross-cultural data: Practical and theoretical issues. *Multivariate Behavioral Research, 32,* 53–76.

MacArthur, C. A., and Graham, S. (1987). Learning Disabled Students' Composing under three methods of text production: Handwriting, word processing, and dictation. *Journal of Special Education, 21*(3), 22–42.

Mandinach, E. B., Bridgeman, B., Cahalan-Laitusis, C., and Trapani, C. (2005). *The impact of extended time on SAT test performanc*e. (Research Report No 2005–8). New York, NY: The College Board. Unblock text.

Marsh, H. W. (1994). Confirmatory factor models of factorial invariance: A multi-faceted approach. *Structural Equation Modeling, 1,* 5–34.

Marsh, H. W., Hau, K., and Wen, Z. (2004). In sear of golden rules: Comment on hypothesis-testing approaches to setting cut-off values for fit indexes and dangers in overgeneralization Hu and Bentler's (1999) findings. *Structural Equation Modeling, 11*(3), 320–341.

Marsh, H.W., Balla, J. R., and McDonald, R. P. (1988). Goodness-of-fit indexes in Confirmatory Factor Analysis: The effect of sample size. *Psychological Bulletin, 103*(3), 391–410.

McArdle, J.J. (1998). Contemporary statistical models of test bias. In J. J. McArdle and R.W. Woodcock (Eds.), *Human abilities in theory and practice* (pp. 157–195). Mahway, NJ: Lawrence Erlbaum Associates, Inc.

McKevitt, B. C., Elliot, S. N. (2003). The effects and consequences of using testing accommodations on a standardized reading test. *School Psychology Review, 32,* 583–600.

Meade, A.W., Johnson, E. C., and Braddy, P.W. (2006). *The utility of alternative fit indices in test of measurement invariance*. Paper presented at the annual Academy of Management conference, Atlanta GA, August 2006.

Meloy, L., Deville, C., and Frisbie, D. (2000, April). *The effects of a reading accommodation on standardized test scores of learning disabled and non learning disabled students*. Paper presented at the annual meeting of the National Council on Measurement in Education, New Orleans, LA.

Meredith, W. (1993). MI, factor analysis, and factorial invariance. *Psychometrika, 58,* 525–43.

Rivera, C., and Collum, E. (2004). *An analysis of state assessment policies addressing the accommodation of English language learners.* Paper presented at the NAGB Conference on Increasing Participation of SD and LEP Students in NAEP.

Rivera, C., and Stansfield, C.W. (2004) The Effect of Linguistic Simplification of Science Test Items on Score Comparability. *Educational Assessment, 9*(3–4), 79–105.

Schnirman, R. K. (2005). The effect of audiocassette presentation on the performance of students with and without learning disabilities on a group standardized math test. *Dissertation Abstracts International, 66*(6), 2172 A. Retrieved August 5, 2006 from Digital Dissertations database.

Schulte, A. G., Elliott, S. N., and Kratochwill, T. R. (2001). Effects of testing accommodations on standardized mathematics test scores: An experimental analysis of the performances of students with and without disabilities. *School Psychology Review, 30*(4), 527–547.

Sireci, S. G. (2004). *Validity issues in accommodating NAEP reading tests*. Center for Educational Assessment (Research Report No. 515), Amherst, MA: School of Education, University of Massachusetts Amherst.

Sireci, S.G., Li, S., and Scarpati, S. (2003). *The effects of test accommodations on test performance: A review of the literature.* (CEA Research Rep. No. 485). Amherst, MA: School of Education, University of Massachusetts.

Sireci, S. G., Scarpati, S. E., & Li, S. (2005). Test accommodations for students with disabilities: An analysis of the interaction hypothesis. *Review of Educational Research, 75*(4), 457–490.

Sireci, S., Wells, C., and Dunn, J. (2008). *A psychometric analysis of a Spanish read-aloud accommodation.* Paper presented at the National Council of Measurement in Education, New York.

Thompson, S., Blount, A., and Thurlow, M. (2002). *A summary of research on the effects of test accommodations: 1999 through 2001* (Technical Report 34). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes. Retrieved December 2008, from: http://education.umn.edu/NCEO/OnlinePubs/Technical34.htm

Thurlow, M., and Bolt, S. (2001). *Empirical support for accommodations most often allowed in state policy* (Synthesis Report 41). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes. This should be unblocked.

Tindal, G., Heath, B., Hollenbeck, K., Almond, P., and Harniss, M. (1998). Accommodating students with disabilities on large-scale tests: An experimental study. *Exceptional Children,64*(4), 439–450.

Trimble, S. (1998). Performance Trends and Use of Accommodations on a Statewide Assessment: Students with Disabilities in the KIRIS On-Demand Assessments from 1992–93 through 1995–96. *State Assessment Series, Maryland/Kentucky Report 3*. National Center on Educational Outcomes, Minneapolis, MN.; Maryland State Dept. of Education, Baltimore.

Vanderberg, R. J. and Lance, C. E. (2000). A review and synthesis of the MI literature: Suggestions, practices, and recommendations for organizational research. *Organizational Research Methods, 3,* 4–69.

Weston, T.J. (2003). The validity of oral accommodation in testing: NAEP validity studies.

Wu, A.D, Li, Z., and Zumbo, B.D. (2007). Decoding the meaning of factorial invariance and updating the practice of multi-group confirmatory factor analysis: a demonstration with TIMSS data. *Practical Assessment, Research and Evaluation, 12*(3): 1–26.

Young, J. W., Cho Y., Ling, G., Cline, F., Steinberg, J., and Stone, E. (2008). Validity and fairness of State Standards-based assessments for English language learners. *Educational Assessment, 13,* 170–192.

Zenisky, A. L., and Sireci, S. G. (2007*). A summary of the research on the effects of test accommodations: 2005–2006* (Technical Report 47). Minneapolis, MN: University of Minnesota, National Center on Educational Outcomes.

Ziomek, R.L., and Andrews, K.M. (1998). *ACT Assessment Score Gains of Special-Tested Students Who Tested at Least Twice* (Report No.: ACT-RR-98−8). Iowa city, Iowa: ACT Research Report Series.

Zuriff, G.E. (2000). Extra examination time for students with learning disabilities: An examination of the maximum potential thesis. *Applied Measurement in Education, 13*(1), 99–117.

Zwick, R., Donoghue, J. R., and Grima, A. (1993). Assessment of differential item functioning for performance tasks. *Journal of Educational Measurement, 30,* 233–251.

Appendix

2006 Results

Table 1: Frequency Distribution of Accommodated Students, English Language Learners (ELL), and Students with Disabilities (SWD) for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	N Count	65344	66704	73516	61593
	% Accommodated	9.79	11.35	10.67	7.79
	% ELL	2.96	2.48	1.67	1.19
	% Disabled	16.04	15.48	14.26	11.90
Mathematics	N Count	65325	66703	73523	69229
	% Accommodated	9.90	11.75	11.04	9.18
	% ELL	2.95	2.51	1.64	1.41
	% Disabled	16.01	15.49	14.28	13.09

Table 2: Frequency Distribution of Categories of Accommodations for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	Total	65344	66704	73516	61593
	% Accommodated	9.79	11.35	10.67	7.79
	% Admin	0.59	0.57	0.55	0.45
	% Timing	6.38	7.55	6.11	4.36
	% Response	3.19	2.75	1.69	0.76
	% Setting	9.45	10.99	10.01	7.09
Mathematics	Total	65325	66703	73523	69229
	% Accommodated	9.90	11.75	11.04	9.18
	% Admin	6.37	7.13	5.36	4.05
	% Timing	6.18	7.54	6.06	4.95
	% Response	3.56	4.55	5.58	4.62
	% Setting	9.49	11.22	10.24	8.33

Table 3: Frequency Distribution of Categories of Accommodations used by English Language Learners for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	N Count	1932	1651	1227	730
	% Accommodated	31.68	30.53	21.03	12.19
	% Admin	0.52	1.03	0.90	0.68
	% Timing	18.74	18.05	9.78	7.53
	% Response	4.81	4.24	2.04	0.68
	% Setting	28.31	28.23	17.36	9.18
Mathematics	N Count	1924	1672	1207	977
	% Accommodated	39.35	39.23	30.49	15.56
	% Admin	27.91	28.59	21.13	9.52
	% Timing	20.27	20.57	14.91	4.91
	% Response	7.12	9.63	11.52	4.71
	% Setting	34.20	34.15	22.87	11.67

Table 4: Frequency Distribution of Categories of Accommodations used by Students with Disabilities for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	N Count	10480	10323	10482	7331
	% Accommodated	52.48	66.05	70.28	62.28
	% Admin	3.49	3.49	3.64	3.64
	% Timing	35.21	44.74	40.80	35.02
	% Response	18.23	16.53	11.18	5.88
	% Setting	51.31	64.59	66.46	57.06
Mathematics	N Count	10461	10332	10496	9063
	% Accommodated	52.38	67.31	71.92	65.97
	% Admin	34.01	41.26	34.55	29.28
	% Timing	33.75	44.09	39.98	36.38
	% Response	20.10	27.26	37.07	33.39
	% Setting	51.08	65.09	67.59	60.55

Table 5: Frequency Distribution of Combinations of Categories of Accommodations used by English Language Learners for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	Total	1932	1651	1227	730
	% Administration	0.05	0.12	0.16	0.14
	% Timing	2.80	1.82	2.61	2.47
	% Setting	10.97	11.02	9.54	3.97
	% Response	0.36	0.06	0.81	0.27
	% Time & Administration				
	% Admin & Setting	0.05	0.30	0.24	0.27
	% Admin & Response	0.05		0.08	
	% Time & Setting	12.78	12.66	6.36	4.38
	% Time & Response	0.10	0.30		0.14
	% Response & Setting	1.40	0.91	0.33	
	% Admin & Response & Setting	0.05	0.06	0.08	
	% Admin & Time & Setting	0.21	0.36	0.08	0.27
	% Time & Response & Setting	2.74	2.73	0.49	0.27
	% Admin & Response & Time & Setting	0.10	0.18	0.24	
Mathematics	Total	1924	1672	1207	977
	% Administration	1.72	1.91	1.49	2.15
	% Timing	2.03	1.56	0.83	0.10
	% Setting	5.82	4.07	3.73	3.28
	% Response	0.36	0.24	0.33	0.20
	% Time & Administration	0.36	0.06	1.74	0.31
	% Admin & Setting	8.73	8.79	5.55	2.35
	% Admin & Response	0.57	0.90	0.99	0.82
	% Time & Setting	2.65	3.35	1.99	0.72
	% Time & Response		0.36		0.31
	% Response & Setting	0.10	0.36	1.08	0.51
	% Admin & Response & Setting	1.77	2.39	2.40	1.33
	% Admin & Time & Setting	10.91	9.87	3.65	1.94
	% Admin & Time & Response	0.10	0.06	2.24	
	% Time & Response & Setting	0.47	0.72	1.41	0.92
	% Admin & Response & Time & Setting	3.74	4.61	3.07	0.61

Table 6: Frequency Distribution of Combinations of Categories of Accommodations used by Students with Disabilities for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	Total	10480	10323	10482	7331
	% Administration	0.17	0.10	0.22	0.49
	% Timing	0.53	0.78	2.89	4.21
	% Setting	11.12	15.94	24.79	23.99
	% Response	0.30	0.28	0.23	0.22
	% Time & Administration		0.03	0.10	0.12
	% Admin & Setting	0.50	0.70	0.82	1.17
	% Admin & Response		0.02	0.10	0.03
	% Time & Setting	20.73	30.79	29.03	25.28
	% Time & Response	0.16	0.23	0.27	0.15
	% Response & Setting	4.78	3.91	3.05	1.17
	% Admin & Response & Setting	0.41	0.36	0.27	0.19
	% Admin & Time & Setting	1.20	1.19	1.25	1.13
	% Admin & Time & Response	0.01	0.01	0.01	
	% Time & Response & Setting	11.36	10.63	6.38	3.61
	% Admin & Response & Time & Setting	1.20	1.08	0.87	0.50
Mathematics	Total	10461	10332	10496	9063
	% Administration	0.47	0.35	0.54	0.74
	% Timing	0.28	0.59	1.65	1.83
	% Setting	5.2	7.63	11.86	10.86
	% Response	0.12	0.33	0.63	0.71
	% Time & Administration	0.12	0.21	0.37	0.75
	% Admin & Setting	6.61	6.61	5.40	5.14
	% Admin & Response	0.17	0.41	0.30	0.29
	% Time & Setting	7.80	10.21	8.28	7.91
	% Time & Response	0.06	0.15	0.51	0.77
	% Response & Setting	1.33	2.27	5.68	5.77
	% Admin & Response & Setting	4.72	5.62	7.53	6.09
	% Admin & Time & Setting	11.80	14.44	6.75	5.35
	% Admin & Time & Response	0.08	0.17	0.32	0.33
	% Time & Response & Setting	3.58	4.86	8.77	8.84
	% Admin & Response & Time & Setting	10.05	13.44	13.33	10.59

Table 7: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for Non-English Language Learners (non-ELL), English Language Learners (ELL), Non-Disabled Students (non-SWD), and Students with Disabilities (SWD) for Grades 3, 5, 8, and 11 Communication Arts MAP

Grade	ELL	N	Mean	Std. Dev.	Alpha	SEM	Effect
3	Non-ELL	62689	640.47	36.61	0.90	11.58	
	ELL	1797	618.37	38.26	0.91	11.48	0.60
	Non-SWD	54508	644.84	33.05	0.88	11.45	
	SWD	9978	612.65	43.90	0.92	12.42	0.92
5	Non-ELL	64488	668.74	36.78	0.91	11.03	
	ELL	1519	644.51	42.10	0.90	13.31	0.66
	Non-SWD	56144	674.42	30.95	0.89	10.26	
	SWD	9863	632.67	47.69	0.91	14.31	1.23
8	Non-ELL	71342	687.34	37.64	0.92	10.65	
	ELL	1141	656.1	39.79	0.91	11.94	0.83
	Non-SWD	62534	693.61	32.85	0.90	10.39	
	SWD	9949	644.38	39.67	0.90	12.54	1.45
11	Non-ELL	59338	717.01	31.26	0.91	9.38	
	ELL	666	688.78	32.99	0.89	10.94	0.90
	Non-SWD	53302	721.61	27.34	0.89	9.07	
	SWD	6702	677.58	34.20	0.87	12.33	1.56

Table 8: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for Non-English Language Learners (non-ELL), English Language Learners (ELL), Non-Disabled Students (non-SWD), and Students with Disabilities (SWD) for Grades 3, 5, 8, and 10 Mathematics MAP

Grade	ELL	N	Mean	Std. Dev.	Alpha	SEM	Effect
3	Non-ELL	62850	622.05	39.02	0.90	12.34	
	ELL	1913	606.4	38.79	0.91	11.64	0.40
	Non-SWD	54726	625.51	36.74	0.89	12.19	
	SWD	10037	600.21	44.36	0.93	11.74	0.67
5	Non-ELL	64464	660.50	39.86	0.91	11.96	
	ELL	1659	642.88	41.22	0.92	11.66	0.44
	Non-SWD	56242	665.72	36.17	0.90	11.44	
	SWD	9881	627.84	45.09	0.93	11.93	1.01
8	Non-ELL	62583	704.29	35.59	0.92	10.07	
	ELL	9959	656.47	44.05	0.89	14.61	1.30
	Non-SWD	71351	698.13	40.16	0.93	10.63	
	SWD	1191	673.60	45.22	0.92	12.79	0.61
10	Non-ELL	67120	725.00	50.93	0.94	12.48	
	ELL	963	687.44	54.60	0.92	15.44	0.74
	Non-SWD	59554	732.71	45.38	0.93	12.01	
	SWD	8529	666.89	52.35	0.89	17.36	1.42

Table 9: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for all Categories of Accommodations for Grades 3, 5, 8, and 11 Communication Arts MAP

Grade		N	Communication Arts				Effect
			Mean SS	STD SS	Alpha	SEM	
3	No Accommodation	58199	644.46	33.35	0.91	9.91	
	Accommodation	6287	597.25	40.16	0.92	11.17	1.39
	Administration	358	586.17	52.68	0.95	11.31	1.74
	Timing	4112	596.79	39.31	0.92	11.22	1.41
	Response	2047	598.38	41.35	0.93	10.80	1.37
	Setting	6073	596.75	40.04	0.92	11.20	1.40
5	No Accommodation	58495	673.77	31.63	0.91	9.55	
	Accommodation	7512	624.67	46.52	0.91	14.26	1.46
	Administration	360	620.24	59.86	0.95	13.81	1.68
	Timing	5000	625.55	45.42	0.90	14.14	1.46
	Response	1816	627.69	49.86	0.92	13.83	1.43
	Setting	7276	624.16	46.45	0.90	14.33	1.48
8	No Accommodation	64759	692.50	33.51	0.92	9.47	
	Accommodation	7724	639.46	39.15	0.91	11.98	1.55
	Administration	385	625.71	50.87	0.94	12.25	1.99
	Timing	4433	639.35	39.17	0.91	12.03	1.57
	Response	1222	632.13	45.04	0.92	12.65	1.79
	Setting	7243	638.42	38.93	0.90	12.06	1.59
11	No Accommodation	55403	720.33	28.25	0.92	8.05	
	Accommodation	4601	672.87	34.35	0.89	11.21	1.65
	Administration	248	663.93	43.47	0.94	10.94	1.99
	Timing	2584	672.97	34.29	0.89	11.19	1.66
	Response	432	668.85	40.51	0.93	10.98	1.81
	Setting	4193	671.63	34.13	0.89	11.35	1.70

Table 10: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for all Categories of Accommodations for Grades 3, 5, 8, and 10 Mathematics MAP

Grade		N	Mathematics				Effect
			Mean SS	STD SS	Alpha	SEM	
3	No Accommodation	58334	625.35	36.99	0.91	10.91	
	Accommodation	6429	587.43	41.16	0.92	11.49	1.01
	Administration	4142	584.85	41.78	0.92	11.64	1.09
	Timing	4021	586.82	40.53	0.92	11.51	1.03
	Response	2311	584.75	43.14	0.93	11.75	1.09
	Setting	6165	587.31	40.81	0.92	11.45	1.02
5	No Accommodation	58321	665.30	36.51	0.91	10.66	
	Accommodation	7802	620.88	42.99	0.92	12.07	1.19
	Administration	4739	618.37	42.09	0.92	12.02	1.27
	Timing	5003	621.02	42.41	0.92	12.02	1.20
	Response	3020	616.77	43.32	0.92	12.13	1.32
	Setting	7448	620.45	42.87	0.92	12.07	1.20
8	No Accommodation	64521	703.37	36.20	0.93	9.54	
	Accommodation	8021	652.32	43.39	0.90	13.71	1.38
	Administration	3912	649.57	43.64	0.89	14.29	1.47
	Timing	4405	651.58	44.31	0.90	13.83	1.41
	Response	4067	647.85	43.66	0.90	14.14	1.51
	Setting	7439	651.85	43.18	0.90	13.71	1.39
10	No Accommodation	61831	730.77	46.75	0.94	11.31	
	Accommodation	6252	662.12	51.34	0.89	16.92	1.45
	Administration	2763	658.79	51.87	0.89	17.59	1.53
	Timing	3366	660.26	52.16	0.89	17.29	1.50
	Response	3156	655.87	51.97	0.89	17.61	1.59
	Setting	5676	660.54	50.90	0.89	17.22	1.49

Table 11: Distribution of MAP Achievement Levels for Students with Disabilities (SWD), English Language Learners (ELL), Accommodated Students, and Non-Accommodated Students, Grades 3, 5, 8, and 11 Communication Arts MAP

Accommodation Type	Achievement Level	Grade			
		3	5	8	11
Disabled	Total	5500	6818	7367	4566
	No Level	1.84	0.81	1.43	3.90
	Below Basic	41.36	40.79	43.97	51.64
	Basic	50.02	50.13	49.75	40.43
	Proficient	5.36	7.00	4.19	3.61
	Advanced	1.42	1.28	0.67	0.42
	% P+A	6.78	8.27	4.86	4.03
ELL	Total	612	504	258	89
	No Level	1.80	0.60	4.26	3.37
	Below Basic	33.82	40.67	53.88	46.07
	Basic	58.17	52.78	39.92	44.94
	Proficient	4.41	5.36	1.94	4.49
	Advanced	1.80	0.60		1.12
	% P+A	6.21	5.95	1.94	5.62
Accommodated	Total	6397	7573	7842	4797
	No Level	1.72	0.81	1.50	4.09
	Below Basic	39.25	39.84	43.62	51.03
	Basic	51.43	50.60	49.73	40.44
	Proficient	5.83	7.32	4.45	3.90
	Advanced	1.77	1.44	0.69	0.54
	% P+A	7.60	8.75	5.14	4.44
Not Accommodated	Total	58947	59131	65674	56796
	No Level	1.27	1.08	1.39	2.45
	Below Basic	5.51	5.14	4.94	6.61
	Basic	47.05	44.09	47.77	46.54
	Proficient	27.82	32.46	29.22	32.98
	Advanced	18.35	17.24	16.68	11.41
	% P+A	46.17	49.70	45.90	44.40

Table 12: Distribution of MAP Achievement Levels for Students with Disabilities (SWD), English Language Learners (ELL), Accommodated Students, and Non-Accommodated Students, Grades 3, 5, 8, and 10 Mathematics MAP

Accommodation Type	Achievement Level	Grade			
		3	5	8	10
Disabled	Total	5479	6954	7549	5979
	No Level	0.66	0.52	1.23	1.66
	Below Basic	28.98	33.13	64.19	72.84
	Basic	56.84	55.16	27.75	20.57
	Proficient	11.85	9.79	6.15	4.58
	Advanced	1.68	1.39	0.68	0.35
	% P+A	13.52	11.19	6.82	4.93
ELL	Total	757	656	368	152
	No Level		0.15	0.54	
	Below Basic	21.66	25.30	59.51	55.26
	Basic	63.54	61.59	27.72	31.58
	Proficient	13.47	11.13	8.42	10.53
	Advanced	1.32	1.83	3.80	2.63
	% P+A	14.80	12.96	12.23	13.16
Accommodated	Total	6466	7839	8118	6355
	No Level	0.57	0.47	1.19	1.62
	Below Basic	27.31	31.92	63.72	72.08
	Basic	57.73	55.73	27.84	20.94
	Proficient	12.62	10.40	6.38	4.88
	Advanced	1.76	1.48	0.86	0.47
	% P+A	14.38	11.88	7.24	5.35
Not Accommodated	Total	58859	58864	65405	62874
	No Level	0.89	0.92	1.35	1.66
	Below Basic	4.98	4.88	15.80	19.23
	Basic	47.68	46.74	39.01	33.92
	Proficient	35.53	35.68	30.25	34.13
	Advanced	10.91	11.78	13.59	11.06
	% P+A	46.44	47.45	43.84	45.20

Table 13: Number of Items Flagged for Large Negative DIF, Moderate Negative DIF, Moderate Positive DIF, and Large Positive DIF for or against Accommodated Students, Grades 3, 5, 8, and High School Communication Arts MAP 2006

Grade	Group	Sample Size	Moderate Positive	Moderate Negative	Large Positive	Large Negative
3	Accommodated	6287	1	1	0	0
	SWD	9978	1	0	0	0
	ELL	1797	1	1	0	0
5	Accommodated	7512	0	0	0	0
	SWD	9863	0	0	0	0
	ELL	1519	0	1	0	0
8	Accommodated	7724	0	0	0	0
	SWD	9949	0	0	0	0
	ELL	1141	3	2	0	0
11	Accommodated	4601	0	0	0	1
	SWD	6702	0	0	0	1
	ELL	666	2	5	0	0

Table 14: Number of Items Flagged for Large Negative DIF, Moderate Negative DIF, Moderate Positive DIF, and Large Positive DIF for or against English Language Learners, Grades 3, 5, 8, and High School Mathematics MAP 2006

Grade	Group	Sample Size	Moderate Positive	Moderate Negative	Large Positive	Large Negative
3	Accommodated	6429	2	0	0	0
	SWD	10037	0	0	0	0
	ELL	1913	2	1	0	0
5	Accommodated	7802	0	0	0	0
	SWD	9881	0	0	0	0
	ELL	1659	1	0	0	0
8	Accommodated	8021	2	0	0	0
	SWD	9959	0	0	0	0
	ELL	1191	0	2	0	0
10	Accommodated	6252	1	0	0	0
	SWD	8529	0	0	0	0
	ELL	963	0	4	0	2

Table 15: Test of Invariance by Grade, Group, and Model, Communication Arts 2006

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Non-Accommodated vs. Accommodated Students								
3	1	4	566.88	0	0.99	0.07	1	
	2	7	1250.64	0	0.98	0.07	0.99	-0.01
	3	11	4014.85	0	0.97	0.12	0.97	-0.02
5	2	2	299.16	0	0.99	0.07	1	
	3	5	723.20	0	0.99	0.07	0.99	-0.01
8	2	2	1102.51	0	0.96	0.12	0.99	
	3	5	3498.53	0	0.96	0.16	0.96	-0.03
11	1	4	625.45	0	0.98	0.07	0.99	
	2	7	1027.35	0	0.99	0.07	0.99	0
	3	11	2774.54	0	0.97	0.11	0.98	-0.01
Accommodated SWD vs. Non-Accommodated SWD vs. Regular Students								
3	1	6	593.22	0	0.99	0.07	1	
	2	12	1283.75	0	0.99	0.07	0.99	-0.01
	3	20	3947.11	0	0.97	0.11	0.97	-0.02
5	2	4	311.90	0	0.99	0.06	1	
	3	10	722.98	0	0.99	0.06	0.99	-0.01
8	2	4	1267.91	0	0.97	0.11	0.99	
	3	10	3891.04	0	0.96	0.14	0.96	-0.03
11	1	6	665.98	0	0.98	0.07	0.99	
	2	12	1233.20	0	0.99	0.07	0.99	0
	3	20	3330.14	0	0.98	0.11	0.97	-0.02
Accommodated ELL vs. Non-Accommodated ELL vs. Regular Students								
3	1	6	553.28	0	0.99	0.07	1	
	2	12	605.28	0	0.99	0.05	0.99	-0.01
	3	20	812.89	0	0.99	0.05	0.99	0
5	2	4	41.72	0	1	0.02	1	
	3	10	108.11	0	1	0.02	1	0
8	2	4	103.31	0	1	0.03	1	
	3	10	312.92	0	1	0.04	1	0
11	1	6	593.62	0	0.98	0.07	0.99	
	2	12	662.67	0	0.99	0.05	0.99	0
	3	20	927.70	0	0.99	0.06	0.99	0

Table 16: Test of Invariance by Grade, Group, and Model, Mathematics 2006

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Non-Accommodated vs. Accommodated Students								
	1	10	206.55	0	1	0.03	1	
3	2	14	624.90	0	1	0.04	1	0
	3	19	2431.35	0	0.99	0.07	0.99	-0.01
	1	10	1514.27	0	0.99	0.07	0.99	
5	2	14	3514.87	0	0.98	0.09	0.99	0
	3	19	7603.81	0	0.97	0.13	0.97	-0.02
	1	10	1452.36	0	0.99	0.06	1	
8	2	14	2444.29	0	0.99	0.07	0.99	-0.01
	3	19	3190.82	0	0.99	0.07	0.99	0
	1	10	748.57	0	1	0.05	1	
10	2	14	1103.49	0	1	0.05	1	0
	3	19	2017.37	0	0.99	0.06	0.99	-0.01
Accommodated SWD vs. Non-Accommodated SWD vs. Regular Students								
	1	15	237.99	0	1	0.03	1	
3	2	23	697.96	0	1	0.04	1	0
	3	33	2436.69	0	0.99	0.06	0.99	-0.01
	1	15	1569.34	0	0.99	0.07	0.99	
5	2	23	3608.53	0	0.98	0.09	0.99	0
	3	33	7675.75	0	0.97	0.12	0.97	-0.02
	1	15	1506.02	0	0.99	0.07	1	
8	2	23	2660.26	0	0.99	0.07	0.99	-0.01
	3	33	3474.01	0	0.99	0.06	0.99	0
	1	15	779.66	0	1	0.05	1	
10	2	23	1218.50	0	1	0.05	1	0
	3	33	2262.37	0	0.99	0.05	0.99	-0.01
Accommodated ELL vs. Non-Accommodated ELL vs. Regular Students								
	1	15	215.16	0	1	0.03	1	
3	2	23	268.06	0	1	0.02	1	0
	3	33	508.60	0	1	0.03	1	0
	1	15	1378.46	0	0.99	0.07	0.99	
5	2	23	1593.06	0	0.99	0.06	0.99	0
	3	33	1994.13	0	0.99	0.06	0.99	0
	1	15	1377.07	0	0.99	0.07	1	
8	2	23	1392.93	0	0.99	0.05	1	0
	3	33	1428.94	0	1	0.05	1	0
	1	15	736.49	0	1	0.05	1	
10	2	23	795.47	0	1	0.04	1	0
	3	33	849.34	0	1	0.04	1	0

Table 17: Test of Invariance by Grade, Group, and Model for Categories of Accommodation, Communication Arts 2006

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Administration Accommodation vs. No Accommodation								
3	1	4	559.04	0	0.99	0.07	1	
	2	7	629.44	0	0.99	0.06	0.99	-0.01
	3	11	939.33	0	0.99	0.06	0.99	0
5	2	2	9.13	0.01	1	0.01	1	
	3	5	23.73	0	1	0.01	1	0
8	2	2	79.43	0	1	0.03	1	
	3	5	204.09	0	1	0.04	1	0
11	1	4	597.18	0	0.98	0.07	0.99	
	2	7	631.87	0	0.99	0.06	0.99	0
	3	11	737.05	0	0.99	0.05	0.99	0
Response Accommodation vs. No Accommodation								
3	1	4	569.84	0	0.99	0.07	1	
	2	7	800.78	0	0.99	0.06	0.99	-0.01
	3	11	1828.91	0	0.98	0.09	0.98	-0.01
5	2	2	83.17	0	1	0.04	1	
	3	5	212.51	0	1	0.04	1	0
8	2	2	222.96	0	0.99	0.06	1	
	3	5	802.92	0	0.99	0.09	0.99	-0.01
11	1	4	592.75	0	0.98	0.07	0.99	
	2	7	640.09	0	0.99	0.06	0.99	0
	3	11	889.29	0	0.99	0.06	0.99	0
Setting Accommodation vs. No Accommodation								
3	1	4	565.69	0	0.99	0.07	1	
	2	7	1241.66	0	0.98	0.07	0.99	-0.01
	3	11	3978.21	0	0.97	0.12	0.97	-0.02
5	2	2	291.91	0	0.99	0.07	1	
	3	5	715.50	0	0.99	0.07	0.99	-0.01
8	2	2	1053.98	0	0.97	0.12	0.99	
	3	5	3381.56	0	0.96	0.16	0.96	-0.03
11	1	4	624.13	0	0.98	0.07	0.99	
	2	7	996.30	0	0.99	0.07	0.99	0
	3	11	2683.74	0	0.98	0.11	0.98	-0.01

Timing Accommodation vs. No Accommodation								
3	1	4	557.57	0	0.99	0.07	1	
	2	7	1071.75	0	0.98	0.07	0.99	-0.01
	3	11	3001.70	0	0.97	0.11	0.98	-0.01
5	2	2	206.51	0	0.99	0.06	1	
	3	5	516.68	0	0.99	0.06	0.99	-0.01
8	2	2	680.93	0	0.98	0.1	0.99	
	3	5	2147.93	0	0.97	0.13	0.98	-0.01
11	1	4	598.44	0	0.98	0.07	0.99	
	2	7	811.04	0	0.99	0.06	0.99	0
	3	11	1821.16	0	0.98	0.09	0.98	-0.01

Table 18: Test of Invariance by Grade, Group, and Model for Categories of Accommodation, Mathematics 2006

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Administration Accommodation vs. No Accommodation								
3	1	10	203.54	0	1	0.03	1	
	2	14	549.85	0	1	0.04	1	0
	3	19	1984.17	0	0.99	0.07	0.99	-0.01
5	1	10	1469.41	0	0.99	0.07	0.99	
	2	14	2853.15	0	0.98	0.08	0.99	0
	3	19	5612.11	0	0.97	0.12	0.98	-0.01
8	1	10	1390.95	0	0.99	0.07	1	
	2	14	1963.83	0	0.99	0.07	0.99	-0.01
	3	19	2358.37	0	0.99	0.06	0.99	0
10	1	10	726.59	0	1	0.05	1	
	2	14	906.75	0	1	0.05	1	0
	3	19	1355.74	0	1	0.05	1	0
Response Accommodation vs. No Accommodation								
3	1	10	201.89	0	1	0.03	1	
	2	14	381.82	0	1	0.03	1	0
	3	19	1265.76	0	0.99	0.06	0.99	-0.01
5	1	10	1427.41	0	0.99	0.07	0.99	
	2	14	2318.55	0	0.99	0.08	0.99	0
	3	19	4493.01	0	0.98	0.11	0.98	-0.01
8	1	10	1396.87	0	0.99	0.07	1	
	2	14	2003.40	0	0.99	0.07	0.99	-0.01
	3	19	2401.79	0	0.99	0.06	0.99	0
10	1	10	727.30	0	1	0.05	1	
	2	14	1021.49	0	1	0.05	1	0
	3	19	1624.13	0	1	0.05	1	0
Setting Accommodation vs. No Accommodation								
3	1	10	205.21	0	1	0.03	1	
	2	14	595.24	0	1	0.04	1	0
	3	19	2359.42	0	0.99	0.07	0.99	-0.01
5	1	10	1501.16	0	0.99	0.07	0.99	
	2	14	3477.95	0	0.98	0.09	0.99	0
	3	19	7448.08	0	0.97	0.13	0.97	-0.02
8	1	10	1440.38	0	0.99	0.06	1	
	2	14	2369.74	0	0.99	0.07	0.99	-0.01
	3	19	3084.62	0	0.99	0.07	0.99	0
10	1	10	741.69	0	1	0.05	1	
	2	14	1079.32	0	1	0.05	1	0
	3	19	1955.89	0	0.99	0.05	0.99	-0.01

Timing Accommodation vs. No Accommodation								
3	1	10	201.79	0	1	0.03	1	
	2	14	466.74	0	1	0.03	1	0
	3	19	1623.54	0	0.99	0.06	0.99	-0.01
5	1	10	1454.70	0	0.99	0.07	0.99	
	2	14	2798.67	0	0.98	0.08	0.99	0
	3	19	5587.87	0	0.97	0.11	0.98	-0.01
8	1	10	1410.59	0	0.99	0.07	1	
	2	14	2004.02	0	0.99	0.07	0.99	-0.01
	3	19	2377.25	0	0.99	0.06	0.99	0
10	1	10	726.85	0	1	0.05	1	
	2	14	930.43	0	1	0.05	1	0
	3	19	1428.30	0	1	0.05	1	0

2007 Results

Table 1: Frequency Distribution of Accommodated Students, English Language Learners (ELL), and Students with Disabilities (SWD) for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	N Count	67259	66098	71200	62946
	% Accommodated	9.51	11.20	10.41	7.91
	% ELL	3.83	3.16	2.54	2.19
	% Disabled	16.04	15.49	14.30	12.07
Mathematics	N Count	67257	66075	71190	69488
	% Accommodated	9.82	11.41	10.75	8.89
	% ELL	3.83	3.17	2.55	2.53
	% Disabled	16.03	15.48	14.28	13.05

Table 2: Frequency Distribution of Categories of Accommodations for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	Total	67259	66098	71200	62946
	% Accommodated	9.51	11.20	10.41	7.91
	% Admin	0.47	0.46	0.38	0.31
	% Timing	6.71	7.98	6.57	4.38
	% Response	3.28	2.82	1.61	0.67
	% Setting	9.26	10.91	9.69	7.35
Mathematics	Total	67257	66075	71190	69488
	% Accommodated	9.82	11.41	10.75	8.89
	% Admin	6.34	7.08	4.95	3.46
	% Timing	6.54	7.90	6.32	4.85
	% Response	3.71	4.64	5.27	4.33
	% Setting	9.47	11.07	9.87	7.95

Table 3: Frequency Distribution of Categories of Accommodations used by English Language Learners for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	N Count	2578	2086	1808	1381
	% Accommodated	26.96	25.79	20.63	11.08
	% Admin	0.97	0.43	0.11	0.14
	% Timing	16.18	15.68	13.72	7.39
	% Response	5.20	3.60	3.15	1.09
	% Setting	25.95	24.98	17.26	10.43
Mathematics	N Count	2579	2096	1815	1757
	% Accommodated	34.35	32.63	24.52	12.92
	% Admin	23.73	21.61	13.50	5.41
	% Timing	18.53	18.89	15.15	7.40
	% Response	5.43	5.68	11.68	5.58
	% Setting	31.25	30.30	19.67	11.16

Table 4: Frequency Distribution of Categories of Accommodations used by Students with Disabilities for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	N Count	10791	10239	10180	7600
	% Accommodated	51.17	65.25	68.58	62.70
	% Admin	2.56	2.82	2.56	2.51
	% Timing	37.39	47.68	43.33	35.04
	% Response	18.58	17.17	10.45	5.26
	% Setting	50.29	63.93	64.53	58.49
Mathematics	N Count	10781	10229	10163	9067
	% Accommodated	51.27	65.48	70.07	65.07
	% Admin	33.60	41.47	32.09	25.44
	% Timing	35.64	46.57	41.42	35.69
	% Response	21.22	28.59	34.72	31.97
	% Setting	50.32	64.00	65.37	58.61

Table 5: Frequency Distribution of Combinations of Categories of Accommodations used by English Language Learners for Grades 3, 5, 8, and High School (HS) for Communication Arts, Mathematics, and Science MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	Total	2578	2086	1808	1381
	% Administration	0.08			0.07
	% Timing	0.85	0.72	2.49	0.58
	% Setting	9.31	9.25	6.03	3.19
	% Response	0.08	0.10	0.72	
	% Admin & Setting	0.31			0.07
	% Admin & Response & Setting	0.04	0.10		
	% Time & Setting	10.82	12.03	8.90	6.08
	% Time & Response			0.17	
	% Response & Setting	0.97	0.67	0.17	0.36
	% Time & Administration				
	% Admin & Time & Setting	0.39	0.19	0.06	
	% Time & Response & Setting	3.96	2.59	2.05	0.72
	% Admin & Response & Time & Setting	0.16	0.14	0.06	
Mathematics	Total	2579	2096	1815	1757
	% Setting	5.31	5.20	1.93	2.11
	% Response		0.1	1.21	0.17
	% Response & Setting	0.39	0.52	1.82	1.02
	% Timing	0.62	0.62	1.43	0.80
	% Time & Setting	3.45	3.77	1.6	1.59
	% Time & Response	0.08		0.22	0.28
	% Time & Response & Setting	0.78	0.81	2.81	1.54
	% Administration	1.94	0.57	0.72	0.46
	% Admin & Setting	7.21	6.39	1.54	1.14
	% Admin & Response	0.04	0.05		
	% Admin & Response & Setting	0.93	0.91	2.15	0.63
	% Time & Administration	0.43	0.91	1.27	0.06
	% Admin & Time & Setting	9.97	9.49	4.35	1.2
	% Admin & Time & Response		0.1		
	% Admin & Response & Time & Setting	3.22	3.20	3.47	1.94

Table 6: Frequency Distribution of Combinations of Categories of Accommodations used by Students with Disabilities for Grades 3, 5, 8, and High School (HS) for Communication Arts and Mathematics MAP

Content	Accommodation	Grade			
		3	5	8	HS
Communication Arts	Total	10791	10239	10180	7600
	% Administration	0.06	0.14	0.17	0.17
	% Timing	0.32	0.86	3.02	3.61
	% Setting	9.1	12.99	21.88	24.82
	% Response	0.3	0.15	0.26	0.17
	% Time & Administration	0.02	0.01	0.07	0.11
	% Admin & Setting	0.23	0.21	0.33	0.82
	% Admin & Response			0.03	0.05
	% Time & Setting	21.96	32.74	31.38	26.97
	% Time & Response	0.15	0.15	0.5	0.07
	% Response & Setting	3.92	3.88	2.45	1.49
	% Admin & Response & Setting	0.17	0.21	0.14	0.14
	% Admin & Time & Setting	0.89	1.13	1.29	0.95
	% Admin & Time & Response	0.03	0.02	0.01	0.04
	% Time & Response & Setting	12.86	11.67	6.54	3.07
	% Admin & Response & Time & Setting	1.16	1.10	0.53	0.24
Mathematics	Total	10781	10229	10163	9067
	% Administration	0.16	0.30	0.86	0.98
	% Timing	0.22	0.40	1.72	2.31
	% Setting	4.93	6.14	11.2	12.05
	% Response	0.13	0.17	0.9	0.85
	% Time & Administration	0.14	0.22	0.17	0.74
	% Admin & Setting	5.21	5.63	4.91	3.97
	% Admin & Response	0.05	0.06	0.29	0.25
	% Time & Setting	7.33	9.98	9.63	8.43
	% Time & Response	0.13	0.11	0.62	0.75
	% Response & Setting	1.22	1.80	4.91	7.21
	% Admin & Response & Setting	3.94	4.81	5.59	4.06
	% Admin & Time & Setting	12.06	14.21	6.86	4.62
	% Admin & Time & Response	0.12	0.22	0.15	0.58
	% Time & Response & Setting	3.72	5.42	9.00	8.03
	% Admin & Response & Time & Setting	11.92	16.01	13.27	10.23

Table 7: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for Non-English Language Learners (non-ELL), English Language Learners (ELL), Non-Disabled Students (non-SWD), and Students with Disabilities (SWD) for Grades 3, 5, 8, and 11 Communication Arts MAP

Grade	ELL	N	Mean	Std. Dev.	Alpha	SEM	Effect
3	Non-ELL	63871	640.45	37.68	0.91	11.30	
	ELL	2476	616.95	40.30	0.92	11.40	0.62
	Non-SWD	56160	644.58	34.26	0.89	11.36	
	SWD	10187	612.01	45.37	0.93	12.00	0.90
5	Non-ELL	63465	671.73	36.78	0.91	11.03	
	ELL	1996	648.16	41.16	0.91	12.35	0.64
	Non-SWD	55700	677.17	31.45	0.88	10.89	
	SWD	9761	635.87	46.44	0.92	13.14	1.21
8	Non-ELL	68457	687.65	37.25	0.92	10.54	
	ELL	1730	657.03	36.65	0.91	11.00	0.82
	Non-SWD	60625	693.60	32.33	0.90	10.22	
	SWD	9562	644.39	40.30	0.91	12.09	1.47
11	Non-ELL	60149	716.37	31.06	0.91	9.32	
	ELL	1333	692.67	34.30	0.90	10.85	0.76
	Non-SWD	54561	720.86	26.76	0.89	8.88	
	SWD	6921	676.40	36.24	0.89	12.02	1.59

Table 8: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for Non-English Language Learners (non-ELL), English Language Learners (ELL), Non-Disabled Students (non-SWD), and Students with Disabilities (SWD) for Grades 3, 5, 8, and 10 Mathematics MAP

Grade	ELL	N	Mean	Std. Dev.	Alpha	SEM	Effect
3	Non-ELL	64075	623.09	38.50	0.91	11.55	
	ELL	2565	605.19	40.36	0.92	11.42	0.46
	Non-SWD	56343	626.40	36.30	0.90	11.48	
	SWD	10297	600.49	43.90	0.93	11.61	0.69
5	Non-ELL	63417	663.92	41.28	0.92	11.68	
	ELL	2081	641.53	42.56	0.92	12.04	0.54
	Non-SWD	55750	668.83	37.91	0.91	11.37	
	SWD	9748	631.03	46.24	0.93	12.23	0.96
8	Non-ELL	68410	699.16	41.63	0.93	11.01	
	ELL	1794	666.73	43.10	0.91	12.93	0.78
	Non-SWD	60650	705.04	37.09	0.93	9.81	
	SWD	9554	655.75	46.02	0.90	14.55	1.28
10	Non-ELL	66587	724.56	47.49	0.94	11.63	
	ELL	1743	690.48	48.98	0.92	13.85	0.72
	Non-SWD	59837	731.32	42.12	0.93	11.14	
	SWD	8493	669.93	51.05	0.90	16.14	1.42

Table 9: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for all Categories of Accommodations for Grades 3, 5, 8, and 11 Communication Arts MAP

Grade		N	Communication Arts				Effect
			Mean SS	STD SS	Alpha	SEM	
3	No Accommodation	60076	644.16	34.51	0.92	10.00	
	Accommodation	6271	595.66	42.07	0.93	11.42	1.37
	Administration	283	581.99	53.68	0.96	11.23	1.80
	Timing	4428	594.83	41.49	0.92	11.42	1.41
	Response	2156	597.10	44.86	0.94	11.22	1.35
	Setting	6106	595.26	41.83	0.93	11.41	1.39
5	No Accommodation	58109	676.59	32.06	0.90	9.97	
	Accommodation	7352	626.92	44.38	0.91	13.48	1.48
	Administration	289	605.74	58.14	0.94	13.93	2.20
	Timing	5251	626.26	44.30	0.91	13.62	1.51
	Response	1850	629.05	47.66	0.92	13.23	1.46
	Setting	7173	626.64	44.27	0.91	13.55	1.49
8	No Accommodation	62887	692.40	33.16	0.92	9.39	
	Accommodation	7300	639.46	39.52	0.90	12.24	1.56
	Administration	245	617.00	52.14	0.94	13.04	2.27
	Timing	4601	638.88	39.90	0.91	12.19	1.59
	Response	1125	633.46	45.08	0.92	12.79	1.76
	Setting	6800	638.24	39.48	0.90	12.39	1.60
11	No Accommodation	56705	719.51	27.90	0.92	7.97	
	Accommodation	4777	672.46	36.70	0.90	11.69	1.64
	Administration	174	660.96	50.97	0.95	11.33	2.09
	Timing	2653	672.04	38.03	0.90	11.95	1.67
	Response	387	672.63	40.16	0.92	11.41	1.67
	Setting	4438	670.94	36.60	0.89	11.91	1.70

Table 10: Mean Scale Score (Mean SS), Standard Deviation of Scale Scores (SD), Reliability (Alpha), Standard Error of Measurement (SEM), and Effect Size for all Categories of Accommodations for Grades 3, 5, 8, and 10 Mathematics MAP

Grade		N	Mathematics				Effect
			Mean SS	STD SS	Alpha	SEM	
3	No Accommodation	58334	625.35	36.99	0.91	10.91	
	Accommodation	6429	587.43	41.16	0.92	11.49	1.01
	Administration	4142	584.85	41.78	0.92	11.64	1.09
	Timing	4021	586.82	40.53	0.92	11.51	1.03
	Response	2311	584.75	43.14	0.93	11.75	1.09
	Setting	6165	587.31	40.81	0.92	11.45	1.02
5	No Accommodation	58321	665.30	36.51	0.91	10.66	
	Accommodation	7802	620.88	42.99	0.92	12.07	1.19
	Administration	4739	618.37	42.09	0.92	12.02	1.27
	Timing	5003	621.02	42.41	0.92	12.02	1.20
	Response	3020	616.77	43.32	0.92	12.13	1.32
	Setting	7448	620.45	42.87	0.92	12.07	1.20
8	No Accommodation	64521	703.37	36.20	0.93	9.54	
	Accommodation	8021	652.32	43.39	0.90	13.71	1.38
	Administration	3912	649.57	43.64	0.89	14.29	1.47
	Timing	4405	651.58	44.31	0.90	13.83	1.41
	Response	4067	647.85	43.66	0.90	14.14	1.51
	Setting	7439	651.85	43.18	0.90	13.71	1.39
10	No Accommodation	61831	730.77	46.75	0.94	11.31	
	Accommodation	6252	662.12	51.34	0.89	16.92	1.45
	Administration	2763	658.79	51.87	0.89	17.59	1.53
	Timing	3366	660.26	52.16	0.89	17.29	1.50
	Response	3156	655.87	51.97	0.89	17.61	1.59
	Setting	5676	660.54	50.90	0.89	17.22	1.49

Table 11: Distribution of MAP Achievement Levels for Students with Disabilities (SWD), English Language Learners (ELL), Accommodated Students, and Non-Accommodated Students, Grades 3, 5, 8, and 11 Communication Arts MAP

Accommodation Type	Achievement Level	Grade 3	Grade 5	Grade 8	Grade 11
Disabled	Total	5522	6681	6981	4765
	No Level	2.08	0.55	1.49	4.22
	Below Basic	42.27	40.79	43.39	51.00
	Basic	47.94	49.77	50.55	40.88
	Proficient	6.03	7.54	3.94	3.46
	Advanced	1.68	1.35	0.63	0.44
	% P+A	7.71	8.89	4.57	3.90
ELL	Total	695	538	373	153
	No Level	1.29	2.60	1.61	2.61
	Below Basic	35.97	37.36	48.79	53.59
	Basic	57.27	53.16	46.92	41.18
	Proficient	4.60	6.13	2.41	2.61
	Advanced	0.86	0.74	0.27	
	% P+A	5.47	6.88	2.68	2.61
Accommodated	Total	6395	7400	7411	4982
	No Level	1.94	0.65	1.50	4.11
	Below Basic	40.53	39.08	42.81	50.26
	Basic	49.49	50.78	50.74	41.07
	Proficient	6.24	8.01	4.25	4.03
	Advanced	1.80	1.47	0.70	0.52
	% P+A	8.04	9.49	4.95	4.56
Not Accommodated	Total	60864	58698	63789	57964
	No Level	1.29	1.00	1.41	2.17
	Below Basic	6.11	4.43	4.75	6.76
	Basic	46.33	41.94	48.03	47.40
	Proficient	27.83	32.51	29.57	33.88
	Advanced	18.43	20.12	16.24	9.78
	% P+A	46.27	52.63	45.81	43.67

Table 12: Distribution of MAP Achievement Levels for Students with Disabilities (SWD), English Language Learners (ELL), Accommodated Students, and Non-Accommodated Students, Grades 3, 5, 8, and 10 Mathematics MAP

Accommodation Type	Achievement Level	Grade			
		3	5	8	10
Disabled	Total	5527	6698	7121	5900
	No Level	0.43	0.57	1.29	2.00
	Below Basic	29.94	31.91	64.54	71.12
	Basic	55.49	55.14	27.68	21.73
	Proficient	12.85	10.82	5.69	4.73
	Advanced	1.28	1.57	0.80	0.42
	% P+A	14.13	12.39	6.49	5.15
ELL	Total	886	684	445	227
	No Level	0.23	0.73	0.45	0.88
	Below Basic	23.48	24.71	64.72	71.37
	Basic	61.51	57.46	25.62	22.47
	Proficient	12.75	14.47	6.97	4.41
	Advanced	2.03	2.63	2.25	0.88
	% P+A	14.79	17.11	9.21	5.29
Accommodated	Total	6605	7536	7650	6177
	No Level	0.42	0.54	1.23	2.01
	Below Basic	28.04	30.36	63.57	70.34
	Basic	56.87	55.49	27.83	22.00
	Proficient	13.14	11.78	6.17	5.12
	Advanced	1.53	1.82	1.20	0.53
	% P+A	14.67	13.60	7.37	5.65
Not Accommodated	Total	60652	58539	63540	63311
	No Level	0.97	0.92	1.40	1.63
	Below Basic	4.98	4.72	16.34	19.24
	Basic	45.77	43.56	37.62	35.69
	Proficient	37.38	35.90	29.11	34.75
	Advanced	10.89	14.90	15.52	8.68
	% P+A	48.28	50.80	44.63	43.44

Table 13: Number of Items Flagged for Large Negative DIF, Moderate Negative DIF, Moderate Positive DIF, and Large Positive DIF for or against Accommodated Students, Grades 3, 5, 8, and High School Communication Arts MAP 2007

Grade	Group	Sample Size	Moderate Positive	Moderate Negative	Large Positive	Large Negative
3	ELL	2476	0	2	0	0
	Accommodations	6271	0	2	0	0
	Disability	10187	0	0	0	0
5	ELL	1996	0	4	0	0
	Accommodations	7352	0	0	0	0
	Disability	9761	0	0	0	0
8	ELL	1730	1	0	0	2
	Accommodations	7300	0	0	0	0
	Disability	9562	0	0	0	0
11	ELL	1333	0	1	0	1
	Accommodations	4777	0	1	0	1
	Disability	6921	0	1	0	1

Table 14: Number of Items Flagged for Large Negative DIF, Moderate Negative DIF, Moderate Positive DIF, and Large Positive DIF for or against English Language Learners, Grades 3, 5, 8, and High School Mathematics MAP 2007

Grade	Group	Sample Size	Moderate Positive	Moderate Negative	Large Positive	Large Negative
3	ELL	2565	0	2	0	1
	Accommodations	6577	2	1	0	0
	Disability	10297	0	0	0	0
5	ELL	2081	0	1	0	0
	Accommodations	7495	0	0	0	0
	Disability	9748	0	0	0	0
8	ELL	1794	0	0	0	0
	Accommodations	7556	1	1	1	1
	Disability	9554	1	0	0	1
10	ELL	1743	0	0	0	1
	Accommodations	6053	1	0	0	0
	Disability	8493	0	0	0	0

Table 15: Test of Invariance by Grade, Group, and Model, Communication Arts 2007

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Non-Accommodated vs.. Accommodated Students								
3	1	4	918.25	0	0.98	0.08	0.99	
	2	7	1683.70	0	0.98	0.08	0.99	0
	3	11	4474.72	0	0.97	0.13	0.97	-0.02
5	2	2	288.44	0	0.99	0.06	1	
	3	5	909.38	0	0.99	0.08	0.99	-0.01
8	2	2	1038.95	0	0.97	0.12	0.99	
	3	5	3011.46	0	0.96	0.15	0.97	-0.02
11	1	4	118.66	0	1	0.03	1	
	2	7	390.28	0	0.99	0.04	1	0
	3	11	1582.71	0	0.98	0.08	0.99	-0.01
Accommodated SWD vs. Non-Accommodated SWD vs. Regular Students								
3	1	6	937.76	0	0.98	0.08	0.99	
	2	12	1720.50	0	0.98	0.08	0.99	0
	3	20	4382.38	0	0.97	0.11	0.97	-0.02
5	2	4	287.41	0	0.99	0.06	1	
	3	10	933.22	0	0.99	0.07	0.99	-0.01
8	2	4	1212.76	0	0.97	0.11	0.99	
	3	10	3379.95	0	0.97	0.13	0.96	-0.03
11	1	6	123.54	0	1	0.03	1	
	2	12	482.49	0	0.99	0.04	1	0
	3	20	1970.29	0	0.98	0.08	0.98	-0.02
Accommodated ELL vs. Non-Accommodated ELL vs. Regular Students								
3	1	6	795.86	0	0.98	0.08	0.99	
	2	12	892.73	0	0.99	0.06	0.99	0
	3	20	1252.86	0	0.99	0.06	0.99	0
5	2	4	59.09	0	1	0.03	1	
	3	10	164.92	0	1	0.03	1	0
8	2	4	94.05	0	1	0.03	1	
	3	10	382.11	0	1	0.05	1	0
11	1	6	112.44	0	1	0.03	1	
	2	12	216.10	0	1	0.03	1	0
	3	20	387.14	0	1	0.04	1	0

Table 16: Test of Invariance by Grade, Group, and Model, Mathematics 2007

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Non-Accommodated vs. Accommodated Students								
	1	10	390.77	0	1	0.03	1	
3	2	14	1281.16	0	0.99	0.05	1	0
	3	19	3203.26	0	0.99	0.08	0.99	-0.01
	1	10	728.23	0	0.99	0.05	1	
5	2	14	2782.03	0	0.98	0.08	0.99	-0.01
	3	19	6160.03	0	0.98	0.12	0.98	-0.01
	1	10	1018.09	0	0.99	0.06	1	
8	2	14	1234.12	0	0.99	0.05	1	0
	3	19	1925.65	0	0.99	0.05	0.99	-0.01
	1	10	447.39	0	1	0.04	1	
10	2	14	846.66	0	1	0.04	1	0
	3	19	1311.47	0	1	0.04	1	0
Accommodated SWD vs. Non-Accommodated SWD vs. Regular Students								
	1	15	416.77	0	1	0.03	1	
3	2	23	1305.30	0	0.99	0.05	1	0
	3	33	3076.29	0	0.99	0.07	0.99	-0.01
	1	15	774.18	0	0.99	0.05	1	
5	2	23	3020.82	0	0.99	0.08	0.99	-0.01
	3	33	6418.22	0	0.98	0.11	0.98	-0.01
	1	15	1043.84	0	0.99	0.05	1	
8	2	23	1294.21	0	1	0.05	1	0
	3	33	2084.32	0	0.99	0.05	0.99	-0.01
	1	15	461.25	0	1	0.04	1	
10	2	23	932.95	0	1	0.04	1	0
	3	33	1493.86	0	1	0.04	1	0
Accommodated ELL vs. Non-Accommodated ELL vs. Regular Students								
	1	15	353.76	0	1	0.03	1	
3	2	23	462.08	0	1	0.03	1	0
	3	33	863.38	0	1	0.04	1	0
	1	15	496.98	0	1	0.04	1	
5	2	23	721.19	0	1	0.04	1	0
	3	33	1173.93	0	1	0.05	1	0
	1	15	996.47	0	0.99	0.06	1	
8	2	23	1035.38	0	1	0.05	1	0
	3	33	1113.89	0	1	0.04	1	0
	1	15	469.60	0	1	0.04	1	
10	2	23	546.78	0	1	0.03	1	0
	3	33	607.01	0	1	0.03	1	0

Table 17: Test of Invariance by Grade, Group, and Model for Categories of Accommodation, CommArts 2007

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Administration Accommodation vs. No Accommodation								
	1	4	793.62	0	0.98	0.08	0.99	
3	2	7	850.01	0	0.99	0.06	0.99	0
	3	11	1083.61	0	0.99	0.06	0.99	0
5	2	2	21.33	0	1	0.02	1	
	3	5	41.36	0	1	0.02	1	0
8	2	2	63.18	0	1	0.03	1	
	3	5	131.58	0	1	0.03	1	0
	1	4	101.34	0	1	0.03	1	
11	2	7	119.57	0	1	0.02	1	0
	3	11	172.70	0	1	0.03	1	0
Response Accommodation vs. No Accommodation								
	1	4	823.78	0	0.98	0.08	0.99	
3	2	7	1135.29	0	0.99	0.07	0.99	0
	3	11	2218.02	0	0.98	0.09	0.98	-0.01
5	2	2	83.29	0	1	0.04	1	
	3	5	256.09	0	1	0.05	1	0
8	2	2	246.27	0	0.99	0.06	1	
	3	5	719.74	0	0.99	0.08	0.99	-0.01
	1	4	107.25	0	1	0.03	1	
11	2	7	124.26	0	1	0.02	1	0
	3	11	229.39	0	1	0.03	1	0
Setting Accommodation vs. No Accommodation								
	1	4	909.80	0	0.98	0.08	0.99	
3	2	7	1657.57	0	0.98	0.08	0.99	0
	3	11	4379.57	0	0.97	0.13	0.97	-0.02
5	2	2	279.28	0	0.99	0.06	1	
	3	5	894.00	0	0.99	0.08	0.99	-0.01
8	2	2	988.18	0	0.97	0.12	0.99	
	3	5	2907.65	0	0.96	0.15	0.97	-0.02
	1	4	116.87	0	1	0.03	1	
11	2	7	376.11	0	0.99	0.04	1	0
	3	11	1526.80	0	0.99	0.08	0.99	-0.01

Timing Accommodation vs. No Accommodation								
3	1	4	884.48	0	0.98	0.08	0.99	
	2	7	1481.39	0	0.98	0.08	0.99	0
	3	11	3668.55	0	0.97	0.12	0.97	-0.02
5	2	2	240.82	0	0.99	0.06	1	
	3	5	692.64	0	0.99	0.07	0.99	-0.01
8	2	2	723.93	0	0.98	0.1	0.99	
	3	5	2096.43	0	0.97	0.13	0.98	-0.01
11	1	4	124.52	0	1	0.03	1	
	2	7	249.81	0	1	0.03	1	0
	3	11	988.81	0	0.99	0.07	0.99	-0.01

Table 18: Test of Invariance by Grade, Group, and Model for Categories of Accommodation, Mathematics 2007

Grade	Model	DF	Chi Square	Significance	NNFI	RMSEA	CFI	Δ CFI
Administration Accommodation vs. No Accommodation								
3	1	10	370.05	0	1	0.03	1	
	2	14	1072.75	0	0.99	0.05	1	0
	3	19	2504.91	0	0.99	0.07	0.99	-0.01
5	1	10	642.13	0	0.99	0.05	1	
	2	14	2216.12	0	0.99	0.08	0.99	-0.01
	3	19	4646.47	0	0.98	0.11	0.98	-0.01
8	1	10	989.83	0	0.99	0.06	1	
	2	14	1095.40	0	1	0.05	1	0
	3	19	1450.75	0	1	0.05	1	0
10	1	10	448.39	0	1	0.04	1	
	2	14	636.77	0	1	0.04	1	0
	3	19	876.22	0	1	0.04	1	0
Response Accommodation vs. No Accommodation								
3	1	10	347.73	0	1	0.03	1	
	2	14	828.61	0	1	0.05	1	0
	3	19	1736.06	0	0.99	0.06	0.99	-0.01
5	1	10	584.37	0	1	0.04	1	
	2	14	1684.37	0	0.99	0.07	0.99	-0.01
	3	19	3616.48	0	0.98	0.1	0.99	0
8	1	10	987.11	0	0.99	0.06	1	
	2	14	1104.49	0	1	0.05	1	0
	3	19	1515.71	0	1	0.05	1	0
10	1	10	441.72	0	1	0.04	1	
	2	14	672.24	0	1	0.04	1	0
	3	19	994.89	0	1	0.04	1	0
Setting Accommodation vs. No Accommodation								
3	1	10	388.88	0	1	0.03	1	
	2	14	1267.69	0	0.99	0.05	1	0
	3	19	3136.44	0	0.99	0.08	0.99	-0.01
5	1	10	723.76	0	0.99	0.05	1	
	2	14	2725.82	0	0.99	0.08	0.99	-0.01
	3	19	6020.01	0	0.98	0.12	0.98	-0.01
8	1	10	1007.88	0	0.99	0.05	1	
	2	14	1217.63	0	0.99	0.05	1	0
	3	19	1897.67	0	0.99	0.05	0.99	-0.01
10	1	10	443.87	0	1	0.04	1	
	2	14	808.44	0	1	0.04	1	0
	3	19	1300.63	0	1	0.04	1	0

Timing Accommodation vs. No Accommodation								
3	1	10	371.84	0	1	0.03	1	
	2	14	1004.36	0	0.99	0.05	1	0
	3	19	2394.11	0	0.99	0.07	0.99	-0.01
5	1	10	642.51	0	0.99	0.05	1	
	2	14	2137.29	0	0.99	0.07	0.99	-0.01
	3	19	4845.44	0	0.98	0.11	0.98	-0.01
8	1	10	997.88	0	0.99	0.06	1	
	2	14	1154.17	0	0.99	0.05	1	0
	3	19	1632.4	0	0.99	0.05	1	0
10	1	10	449.68	0	1	0.04	1	
	2	14	690.31	0	1	0.04	1	0
	3	19	949.55	0	1	0.04	1	0