MICHIGAN MERIT EXAMINATION
Technical Manual

2014 Testing Cycle

Michigan Department of Education
Division of Accountability Services

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Preface

The purpose of this manual is to document the technical characteristics of the 2014 Michigan Merit Examination (MME) based on the results of the 2014 operational administration. Analytic results and relevant documents are provided by Michigan Department of Education (MDE)'s Division of Accountability Services (DAS), formerly, Office of Educational Assessment and Accountability (OEAA), ACT, Inc., Measurement, Inc., and Data Recognition Corporation (DRC). This manual includes information regarding: (1) changes implemented in the 2014 MME administration, (2) background of the test, (3) test development analyses, (4) erasure analyses, (5) ACT writing scoring analyses, (6) model fit analyses, (7) scaling and equating information related to linking across MME forms, (8) reliability and validity information, (9) item analysis information, (10) information regarding MME proficiency level cut scores, and (11) information related to Michigan School Scorecards and Education YES.

The Michigan Merit Examination (MME) is used to assess Grade 11 and eligible Grade 12 students on Michigan's English language arts (ELA), mathematics, science, and social studies high school content standards and expectations. It is designed differently than other statewide assessments in that the MME has three distinct components: (1) the ACT Plus Writing college entrance examination, (2) *ACT WorkKeys* job skill assessments in *Reading for Information, Applied Mathematics,* and *Locating Information*; and (3) Michigan-specific assessments in mathematics, science, and social studies. Each component is administered on a different day. The ACT Plus Writing component is administered on Day 1, the *ACT WorkKeys* component is administered on Day 2, and the Michigan component is administered on Day 3.

We encourage individuals who are interested in receiving more detailed information on topics discussed in this manual, or on related topics, to contact the Division of Accountability Services (DAS) and visit the Michigan Department of Education's website (http://www.michigan.gov/mde).

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Chapter 1: Changes for the MME 2014 Administration

Statewide assessments undergo periodic modifications or changes to their design, administration, and reporting. In the Spring 2014 MME test cycle, there were several such modifications or changes made regarding MME administration. These modifications and changes are briefly described below.

Change of Administration Contractors' Responsibilities

For Spring 2014 MME Day 3 administration, administration responsibility was split between Measurement Incorporated (MI) and Data Recognition Corporation (DRC). DRC was in charge of the pre-assessment process including materials ordering, packing and shipping while MI was responsible for the post-assessment process including receiving testing materials, scoring and reporting.

Changes in Training Delivery Method

A major change from 2013 to 2014 MME Administration was training delivery. In 2013 and prior, MME training videos were presented live (in-person) to MME Coordinators in large auditoriums. Participation was required by MDE in order for schools to be allowed to administer the MME. Following the presentation of each training video, MDE staff would answer questions posed by the audience with help from ACT and Measurement Incorporated. In 2014, MME training videos were made available online only. Live training presentations were no longer available. MDE and its MME contractors instead held Q&A phone calls to answer any questions the field may have had.

Chapter 2: Background of the Michigan Merit Examination

School Structure and MME Administration

Michigan's 57 intermediate school districts provide leadership, services, resources, and programs to Michigan districts and schools. The intermediate school districts include more than 550 public school districts, which consist of approximately 3,000 school buildings and approximately 125,000 students per grade. There were approximately 950 high schools in operation during the Spring 2014 test cycle. Public school academies (charter schools) are also required to administer the MME assessments. There are approximately 370 public school academies in the state. The MME assessments are administered to all Grade 11 and eligible Grade 12 students, including those with exceptional needs and English language learners.

There were over 2,500 home-schooled students reported in the Michigan Student Data System (MSDS) during the 2013–14 school year in the state of Michigan. However, the actual number could be much greater than reported here because home-schooled students are not required to be reported in MSDS. Home-schooled students are given the opportunity to be tested at their local public school district. Over 500 home-schooled students participated in the state assessments in 2013–14. According to the Michigan Department of Education, for the 2013–2014 school year, there were roughly 576 nonpublic schools that reported to MDE, with approximately 101,668 students in total. The total number of nonpublic school students varied from 72,074 for the K–8th grades to 29,594 for 9–12th grades. Michigan law requires the state to provide MME assessment opportunities to high school students who attend nonpublic schools. This is accomplished by giving nonpublic schools the opportunity to establish as ACT test centers or to send students to one of several auxiliary test centers located in several regions throughout the state. Participation of nonpublic schools and students is voluntary.

Students to Be Tested

Schools administered all three components of the MME to all public school and charter school students enrolled in Grade 11 during the Spring 2014 testing window. There were two exceptions:

1. A Grade 11 student is NOT to be tested on the MME if the student's IEP indicates that the student should take MI-Access, Michigan's alternate assessment. A student who took MI-Access in Spring 2014 wasn't allowed to take any portion of the MME in Spring 2014.
2. A Grade 11 student (retained or reclassified as Grade 11) is NOT to be tested on the MME if the student has taken the complete MME in a previous year and has achieved a performance level of either 1, 2, 3, or 4 in each MME subject area, including reading, writing, mathematics, science, and social studies. A student who has a reported performance level of "N/A" or a blank performance level, in any MME subject area, is considered to have not yet taken the complete MME. They are eligible to retake the test, but would not be required to. In case they retake the MME, these students must take the complete (all three days) MME.

Michigan law now requires that the complete MME be administered to a student once and only once. A Grade 12 student is only eligible, but not required to take the MME if either of the following is true:

- The student is a first-time tester who has not previously taken the MME.

- The student has taken the MME previously but received an invalid MME score (blank or "N/A" performance level) in any of the MME subjects tested, including reading, writing, mathematics, science, or social studies.

A 12th grader not previously tested due to grade reclassification (e.g., a tenth grader the year before and now categorized as a twelfth grader without ever having been an eleventh grader) must be tested or a school is likely to face accountability consequences.

MME Assessment Components and Schedule

The MME is composed of three distinct components: (1) the ACT Plus Writing college entrance examination, (2) ACT WorkKeys job skills assessments in *Reading for Information*, *Applied Mathematics*, and *Locating Information*, and (3) the Michigan-developed assessments in mathematics, science, and social studies. Table 2.1 presents the MME assessment components for the 2013–2014 school year.

Table 2.1: MME Components and Sections

MME Day	MME Component	Sections	Reading	Writing	Mathematics	Science	Social Studies
Day 1	ACT Plus Writing	English		S			
		Mathematics			S		
		Reading	S				
		Science				S	
		Writing		A			
Day 2	ACT WorkKeys	Reading for Information	S				
		Applied Mathematics			S		
		Locating Information			S		S
Day 3	Michigan Component	Mathematics			A		
		Science				A	
		Social Studies					A

Note: The shaded area shows the sections in each component that contribute to a student's MME score in each subject area. An "A" means all operational items in that section contribute to the student's MME score, and an "S" means select items in that section contribute to the MME score.

Appropriate Uses for Scores and Reports

Following administration of the MME assessment, reports are provided to help educators understand and use the MME assessment results. Under the No Child Left Behind Act, all schools are required to demonstrate that their students are making progress and that student achievement is increasing. Information from the MME helps to make that determination at the high school level. The reports provide educators, parents, and the public, as well as students, with an understanding of the educational progress of Michigan students.

Properly used, MME assessment results can

- measure the status of high school academic achievement as compared with high school content expectations, and the extent to which academic achievement is improving over time;
- evaluate instruction, curriculum, and policies designed to improve academic achievement; and
- target academic remediation and support for students where it is needed.

Data Reporting Guidelines and Restrictions

In September 2009, Division of Accountability Services (DAS) (then OEAA) published an updated ethics document, the *Assessment Integrity Guide*, which replaced *Professional Assessment and Accountability Practices for Educators*, published in August 2005. Section 6 of this report provides the following specific instructions for appropriate and ethical data reporting that must be followed by school personnel when using data generated from the MME assessment.

<u>School personnel will</u>

- understand and comply with Michigan and United States laws that apply to the handling of family privacy and student data including but not limited to the Family Educational Rights and Privacy Act (1997) and the Michigan Freedom of Information Act (1996);
- focus on student achievement to improve individual and program performance;
- maintain student confidentiality at all times;
- ensure that the information is reported to parents and teachers as soon as possible to determine individual strengths and weaknesses;
- ensure that student information is accurate before placing it in the student's permanent records;
- analyze student attainment and scores in conjunction with MDE Grade Level Content Expectations, or High School Level Content expectations, and Benchmarks;
- analyze results in the context of the school program as a whole, not in isolation; and
- remind the community that various factors affect test performance and factors such as the following need be taken into consideration when analyzing test results: cultural backgrounds, health conditions, economic status, and former educational experiences.

<u>School personnel will not</u>

- expose any personally identifiable information to anyone other than the student or parents/legal guardian or designated school personnel; (Public law requires the protection of student information.)
- report on sub-groups of students that would lead to inadvertent identification of students. State results are reported for sub-group sizes of ten students per group or more. Smaller group sizes may inadvertently expose student identities;
- use names, student ID numbers, birthdates, gender, race or student ID numbers which may appear on reports on any public information. Names may be used on recognized achievement awards;

- falsify student records to alter the accuracy of reported results; and
- misuse or misrepresent the meaning and interpretation of any student scores. (pp.25–26)

Brief descriptions of MME score reports are provided below. More extensive descriptions with samples are included in the *MME Spring 2014 Guide to Reports*. The guide also outlines information about scale score, performance level, machine-scoring process, and hand-scoring process, and includes notes to help interpret score report data. The *MME Spring 2014 Guide to Reports* is available at the MDE website: http://www.michigan.gov/documents/mde/2014_MME_Guide_to_Reports_Final_459354_7.pdf.

Reports for Individual Students

Individual Student Reports

The Individual Student Report (ISR) provides a detailed description of each student's performance in the content areas assessed on the MME. The ISR is designed to help educators identify their students' academic strengths and areas that may need improvement. Schools may include these reports in student record files.

At the top of the ISR, a student performance summary appears to the right of the student's name and demographic information. The student performance summary contains the student's scale score, and the performance level attained for each subject.

The main section of the ISR presents detailed information on the individual student's performance for each high school content standards. Selected ACT items, selected *ACT WorkKeys* items and all Michigan-developed operational items are included. The number of points earned out of the total number of possible points is reported for each content standard assessed. ACT and *ACT WorkKeys* scores are also included on the ISR.

Parent Reports

The Parent Report presents a summary description of the student's performance by high school content standard for each subject area assessed on the MME, as well as scale scores and performance level information. ACT and *ACT WorkKeys* scores are also included on the Parent Report. One copy of the Parent Report is produced for each student and schools are required to distribute these immediately upon receipt to the respective parent/guardian.

Student Labels

Student Record Labels present summaries of individual scale scores and performance levels in all content areas in label format. The labels are distributed to the schools for placement in the student record files (CA-60). The Record Labels are printed for each student who took the MME.

Student Rosters

Student Rosters are distributed to schools. A Student Roster presents a listing of students by grade. Each student's name, UIC, and Date of Birth, subject area scale score, performance level, and number of points attained per standard are presented. The top row above the listing of student names shows the possible number of points per standard by subject area.

The top section of the School Roster identifies the grade level reported, the assessment cycle, and the subject area. The school name and code, and the district name and code are also provided.

The MME doesn't use Class/Group ID sheets to group students by teachers or counselors. Schools can choose to provide codes for grouping students, thus

the Student Roster would list students grouped according to the codes.

School, District, Intermediate School District, and State Reports

There are four different types of aggregate reports generated for schools, districts, ISDs and the state, respectively: (1) summary reports at the school, district, and state level; (2) comprehensive reports at the district and ISD levels; (3) Demographic Reports at the school, district, and state level; and (4) Student Rosters at the school level.

Aggregate reports provide a comparative set of mean scale score information summarized by school, district, ISD, and state. The aggregate reports are generated for three student populations:

- all students;
- students with disabilities (SWD); and
- all except students with disabilities (AESWD).

Summary Reports summarize student performance at the school, district, and state levels. The top section of each Summary Report identifies the title of the report, the level of aggregation (school, district, state), the student population included in the report, the grade level, and the assessment cycle. School and district names and codes are given as appropriate to the report level.

The first page of the Summary Report provides summary data for each content area for the current year and the four previous years. Also presented for each year are (1) the number of students tested, (2) the mean scale score, (3) the scale score margin of error, (4) the percentage of students at each performance level, and (5) the percentage of students at proficient and advanced levels combined.

The second page of the MME Summary Report presents subscore information for each content area and strands within content area for the current test cycle. The subscore data include the number of students tested, the mean points earned by standard, the total number of possible points for each standard, and the percentage of students earning each raw score point or point range.

Comprehensive Reports are produced for the district and ISD and provide the mean scale score information and percentage of students at each performance level by subject. The district report shows district-level results and results for each school within the district. The ISD report provides ISD-level results and results for each district, and each Public School Academy (PSA) located in the ISD.

Demographic Reports provide a summary of scores by demographic subgroup for each subject area assessed. These data reported includes the number of students tested in each subgroup, the mean scale score for that subgroup, the percentage of students at each performance level, and the percentage of students who are advanced or proficient combined.

The top section of each Demographic Report identifies the title of the report, the level of aggregation (school, district, state), the student population included in the report, the grade level, and the assessment cycle. School and district names and codes are included as applicable.

The main section of the Demographic Report provides MME results for each demographic subgroup and the total student population. Ethnicity subgroups are defined by federal requirements. Under "Additional Reporting Groups" the Economically Disadvantaged and English Language Learners reporting subgroups are broken into two categories each: (1) students who are in the category (Yes), and (2) all students who are not (No). No summary scores are provided for subgroups with fewer than ten students. The demographic subgroups reported are

- gender;
- ethnicity;
- economically disadvantaged (ED);
- English language learners (ELL);
- formerly limited English proficient (FLEP);
- migrant;
- homeless; and
- students with accommodations. MME reports accommodation conditions for the following:
  - standard (all);
  - nonstandard (all);
  - standard (ELL only);
  - nonstandard (ELL only).

More detailed information about reporting is provided in Chapter 4 Administration.

Organizations Involved in MME Testing

Michigan Department of Education (MDE)

Division of Accountability Services (DAS)

A primary function of the Division of Accountability Services (DAS), formerly, Office of Educational Assessment and Accountability (OEAA), located within the Michigan Department of Education (MDE), is to establish, develop, and conduct a state assessment system that fairly and accurately reflects the state's content standards. These assessments include Michigan Educational Assessment Program (MEAP), MI-Access, and the Michigan Merit Examination (MME).

DAS staff directs and manages the implementation of the statewide assessment programs. In addition to planning, scheduling, and directing all assessment activities, the staff is extensively involved in item reviews, security, and quality control procedures.

DAS is also responsible for assessment and accountability reporting, including

- the State of Michigan's *Education Yes!*;
- the federal No Child Left Behind Act (NCLB);
- the National Assessment of Educational Progress (NAEP);
- special reports for legislators, educators, and other stakeholders;
- data for MDE programs and other state agencies;
- external research requests; and
- the federal Individuals with Disabilities Education Act (IDEA).

Center for Educational Performance and Information (CEPI)

The Center for Educational Performance and Information (CEPI) collects and reports data about Michigan K–12 public schools. CEPI initiatives in data collection and reporting facilitate school districts' compliance with NCLB and the MDE's accreditation plan, *Education Yes!* CEPI is located in the Department of Management and Budget.

State and federal laws require Michigan's K–12 public schools to collect and submit data about students, educational personnel, and individual schools. Districts report their data to CEPI via the Michigan Student Data System (MSDS)—formerly known as Single Record Student Database (SRSD), the School Infrastructure Database (SID) and the Registry of Educational Personnel (REP). These data are used for several purposes, including

- determining state aid payments;
- determining school and district accountability status;
- determining school accreditation;
- generating graduation/dropout rates;
- documenting teacher qualifications; and
- measuring what constitutes a "safe" school.

CEPI leads a collaboration of State of Michigan agencies to plan and implement comprehensive educational data management to meet federal and state reporting requirements and time lines. CEPI maintains the State of Michigan's database of school directory information, the Educational Entity Master (EEM). These Report Card data that comes from the EEM includes

- names of superintendents and principals;
- school and district addresses and telephone numbers; and
- e-mail and website addresses.

Department of Information Technology (DIT)

Formed in October 2001 by executive order, the Department of Information Technology (DIT) was created to centralize and consolidate the technology resources in Michigan government. DIT's strategic plan outlines five major goals:

- expand Michigan's services to reach anyone at anytime from anywhere;
- transform Michigan services through sharing and collaboration;
- manage technology to provide better service and faster delivery;
- make Michigan a "Great Workplace" and the employer of choice for technology professionals; and
- create a statewide community of partnerships.

Staff members from the DIT assist with preparing the School Report Card, and provide a process for reviewing and resolving appeals from elementary, middle, and high schools.

Department of Educational Technology

In March 2006, the MDE published the report *Leading Educational Transformation for Today's Global Society*, which outlines Michigan's educational technology plan. The report calls for leadership at all levels to meet a single goal: preparing Michigan students to become productive citizens in a global society. The

report specifies eight objectives with strategies, performance indicators, and action steps to focus current efforts and to utilize available state-level resources.

Objective 4 states: "Every Michigan educator will use data effectively for classroom decision making and school improvement planning through an integrated local and statewide decision support system."

Contractors and Subcontractors

DAS has several contractors for the MME test program. The contractors for the MME Spring 2014 test cycle include ACT Inc., Measurement Inc., Data Recognition Corporation (DRC) and Cheeney Media Concepts Corporation (Cheeney Media).

ACT is responsible for Day 1 (ACT Plus Writing—college readiness) and Day 2 (*ACT WorkKeys*—work skills assessment) materials, administration, and calibration, scaling, and equating, as well as the derivation of MME subject scores using scores from all three assessment components. Measurement Inc. is in charge of MME Day 3 (Michigan component), including administration, Day 3 scoring, and MME Day 3 reporting. PEM, under the direction of DAS, is responsible for test development for Day 3 Michigan components. DRC is the contractor for Day 3 MME item development and item data review.

Cheeney Media produces the accommodated formats for Day 3 Michigan component, including large print, Braille, reader scripts, audio accommodations (audio DVDs, video DVDS) and translated formats in Spanish and Arabic. Subcontracted under Cheeney Media, American Printing House for the Blind, Inc. (APH) creates the Braille and enlarged print versions for the MME assessments. APH assists test developers, including state and federal departments of education, with best practices and appropriate accommodations for assessing blind and visually impaired students.

Educators

The purpose of the Michigan Merit Examination is to accurately measure and report student achievement as measured by knowledge of the Michigan high school content standards. Educators who assist in developing and administering the assessments play crucial roles in helping to achieve fair and accurate student results.

The development of the Michigan Merit Examination is a meticulous process involving thousands of Michigan administrators, teachers, and curriculum experts. The Michigan Revised School Code and the State School Aid Act require the establishment of educational standards and the assessment of students' academic achievement. Accordingly, the State Board of Education, with the input of educators throughout Michigan, approved a system of academic standards and a framework within which local school districts could develop and implement curricula.

The MME assessment is based on the state High School Content Expectations (HSCEs). In 2004, the State Board of Education and the Michigan Department of Education embraced the challenge to initiate a "high school redesign" project. Since then, the national call to create more rigorous learning for high school students has become a major priority for state leaders across the country. The Cherry Commission Report (2005) highlighted several goals for Michigan including the development of HSCEs that reflect both rigorous and a relevant curricular focus. Dovetailing with this call to "curricular action" is Michigan's legislative change in high school assessment. The Michigan Merit Examination, based on rigorous high school learning standards, was implemented in 2007 and was fully aligned with these standards by 2011.

The Michigan Department of Education's Office of Educational Improvement and Innovation (OEII, formerly Office of School Improvement) led the development of grade level content expectations (for grades K–8) and high school content expectations (for grades 9–12). Content area work groups of academicians chaired by nationally known scholars in the respective field were commissioned to conduct a scholarly review and identify content standards and expectations. These content standards and expectations went through an extensive field and national review and reflect best practices and current research in the teaching and learning of the respective field. They not only build from the *Michigan Curriculum Framework Standards and Benchmarks* (1996), the *Career and Employability Skills Content Standards and Benchmarks* (2001), and include the *Michigan State Board of Education's Policy on Learning Expectations for Michigan Students* (2002), but are also closely aligned with national standards and frameworks in the respective subjects. The Michigan State Board of Education approved the English Language Arts and Mathematics High School Content Expectations in April, 2006, the Science High School Content Expectations in December, 2006, and the Social Studies High School Content Expectations in October, 2007. More information can be found at MDE website.

Please note the 2010–2011 school year was the first year for MME Social Studies assessment to apply the HSCEs. Previously it was based on the Michigan Curriculum Framework. The state HSCEs were first applied to the MME English Language Arts assessment and Mathematics assessment in Spring 2007 and to the MME Science assessment in Spring 2009.

Advisory and Review Committees

DAS actively seeks the input and feedback via advisory and review committees in the development and implementation of assessment and accountability systems to further the educational goal of improving what students know and can do in relation to the state content standards. Programs that utilize these committees include:

- the MME and MEAP, the assessments for most students in K–12 education programs throughout the State of Michigan;
- the alternate assessments for students with disabilities (MI-Access); and
- the English Language Proficiency Assessment (ELPA), a screening assessment for students new to this country who have limited English proficiency.

This ensures that Michigan assessments are high quality and gives Michigan educators a valuable professional development opportunity that increases their familiarity with the high school content standards and thereby enhances their teaching effectiveness.

All committees use structured, nationally recognized processes for their work to ensure that the advice provided is clear, well documented, and efficiently obtained. The time and expertise of the committee members are valued. Below are brief descriptions of some of the key committees, their purposes, and characteristics of members.

- **Content Advisory Committees (CACs)** review assessment items and key content decisions to ensure that the content of items and tests measure important elements of the state content standards in each subject, that each item is clearly worded for the students, has one clear "best" answer, and is factually consistent with the most current knowledge in the field. Based on the advice of these committees and other key information, DAS will accept test items for use, drop items from further consideration, or edit items. Separate Content Advisory Committees are required for each subject tested. Committee members are very familiar with the subject, the related state content standards, benchmarks, and expectations, and hold detailed knowledge of the students being tested. Some

committee members have in-depth content expertise such as mathematicians who serve on the mathematics committee. Child development experts serve on several committees. The majority of the committee members must be current teacher experts at the high school level and in the subject tested.

- **Bias and Sensitivity Review Committees (BSCs)** review each text selection, item, and writing prompt for fairness, to assure that no group is unfairly advantaged or disadvantaged compared with any other group by any MME content. The committee rejects items it considers inappropriate, suggests revisions to some, and passes on the majority of the items to the next review committee.
- **Standard Setting Committees** are charged with establishing the performance levels used to report student results on the state assessments. For the MME, these committees develop the performance level descriptors (PLDs) and recommend cut scores for the four levels. The standard setting committee is an advisory committee that looks at actual student assessments, item by item. The committee decides the performance level these assessment results represent, using clearly defined performance level descriptions, and discusses the rationale for the decision with the other committee members. The majority of standard setting committee members must be current teacher experts at the grade and subject tested. Other committee members include administrators, curriculum specialists, counselors, parents, and business leaders. Committees represent the geographic and ethnic diversity of the state.
- **Professional Practices Committee** assisted with developing the document, *Professional Assessment and Accountability Practices for Educators*. This document, published in August 2005, presents the expected ethical conduct of educators who administer the assessments. For assessments to yield fair and accurate results, they must be given under the same standardized conditions to all students. *Professional Assessment and Accountability Practices for Educators* is intended to be used by districts and schools in the fair, appropriate, and ethical administration of the assessments.

Technical Advisory Committee

The Technical Advisory Committee (TAC) independently monitors all assessment development and implementation processes, including information gathered in field tests and review of item development. The TAC may make recommendations for revisions in design, administration, scoring, processing, or use in the examination.

The TAC was first established in 1993 to assist the MDE in developing a high school proficiency assessment as a requirement for high school graduation, required by PA 118 of 1991. At that time, the purpose of the TAC was to assist the MDE in implementing provisions of the law. The TAC continues to advise and assist DAS (formerly OEAA) to ensure the MME assessments are developed in keeping with technical guidelines that meet national standards. The TAC is composed of individuals from Michigan and across the nation who are recognized experts in developing or reviewing high stakes assessment programs.

Michigan State Board of Education

The State Board of Education provides leadership and general supervision over all public education, including adult education and instructional programs in state institutions, with the exception of higher education institutions granting baccalaureate degrees. The State Board of Education serves as the general planning and coordinating body for all public education, including higher education, and advises the legislature concerning the financial requirements of public education.

The State Board of Education established the standards at key checkpoints during Michigan students' academic careers. With the input of educators throughout Michigan, the State Board of Education approved

a system of academic standards and a framework within which local school districts could develop and implement curricula. MME assessment results show how Michigan students and schools perform compared to standards established by the State Board of Education. MME assessments are criterion-referenced assessments, meaning that student performance is measured against a set standard—in this case, the High School Content Expectations—and results are reported relative to that standard. The standards are developed by Michigan educators and approved by the State Board of Education.

Chapter 3: Test Development (ACT, *ACT WorkKeys*, and Michigan Components)

The MME tests consist of three components: Day 1 ACT Plus Writing, Day 2 *ACT WorkKeys* and Day 3 Michigan Component. The following section deals with the test development process for Day 1 and Day 2 affiliated with ACT. The second half of the chapter documents the test development process for the Day 3 Michigan component, which includes a wide range of related topics (e.g., item development, item review, field testing, post field test item review, operational test construction, item bank, and test form construction). Test alignment information is presented in Chapter 5 ("Test Development Analyses").

Test Development for Day 1 and Day 2

The ACT Plus Writing Test

The ACT Test Program is a comprehensive system of data collection, processing, and reporting designed to help high school students develop postsecondary educational plans and to help postsecondary educational institutions meet the needs of their students. One component of the ACT Test Program is the ACT Plus Writing Test, a battery of four multiple-choice tests: English, Mathematics, Reading, and Science, and a Writing Test. The ACT Test Program also includes an interest inventory and collects information about students' high school courses and grades, educational and career aspirations, extracurricular activities, and special educational needs. The ACT Plus Writing is taken under standardized conditions.

ACT test data are used for many purposes. High schools use ACT data in academic advising and counseling, evaluation studies, accreditation documentation, and public relations. Colleges use ACT results for admissions and course placement. States use the ACT Test as part of their statewide assessment systems. Many of the agencies that provide scholarships, loans, and other types of financial assistance to students tie such assistance to students' academic qualifications. Many state and national agencies also use ACT data to identify talented students and award scholarships.

Philosophical Basis for the ACT

Underlying the ACT tests of educational achievement is the belief that students' preparation for college is best assessed by measuring, as directly as possible, the academic skills that they will need to perform college-level academic work. The required academic skills can be assessed most directly by reproducing as faithfully as possible the complexity of college-level work. Therefore, the tests of educational achievement are designed to determine how skillfully students solve problems, grasp implied meanings, draw inferences, evaluate ideas, and make judgments in content areas important to success in college.

Accordingly, the ACT tests of educational achievement are oriented toward the general content areas of college and high school instructional programs. The test questions require students to integrate the knowledge and skills they possess in major curriculum areas with the information provided by the test. Thus, scores on the tests have a direct and obvious relationship to the students' educational achievement in curriculum-related areas and possess a meaning that is readily grasped by students, parents, and educators. Tests of general educational achievement are used in the ACT because, in contrast to other types of tests, they best satisfy the diverse requirements of tests used to facilitate the transition from secondary to postsecondary education. By comparison, measures of student knowledge of specific course content (as opposed to curriculum areas) do not readily provide a common baseline for comparing students for the

purposes of admission, placement, or awarding scholarships because high school courses vary extensively. In addition, such tests might not measure students' skills in problem solving and in the integration of knowledge from a variety of courses.

Tests of educational achievement can also be contrasted with tests of academic aptitude. The stimuli and test questions for aptitude tests are often chosen precisely for their dissimilarity to instructional materials, and each test within a battery of aptitude tests is designed to be homogeneous in psychological structure. With such an approach, these tests may not reflect the complexity of college-level work or the interactions among the skills measured. Moreover, because aptitude tests are not directly related to instruction, they may not be as useful as tests of educational achievement for making placement decisions in college.

The advantage of tests of educational achievement over other types of tests for use in the transition from high school to college becomes evident when their use is considered in the context of the educational system. Because tests of educational achievement measure many of the same skills that are taught in high school, the best preparation for tests of educational achievement is high school course work. Long-term learning in school, rather than short-term cramming and coaching, becomes the best form of test preparation. Thus, tests of educational achievement tend to serve as motivators by sending students a clear message that high test scores are not simply a matter of innate ability but reflect a level of achievement that has been earned as a result of hard work.

Because the ACT stresses such general concerns as the complexity of college-level work and the integration of knowledge from a variety of sources, students may be influenced to acquire skills necessary to handle these concerns. In this way, the ACT may serve to aid high schools in developing in their students the higher-order thinking skills that are important for success in college and later life.

The tests of the ACT therefore are designed not only to accurately reflect educational goals that are widely accepted and judged by educators to be important, but also to give educational considerations, rather than statistical and empirical techniques, paramount importance.

Description of the ACT Plus Writing

The ACT Plus Writing contains four multiple-choice tests—English, Mathematics, Reading, and Science—and a Writing Test. These tests are designed to measure skills that are most important for success in postsecondary education and that are acquired in secondary education.

The content specifications describing the knowledge and skills to be measured by the ACT were determined through a detailed analysis of relevant information: First, the curriculum frameworks for grades seven through twelve were obtained for all states in the United States that had published such frameworks. Second, textbooks on state-approved lists for courses in grades seven through twelve were reviewed. Third, educators at the secondary and postsecondary levels were consulted on the importance of the knowledge and skills included in the reviewed frameworks and textbooks.

Because one of the primary purposes of the ACT is to assist in college admission decisions, in addition to taking the steps described above, ACT conducted a detailed survey to ensure the appropriateness of the content of the ACT tests for this particular use. College faculty members across the nation who were familiar with the academic skills required for successful college performance in language arts, mathematics, and science were surveyed. They were asked to rate numerous knowledge and skill areas on the basis of their importance to success in entry-level college courses and to indicate which of these areas students should be expected to master before entering the most common entry-level courses. They were also asked to

identify the knowledge and skills that mastery of would qualify a student for advanced placement. A series of consultant panels were convened, at which the experts reached consensus regarding the important knowledge and skills in English and reading, mathematics, and science given current and expected curricular trends.

Curriculum study is ongoing at ACT. Curricula in each content area (English, reading, mathematics, science, and writing) in the ACT tests are reviewed on a periodic basis. ACT's analyses include reviews of tests, curriculum guides, and national standards; surveys of current instructional practice; and meetings with content experts (see ACT, *ACT National Curriculum Survey® 2009*, 2009).

The tests in the ACT are designed to be developmentally and conceptually linked to those of EXPLORE (Grades 8 and 9) and PLAN (Grade 10). To reflect that continuity, the names of the content area tests are the same across the three programs. Moreover, the programs are similar in their focus on thinking skills and in their common curriculum base. The test specifications for the ACT are consistent with, and should be seen as a logical extension of, the content and skills measured in EXPLORE and PLAN.

The ACT English Test

The ACT English Test is a 75-item, 45-minute test that measures understanding of the conventions of standard written English (punctuation, grammar and usage, and sentence structure) and of rhetorical skills (strategy, organization, and style). Spelling, vocabulary, and rote recall of rules of grammar are not tested. The test consists of five prose passages, each accompanied by a sequence of multiple-choice test items. Different passage types are employed to provide a variety of rhetorical situations. Passages are chosen not only for their appropriateness in assessing writing skills but also to reflect students' interests and experiences. Most items refer to underlined portions of the passage and offer several alternatives to the portion underlined. These items include "NO CHANGE" to the underlined portion in the passage as one of the possible responses. Some items are identified by a number or numbers in a box. These items ask about a section of the passage, or about the passage as a whole. The student must decide which choice is most appropriate in the context of the passage, or which choice best answers the question posed.

Three scores are reported for the English Test: a total test score based on all 75 items, a subscore in Usage/Mechanics based on 40 items, and a subscore in Rhetorical Skills based on 35 items.

The ACT Mathematics Test

The ACT Mathematics Test is a 60-item, 60-minute test that is designed to assess the mathematical reasoning skills that students across the United States have typically acquired in courses taken up to the beginning of Grade 12. The test presents multiple-choice items that require students to use their mathematical reasoning skills to solve practical problems in mathematics. Knowledge of basic formulas and computational skills are assumed as background for the problems, but memorization of complex formulas and extensive computation are not required. The material covered on the test emphasizes the major content areas that are prerequisite to successful performance in entry-level courses in college mathematics. Six content areas are included: pre-algebra, elementary algebra, intermediate algebra, coordinate geometry, plane geometry, and trigonometry.

The items included in the Mathematics Test cover four cognitive levels: knowledge and skills, direct application, understanding concepts, and integrating conceptual understanding. "Knowledge and skills" items require students to use one or more facts, definitions, formulas, or procedures to solve problems that are presented in purely mathematical terms. "Direct application" items require students to use one or more

facts, definitions, formulas, or procedures to solve straightforward problem sets in real-world situations. "Understanding concepts" items test students' depth of understanding of major concepts by requiring reasoning from a concept to reach an inference or a conclusion. "Integrating conceptual understanding" items test students' ability to achieve an integrated understanding of two or more major concepts so as to solve non-routine problems.

Calculators, although not required, are permitted for use on the Mathematics Test. Almost any four-function, scientific, or graphing calculator may be used on the Mathematics Test. A few restrictions do apply to the calculator used. These restrictions can be found in the current year's *ACT User Handbook* or on ACT's website at **www.act.org**.

Four scores are reported for the Mathematics Test: a total test score based on all 60 items, a subscore in Pre-Algebra/Elementary Algebra based on 24 items, a subscore in Intermediate Algebra/Coordinate Geometry based on 18 items, and a subscore in Plane Geometry/Trigonometry based on 18 items.

The ACT Reading Test

The ACT Reading Test is a 40-item, 35-minute test that measures reading comprehension as a product of skill in referring and reasoning. That is, the test items require students to derive meaning from several texts by: (1) referring to what is explicitly stated and (2) reasoning to determine implicit meanings. Specifically, items ask students to use referring and reasoning skills to determine main ideas; locate and interpret significant details; understand sequences of events; make comparisons; comprehend cause-effect relationships; determine the meaning of context-dependent words, phrases, and statements; draw generalizations; and analyze the author's or narrator's voice or method. The test comprises four prose passages that are representative of the level and kinds of text commonly encountered in first-year college curricula; passages on topics in the social sciences, the natural sciences, prose fiction, and the humanities are included. Each passage is preceded by a heading that identifies what type of passage it is (e.g., "Prose Fiction"), names the author, and may include a brief note that helps in understanding the passage. Each passage is accompanied by a set of multiple-choice test items. These items focus on the complex of complementary and mutually supportive skills that readers must bring to bear in studying written materials across a range of subject areas. They do not test the rote recall of facts from outside the passage or rules of formal logic, nor do they contain isolated vocabulary questions.

Three scores are reported for the Reading Test: a total test score based on all 40 items, a subscore in Social Studies/Sciences reading skills (based on the 20 items in the social sciences and natural sciences sections of the test), and a subscore in Arts/Literature reading skills (based on the 20 items in the prose fiction and humanities sections of the test).

The ACT Science Test

The ACT Science Test is a 40-item, 35-minute test that measures the interpretation, analysis, evaluation, reasoning, and problem-solving skills required in the natural sciences. The content of the Science Test is drawn from biology, chemistry, physics, and the Earth/space sciences, all of which are represented in the test. Students are assumed to have a minimum of two years of introductory science, which ACT's National Curriculum Studies have identified as typically one year of biology and one year of physical science and/or Earth science. Thus, it is expected that students have acquired the introductory content of biology, physical science, and Earth science, are familiar with the nature of scientific inquiry, and have been exposed to laboratory investigation.

The test presents seven sets of scientific information, each followed by a number of multiple-choice test items. The scientific information is conveyed in one of three different formats: data representation (graphs, tables, and other schematic forms), research summaries (descriptions of several related experiments), or conflicting viewpoints (expressions of several related hypotheses or views that are inconsistent with one another).

The items included in the Science Test cover three cognitive levels: understanding, analysis, and generalization. "Understanding" items require students to recognize and understand the basic features of, and concepts related to, the provided information. "Analysis" items require students to examine critically the relationships between the information provided and the conclusions drawn or hypotheses developed. "Generalization" items require students to generalize from given information to gain new information, draw conclusions, or make predictions.

One score is reported for the Science Test: a total test score based on all 40 items.

The ACT Writing Test

The ACT Writing Test is a 30-minute essay test that measures students' writing skills—specifically those writing skills emphasized in high school English classes and in entry-level college composition courses. The test consists of one writing prompt that defines an issue and describes two points of view on that issue. The student is asked to respond to a question about his/her position on the issue described in the writing prompt. In doing so, the student may adopt one or the other of the perspectives described in the prompt, or they may present a different point of view on the issue. The essay score is not affected by the point of view taken on the issue.

Taking the Writing Test does **not** affect a student's score on the multiple-choice tests or the Composite score for those tests. Rather, two additional scores are provided: a Combined English/Writing score and a Writing subscore. Also provided are comments on the student's essay.

Test Development Procedures for the ACT Multiple-Choice Tests

This section describes the procedures that are used in developing the four multiple-choice tests described above. The test development cycle required to produce each new form of the ACT tests takes as long as two and one-half years and involves several stages, beginning with a review of the test specifications.

Reviewing Test Specifications

Two types of test specifications are used in developing the ACT tests: content specifications and statistical specifications.

Content specifications

Content specifications for the ACT tests were developed through the curricular analysis discussed above. While care is taken to ensure that the basic structure of the ACT tests remains the same from year to year so that the scale scores are comparable, the specific characteristics of the test items used in each specification category are reviewed regularly. Consultant panels are convened to review both the tryout versions and the new forms of each test to verify their content accuracy and the match of the content of the tests to the content specifications. At these panels, the characteristics of the items that fulfill the content specifications are also reviewed. While the general content of the test remains constant, the particular kinds of items in a

specification category may change slightly. The basic structure of the content specifications for each of the ACT multiple-choice tests is provided in Tables 3.1 through 3.4.

Statistical specifications

Statistical specifications for the tests indicate the level of difficulty (proportion correct) and minimum acceptable level of discrimination (biserial correlation) of the test items to be used.

The tests are constructed with a target mean item difficulty of about 0.58 for the ACT population and a range of difficulties from about 0.20 to 0.89. The distribution of item difficulties was selected so that the tests will effectively differentiate among students who vary widely in their level of achievement.

With respect to discrimination indices, items should have a biserial correlation of 0.20 or higher with test scores measuring comparable content. Thus, for example, performance on mathematics items should correlate 0.20 or higher with performance on the relevant Mathematics Test subscore.

Six elements of effective writing are included in the English Test. These elements and the approximate proportion of the test devoted to each are given in the table below.

Table 3.1. Content Specifications for the ACT English Test

Content/Skills	Proportion of test		Number of items	
Usage/Mechanics	0.53		40	
Punctuation[a]		0.13		10
Grammar and Usage[b]		0.16		12
Sentence Structure[c]		0.24		18
Rhetorical Skills	0.47		35	
Strategy[d]		0.16		12
Organization[e]		0.15		11
Style[f]		0.16		12
Total	**1.00**		**75**	

Scores reported: Usage/Mechanics
Rhetorical Skills
Total test score

[a]*Punctuation*. The items in this category test the student's knowledge of the conventions of internal and end-of-sentence punctuation, with emphasis on the relationship of punctuation to meaning (for example, avoiding ambiguity, indicating appositives).

[b]*Grammar and Usage*. The items in this category test the student's understanding of agreement between subject and verb, between pronoun and antecedent, and between modifiers and the words modified; verb formation; pronoun case; formation of comparative and superlative adjectives and adverbs; and idiomatic usage.

[c]*Sentence Structure*. The items in this category test the student's understanding of relationships between and among clauses, placement of modifiers, and shifts in construction.

[d]*Strategy*. The items in this category test the student's ability to develop a given topic by choosing expressions appropriate to an essay's audience and purpose; to judge the effect of adding, revising, or deleting supporting material; and to judge the relevancy of statements in context.

[e]*Organization*. The items in this category test the student's ability to organize ideas and to choose effective opening, transitional, and closing sentences.

[f]*Style*. The items in this category test the student's ability to select precise and appropriate words and images, to maintain the level of style and tone in an essay, to manage sentence elements for rhetorical effectiveness, and to avoid ambiguous pronoun references, wordiness, and redundancy.

The items in the Mathematics Test are classified with respect to six content areas. These areas and the approximate proportion of the test devoted to each are given below.

Table 3.2. Content Specifications for the ACT Mathematics Test

Content Area	Proportion of test	Number of items
Pre-Algebra[a]	0.23	14
Elementary Algebra[b]	0.17	10
Intermediate Algebra[c]	0.15	9
Coordinate Geometry[d]	0.15	9
Plane Geometry[e]	0.23	14
Trigonometry [f]	0.07	4
Total	**1.00**	**60**

Scores reported: Pre-Algebra/Elementary Algebra
Intermediate Algebra/Coordinate Geometry
Plane Geometry/Trigonometry
Total test score

[a]*Pre-Algebra*. Items in this content area are based on operations using whole numbers, decimals, fractions, and integers; place value; square roots and approximations; the concept of exponents; scientific notation; factors; ratio, proportion, and percent; linear equations in one variable; absolute value and ordering numbers by value; elementary counting techniques and simple probability; data collection, representation, and interpretation; and understanding simple descriptive statistics.

[b]*Elementary Algebra*. Items in this content area are based on properties of exponents and square roots, evaluation of algebraic expressions through substitution, using variables to express functional relationships, understanding algebraic operations, and the solution of quadratic equations by factoring.

[c]*Intermediate Algebra*. Items in this content area are based on an understanding of the quadratic formula, rational and radical expressions, absolute value equations and inequalities, sequences and patterns, systems of equations, quadratic inequalities, functions, modeling, matrices, roots of polynomials, and complex numbers.

[d]*Coordinate Geometry*. Items in this content area are based on graphing and the relations between equations and graphs, including points, lines, polynomials, circles, and other curves; graphing inequalities; slope; parallel and perpendicular lines; distance; midpoints; and conics.

[e]*Plane Geometry*. Items in this content area are based on the properties and relations of plane figures, including angles and relations among perpendicular and parallel lines; properties of circles, triangles, rectangles, parallelograms, and trapezoids; transformations; the concept of proof and proof techniques; volume; and applications of geometry to three dimensions.

[f]*Trigonometry*. Items in this content area are based on understanding trigonometric relations in right

triangles; values and properties of trigonometric functions; graphing trigonometric functions; modeling using trigonometric functions; use of trigonometric identities; and solving trigonometric equations.

The items in the Reading Test are based on the prose passages that are representative of the kinds of writing commonly encountered in college freshman curricula, including prose fiction, the social sciences, the humanities, and the natural sciences. The four content areas and the approximate proportion of the test devoted to each are given below.

Table 3.3. Content Specifications for the ACT Reading Test

Reading passage content	Proportion of test	Number of items
Prose Fiction[a]	0.25	10
Social Science[b]	0.25	10
Humanities[c]	0.25	10
Natural Science[d]	0.25	10
Total	**1.00**	**40**

Scores reported: Social Studies/Sciences (Social Science, Natural Science)
Arts/Literature (Prose Fiction, Humanities)
Total test score

[a]*Prose Fiction*. The items in this category are based on short stories or excerpts from short stories or novels.

[b]*Social Science.* The items in this category are based on passages in the content areas of anthropology, archaeology, biography, business, economics, education, geography, history, political science, psychology, and sociology.

[c]*Humanities.* The items in this category are based on passages from memoirs and personal essays and in the content areas of architecture, art, dance, ethics, film, language, literary criticism, music, philosophy, radio, television, and theater.

[d]*Natural Science.* The items in this category are based on passages in the content areas of anatomy, astronomy, biology, botany, chemistry, ecology, geology, medicine, meteorology, microbiology, natural history, physiology, physics, technology, and zoology.

The Science Test is based on the type of content that is typically covered in high school science courses. Materials are drawn from the biological sciences, the Earth/space sciences, physics, and chemistry. The test emphasizes scientific reasoning skills rather than recall of specific scientific content, skill in mathematics, or skill in reading. Minimal arithmetic and algebraic computations may be required to answer some items. The three formats and the approximate proportion of the test devoted to each are given below.

Table 3.4. Content Specifications for the ACT Science Test

Content area[a]	Format	Proportion of test	Number of items
Biology Earth/Space Sciences Physics Chemistry	Data Representation[b]	0.38	15
	Research Summaries[c]	0.45	18
	Conflicting Viewpoints[d]	0.17	7
Total		**1.00**	**40**

Score reported: Total test score

[a]All four content areas are represented in the test. The content areas are distributed over the different formats in such a way that at least one passage, and no more than two passages, represents each content area.

[b]*Data Representation*. This format presents students with graphic and tabular material similar to that found in science journals and texts. The items associated with this format measure skills such as graph reading, interpretation of scatter plots, and interpretation of information presented in tables, diagrams, and figures.

[c]*Research Summaries*. This format provides students with descriptions of one or more related experiments. The items focus on the design of experiments and the interpretation of experimental results.

[d]*Conflicting Viewpoints*. This format presents students with expressions of several hypotheses or views that, being based on differing premises or on incomplete data, are inconsistent with one another. The items focus on the understanding, analysis, and comparison of alternative viewpoints or hypotheses.

Selection of Item Writers

Each year, ACT contracts with item writers to construct items for the ACT. The item writers are content specialists in the disciplines measured by the ACT tests. Most are actively engaged in teaching at various levels, from high school to university, and at a variety of institutions, from small private schools to large public institutions. ACT makes every attempt to include item writers who represent the diversity of the population of the United States with respect to ethnic background, gender, and geographic location.

Before being asked to write items for the ACT tests, potential item writers are required to submit a sample set of materials for review. Each item writer receives an item writer's guide that is specific to the content area. The guides include examples of items and provide item writers with the test specifications and ACT's requirements for content and style. Included are specifications for fair portrayal of all groups of individuals, avoidance of subject matter that may be unfamiliar to members of certain groups within society, and nonsexist use of language.

Each sample set submitted by a potential item writer is evaluated by ACT Test Development staff. A decision concerning whether to contract with the item writer is made on the basis of that evaluation.

Every item writer under contract is given an assignment to produce a small number of multiple-choice items. The small size of the assignment ensures production of a diversity of material and maintenance of the security of the testing program, since any item writer will know only a small proportion of the items produced. Item writers work closely with ACT test specialists, who assist them in producing items of high quality that meet the test specifications.

Item Construction

The item writers must create items that are educationally important and psychometrically sound. A large number of items must be constructed because, even with good writers, many items fail to meet ACT's standards.

Each item writer submits a set of items, called a *unit*, in a given content area. Most Mathematics Test items are discrete (not passage-based), but occasionally some may belong to sets composed of several items based on the same paragraph or chart. All items on the English and Reading Tests are related to prose passages. All items on the Science Test are related to passages and/or other stimulus material (such as graphs and tables).

Review of Items

After a unit is accepted, it is edited to meet ACT's specifications for content accuracy, word count, item classification, item format, and language. During the editing process, all test materials are reviewed for fair portrayal and balanced representation of groups within society and for nonsexist use of language. The unit is reviewed several times by ACT staff to ensure that it meets all of ACT's standards.

Copies of each unit are then submitted to content and fairness experts for external reviews prior to the pretest administration of these units. The content review panel consists of high school teachers, curriculum specialists, and college and university faculty members. The content panel reviews the unit for content accuracy, educational importance, and grade-level appropriateness. The fairness review panel consists of experts in diverse educational areas who represent both genders and a variety of racial and ethnic

backgrounds. The fairness panel reviews the unit to help ensure fairness to all students. Any comments on the units by the content consultants are discussed in a panel meeting with all the content consultants and ACT staff, and appropriate changes are made to the unit(s). All fairness consultants' comments are reviewed and discussed, and appropriate changes are made to the unit(s).

Item Tryouts

The items that are judged to be acceptable in the review process are assembled into tryout units for pretesting on samples from the national student population. These samples are carefully selected to be representative of the total student population. Each sample is administered a tryout unit from one of the four academic areas covered by the ACT tests. The time limits for the tryout units permit the majority of students to respond to all items.

Item Analysis of Tryout Units

Item analyses are performed on the tryout units. For a given unit the sample is divided into low-, medium-, and high-performing groups by the individuals' scores on the ACT test in the same content area (taken at the same time as the tryout unit). The cutoff scores for the three groups are the 27th and the 73rd percentile points in the distribution of those scores. These percentile points maximize the critical ratio of the difference between the mean scores of the upper and lower groups, assuming that the standard error of measurement in each group is the same and that the scores for the entire student population are normally distributed (Millman & Greene, 1989).

Proportions of students in each of the groups correctly answering each tryout item are tabulated, as well as the proportion in each group selecting each of the incorrect options. Biserial and point-biserial correlation coefficients between each item score (correct/incorrect) and the total score on the corresponding test of the regular (national) test form are also computed.

Item analyses serve to identify statistically effective test items. Items that are either too difficult or too easy, and items that fail to discriminate between students of high and low educational achievement as measured by their corresponding ACT test scores, are eliminated or revised for future item tryouts. The biserial and point-biserial correlation coefficients, as well as the differences between proportions of students answering the item correctly in each of the three groups, are used as indices of the discriminating power of the tryout items.

Each item is reviewed following the item analysis. ACT staff members scrutinize items flagged for statistical reasons to identify possible problems. Some items are revised and placed in new tryout units following further review. The review process also provides feedback that helps decrease the incidence of poor quality items in the future.

Assembly of New Forms

Items that are judged acceptable in the review process are placed in an item pool. Preliminary forms of the ACT tests are constructed by selecting from this pool items that match the content and statistical specifications for the tests.

For each test in the battery, items for the new forms are selected to match the content distribution for the tests shown in Tables 3.1 through 3.4. Items are also selected to comply with the statistical specifications described in a previous section of this chapter. The distributions of item difficulty levels obtained on recent

forms of the four tests are displayed in Table 3.5. These data in Table 3.5 are taken from random samples of approximately 2,000 students from each of the six national test dates during the 2012–2013 academic year. In addition to the item difficulty distributions, item discrimination indices in the form of observed mean biserial correlations and completion rates are reported.

Table 3.5. Difficulty[a] Distributions and Mean Discrimination[b] Indices for ACT Test Items, 2012–2013

	Observed difficulty distributions (frequencies)			
	English	**Mathematics**	**Reading**	**Science**
Difficulty range				
0.00–0.09	0	0	0	0
0.10–0.19	1	13	1	1
0.20–0.29	9	41	7	18
0.30–0.39	20	43	27	44
0.40–0.49	49	56	34	38
0.50–0.59	78	59	42	53
0.60–0.69	124	49	59	41
0.70–0.79	111	57	53	26
0.80–0.89	53	39	17	18
0.90–1.00	5	3	0	1
Number of items[a]	450	360	240	240
Mean difficulty[b]	0.64	0.54	0.59	0.53
Mean discrimination[c]	0.57	0.58	0.57	0.48
Avg. completion rate[d]	0.91	0.92	0.93	0.94

[a]Six forms consisting of the following number of items per test: English 75, Mathematics 60, Reading 40, Science 40.
[b]Difficulty is the proportion of examinees correctly answering the item.
[c]Discrimination is the item-total score biserial correlation coefficient.
[d]Mean proportion of examinees who answered each of the last five items.

The completion rate is an indication of how "speeded" a test is for a group of students. A test is considered to be speeded if most students do not have sufficient time to answer the items in the time allotted. The completion rate reported in Table 3.5 for each test is the average completion rate for the six national test dates during the 2012–2013 academic year. The completion rate for each test is computed as the average proportion of students who answered each of the last five items.

Content and Fairness Review of Test Forms

The preliminary versions of the test forms are subjected to several reviews to ensure that the items are accurate and that the overall test forms are fair and conform to good test construction practice. The first review is performed by ACT staff. Items are checked for content accuracy and conformity to ACT style. The items are also reviewed to ensure that they are free of clues that could allow testwise students to answer the item correctly even though they lack knowledge in the subject areas or the required skills.

The preliminary versions of the test forms are then submitted to content and fairness experts for external review before the operational administration of the test forms. These experts are different individuals from those consulted for the content and fairness reviews of tryout units.

Two panels, a content review panel and a fairness review panel, are then convened to discuss with ACT staff the consultants' reviews of the forms. The content review panel consists of high school teachers, curriculum specialists, and college and university faculty members. The content panel reviews the forms for content accuracy, educational importance, and grade-level appropriateness. The fairness review panel consists of experts in diverse areas of education who represent both genders and a variety of racial and ethnic backgrounds. The fairness panel reviews the forms to help ensure fairness to all students.

After the panels complete their reviews, ACT summarizes the results. All comments from the consultants are reviewed by ACT staff members, and appropriate changes are made to the test forms. Whenever significant changes are made, the revised components are again reviewed by the appropriate consultants and by ACT staff. If no further corrections are needed, the test forms are prepared for printing.

In all, at least sixteen independent reviews are made of each test item before it appears on a national form of the ACT. The many reviews are performed to help ensure that each student's level of achievement is accurately and fairly evaluated.

Review Following Operational Administration

After each operational administration, item analysis results are reviewed for any anomalies such as substantial changes in item difficulty and discrimination indices between tryout and national administrations. Only after all anomalies have been thoroughly checked and the final scoring key approved are score reports produced. Students may challenge any items that they feel are questionable. Once a challenge to an item is raised and reported, the item is reviewed by content specialists in the content area assessed by the item. In the event that a problem is found with an item, actions are taken to eliminate or minimize the influence of the problem item as necessary. In all cases, the person who challenges an item is sent a letter indicating the results of the review.

Also, after each operational administration, DIF (differential item functioning) analysis procedures are conducted on test data. DIF can be described as a statistical difference between the probability of the specific population group (the "focal" group) getting the item right and the comparison population group (the "base" group) getting the item right given that both groups have the same level of achievement with respect to the content being tested. The procedures currently used for the analysis include the standardized difference in proportion-correct (STD) procedure and the Mantel-Haenszel common odds-ratio (MH) procedure.

Both the STD and MH techniques are designed for use with multiple-choice items, and both require data from significant numbers of students to provide reliable results. For a description of these statistics and their performance overall in detecting DIF, see the ACT Research Report entitled *Performance of Three Conditional DIF Statistics in Detecting Differential Item Functioning on Simulated Tests* (Spray, 1989). In the analysis of items in an ACT form, large samples representing student groups of interest (e.g., males and females) are selected from the total number of students taking the test. The students' responses to each item on the test are analyzed using the STD and MH procedures. Compared with pre-established criteria, the items with STD or MH values exceeding the tolerance level are flagged. The flagged items are then further reviewed by the content specialists for possible explanations of the unusual STD or MH results. In the event that a problem is found with an item, actions will be taken as necessary to eliminate or minimize the influence of the problem item.

Test Development Procedures for the ACT Writing Test

This section describes the procedures that are used in developing essay prompts for the ACT Writing Test. These include many of the same stages as those used to develop the multiple-choice tests.

Selection and Training of Prompt Writers

ACT holds a prompt writing workshop each year in which new essay prompts are developed. The participants invited to take part in this prompt development process are both high school and postsecondary teachers who are specialists in writing, and who represent the diversity of the U.S. population in ethnic background, gender, and geographic location.

Prompt Construction

Prompts developed for the Writing Test provide topics that not only offer adequate complexity and depth so that students can write a thoughtful and engaging essay, but also are within the common experiences of high school students. Topics are carefully chosen so that they are neither too vast nor simplistic, and so that they do not require specialized prior knowledge. The topics are designed so that a student should be able to respond to a topic within the 30-minute time constraint of the test.

Content and Fairness Review of Prompts

After Writing Test prompts are developed and then refined by ACT writing specialists, the prompts go through a rigorous review process by external experts. These fairness and bias experts carefully review each prompt to ensure that neither the language nor the content of a prompt will be offensive to a student, and that no prompt will disadvantage any student from any geographic, socioeconomic, or cultural background.

Field Testing of Prompts

New Writing Test prompts are field tested throughout the United States every year. Students from rural and urban settings, small and large schools, and both public and private schools write responses to the new prompts, which are then read and scored by trained ACT readers.

Review of Field Tests and Operational Administration

Once scoring of the new Writing Test prompts has been completed, the prompts are analyzed for acceptability, validity, and accessibility. The new field tested prompts are also reviewed to ensure that they are compatible with previous operational prompts, that they function in the same way as previous prompts, and that they adhere to ACT's rigorous standards.

ACT Scoring Procedures

For each of the four multiple-choice tests in the ACT (English, Mathematics, Reading, and Science), the raw scores (number of correct responses) are converted to scale scores ranging from 1 to 36.

The Composite score is the average of the four scale scores rounded to the nearest whole number (fractions of 0.5 or greater round up). The minimum Composite score is 1; the maximum is 36.

In addition to the four ACT test scores and Composite score, seven subscores are reported: two each for the English Test and the Reading Test and three for the Mathematics Test. As is done for each of the four tests, the raw scores for the subscore items are converted to scale scores. These subscores are reported on a score scale ranging from 1 to 18. The four test scores and seven subscores are derived independently of one another. The subscores in a content area do not necessarily add to the test score in that area.

In addition to the above scores, if the student took the Writing Test, the student's essay is read and scored independently by two trained readers using a six-point scoring rubric. Essays are evaluated on the evidence they demonstrate of student ability to make and articulate judgments; develop and sustain a position on an issue; organize and present ideas in a logical way; and communicate clearly and effectively using the conventions of standard written English. Essays are scored holistically—that is, on the basis of the overall impression created by all the elements of the writing. Each reader rates an essay on a scale ranging from 1 to 6. The sum of the readers' ratings is a student's Writing Test subscore on a scale ranging from 2 to 12. A student who takes the Writing Test also receives a Combined English/Writing score on a score scale ranging from 1 to 36. Writing Test results do not affect a student's Composite score.

Electronic scanning devices are used to score the four multiple-choice tests of the ACT, thus minimizing the potential for scoring errors. If a student believes that a scoring error has been made, ACT hand-scores the answer document (for a fee) upon receipt of a written request from the student. A student may arrange to be present for hand-scoring by contacting one of ACT's regional offices, but must pay whatever extra costs may be incurred in providing this special service. Strict confidentiality of each student's record is maintained.

If a student believes that a Writing Test essay has been incorrectly scored, that score may be appealed, and the essay will be reviewed and rescored (for a fee) by two new expert readers. The two new readers score the appealed essay without knowledge of the original score, and the new score is adjudicated by ACT staff writing specialists before being finalized.

For certain test dates (specified in the current year's booklet *Registering for the ACT* and on ACT's website at **www.act.org**), students may obtain (upon payment of an additional fee) a copy of the test items used in determining their scores, the correct answers, a list of their answers, and a table to convert raw scores to the reported scale scores. For an additional fee, a student may also obtain a copy of his or her answer document. These materials are available only to students who test during regular administrations of the ACT on specified national test dates. If for any reason ACT must replace the test form scheduled for use at a test center, this offer is withdrawn and the student's fee for this optional service is refunded.

ACT reserves the right to cancel test scores when there is reason to believe the scores are invalid. Cases of irregularities in the test administration process—falsifying one's identity, impersonating another student (surrogate testing), unusual similarities in answers of students at the same test center, or other indicators that the test scores may not accurately reflect the student's level of educational achievement, including but not limited to student misconduct—may result in ACT's canceling the test scores. When ACT plans to cancel a student's test scores, it always notifies the student prior to taking this action. This notification includes information about the options available regarding the planned score cancellation, including procedures for appealing this decision. In all instances, the final and exclusive remedy available to students who want to appeal or otherwise challenge a decision by ACT to cancel their test scores is binding arbitration through written submissions to the American Arbitration Association. The issue for arbitration shall be whether ACT acted reasonably and in good faith in deciding to cancel the scores.

Technical Characteristics of the ACT Tests

ACT has conducted extensive analyses on the technical characteristics in the ACT – the score scale, norms, equating, and reliability of the tests. A carefully selected sample of students from one of the six national test dates each year is used as an equating sample. Scores on the alternate forms are equated to the score scale using equipercentile equating methodology. Summary statistics, based on the six national ACT administrations in 2005–2006, for scale score reliability coefficients and average standard errors of measurement for the ACT tests and subscores are given in Table 3.6. The technical characteristics of the ACT test are thoroughly documented in the ACT Technical Manual (ACT, 2007b). The ACT Technical Manual can be acquired from ACT's website at **www.act.org**.

Table 3.6. Scale Score Reliability and Average Standard Error of Measurement Summary Statistics for the Six National ACT Administrations in 2005–2006

	Scale score reliability			Average SEM		
Test/Subtest	**Median**	**Minimum**	**Maximum**	**Median**	**Minimum**	**Maximum**
English	.91	.89	.91	1.71	1.65	1.79
Usage/Mechanics	.86	.84	.88	1.36	1.25	1.39
Rhetorical Skills	.84	.81	.85	1.19	1.14	1.25
Mathematics	.91	.89	.92	1.47	1.43	1.56
Pre-Algebra/Elementary Algebra	.82	.81	.83	1.37	1.30	1.44
Intermediate Algebra/Coordinate Geometry	.72	.70	.75	1.47	1.38	1.54
Plane Geometry/Trigonometry	.74	.69	.78	1.52	1.34	1.66
Reading	.85	.85	.87	2.18	2.11	2.26
Social Studies/Sciences	.75	.73	.77	1.65	1.57	1.73
Arts/Literature	.77	.76	.78	1.75	1.67	1.89
Science	.80	.74	.83	2.00	1.90	2.12
Composite	.96	.95	.96	0.94	0.91	0.96

The *ACT WorkKeys* Assessments Components: Reading for Information, Applied Mathematics, and Locating Information

In recent years, members of the business community as well as the general public have indicated concern that American workers, both current and future, lack the workplace skills needed to meet the challenges of rapidly evolving technical advances, organizational restructuring, and global economic competition. New jobs often require workers coming from high schools or postsecondary programs to have strong problem-solving and communication skills. Current trends in basic skill deficiencies indicate that American businesses will soon be spending more than $25 billion a year on remedial training programs for new employees.

ACT designed *ACT WorkKeys* to address this problem. The system serves businesses, workers, educators, and learners. As part of the development process, ACT listened to employers, educators, and experts in employment and training requirements to find out which employability skills are crucial in most jobs. Based

on their insights, ACT developed the first nine *ACT WorkKeys* skill areas: *Applied Technology*, *Applied Mathematics (AM)*, *Business Writing*, *Listening*, *Locating Information (LI)*, *Workplace Observation*, *Reading for Information (RFI)*, *Teamwork*, and *Writing*. Personal skills assessments are also available.

Each skill area has its own skill scale that measures both the skill requirements of specified jobs and the employability skills of individuals. Before *ACT WorkKeys*, there were no scales that could measure both the skills a person has and the skills a job needs. Each *ACT WorkKeys* skill scale describes a set of skill levels. This makes it possible to determine the proficiency levels students and workers already have and to design job-training programs that can help them meet the demands of the jobs they want. The *ACT WorkKeys* system is based on the assumption that people who want to improve their skills can do so if they have enough time and appropriate instruction. Showing a direct connection between job requirements, and education and training has a positive effect on learner persistence and achievement.

The ACT WorkKeys Assessment Development Process

ACT WorkKeys assessments are designed to cover a range of skills that is neither too narrow nor too wide. If too narrow, a huge battery of tests would be needed to measure skills accurately; and if too wide, the number of items needed for validation would make the assessment unnecessarily long and time-consuming. Thus, the *ACT WorkKeys* assessments are designed to meet the following criteria:

- The way a skill is assessed is generally congruent with the way the skill is used in the workplace.
- The lowest level assessed is at approximately the lowest level for which an employer would be interested in setting a standard.
- The highest level assessed is at approximately the level beyond which specialized training would be required.
- The steps between the lowest and highest levels are large enough to be distinguished and small enough to have practical value in documenting workplace skills.
- The assessments are sufficiently reliable for high-stakes decision making.
- The assessments can be validated against empirical criteria.
- The assessments are feasible with respect to cost, administration time, and complexity.

The development process for an *ACT WorkKeys* assessment consists of five phases: skill definition, test specifications development, prototyping, pretesting, and construction of operational forms. The process used to develop the *ACT WorkKeys* multiple-choice test items is similar to that used for many standardized assessments including others developed by ACT (Anastasi, 1982; Crocker & Algina, 1986). Both stimuli and response alternatives meet basic requirements associated with high-quality skills.

<u>Skill Definition</u>

Before constructing the *ACT WorkKeys* assessments, ACT defines the content domains and develops hierarchical *ACT WorkKeys* skill descriptions. This process typically begins with a panel made up of employers, educators, and ACT staff. The panel first develops a broad definition of a skill area and identifies the lowest and highest level of the skill that is worthwhile to measure. The panel then identifies examples of tasks within this broadly defined skill domain and narrows that domain to those examples that are important for job performance across a wide range of jobs. Next, the tasks are organized into “strands,” which are aspects of the general skill domain, or skill area that pertain to a singular concept to be measured. The strands assessed in *Reading for Information*, for example, include “choosing main ideas or details,” “understanding word meanings,” “applying instructions,” and “applying information and reasoning.”

The strands are also divided into levels based on the variables believed to cause a task to be more or less difficult. In general, at the low end of a strand a few simple things must be attended to, whereas at the high end, many things must be attended to and a person must process information to apply it to more complex situations. In the "applying instructions" strand of *Reading for Information*, for example, employees need only apply instructions to clearly described situations at the lower levels. At the higher levels, however, employees must not only understand instructions in which the wording is more complex, meanings are more subtle, and multiple steps and conditionals are involved, but must also apply these instructions to new situations.

Test Specifications

Using the skill definitions described above, the ACT *ACT WorkKeys* development team refines the specifications, outlining in more detail the skills the assessment will measure and how the items will become more complex as the skill levels increase. Each level is defined in terms of its characteristics, and exemplar test items are created to illustrate it. While it is sometimes appropriate to assign content to a unique level, in most cases the complexity of the stimulus and question determines the level to which a particular test item is assigned.

ACT WorkKeys test specifications for the multiple-choice assessments are unlike the test blueprints used in education. They are not a list of the content topics or objectives to be covered and the number of test items to be assigned to each. Rather, they are more like scoring rubrics used for holistic scoring of constructed-response assessments (White, E. M., 1994). Similarly, the alternatives for a single multiple-choice question may include multiple content classifications, modeling a well-integrated curriculum, yet making the typical approach to test blueprints, which assume that each item measures only one objective, inappropriate.

Prototyping

After development of the general test specifications, ACT test development associates (TDAs) begin writing items for the prototype test. All the items must be written to meet the test specifications and must correspond to the respective skill levels of the test. A number of prototype test items sufficient to create long test form (75 items for RFI and AM, and 50 items for LI) for the skill area are produced.

Each prototype test form (one per skill area) is administered to at least two groups of high school students and two groups of employees. Typically, one group of students and one of employees will be from the same city. The second groups of students and employees will be found in another state with a different situation (for example, if the first groups are from a suburban setting, the second may be from an inner city). The number of examinees varies according to the test format, with more being used for multiple-choice tests than for constructed-response tests. Typically, at least 200 students and 60 employees are divided across the two administration sites for each multiple-choice prototype test form.

During the prototype process, TDAs interview the examinees to gather their reactions to the test instrument, which helps ACT evaluate the functioning of the test specifications. Questions such as whether the prototype items were too hard, too easy, or tested skills outside the realm of the specifications must be answered before development can move to the pretesting stage. The examinees are asked to provide comments and suggestions about the prototype test form, and educators and employers are also invited to review and comment on it. Based on all the information from prototype testing, the test specifications are adjusted if necessary, and additional prototype studies may be conducted. When the prototype process is completed satisfactorily, a written guide for item writers is prepared.

Pretesting

For the pretesting phase, ACT contracts with numerous freelance item writers who produce a large number of items, which ACT staff edit to meet the content, cognitive, and format standards. *ACT WorkKeys* item writers must be familiar with various work situations and have insight into the use of a particular skill in different employment settings because both content and contextual accuracy are critically important for *ACT WorkKeys*. A test question containing inaccurate content may be distracting even if the specific content does not affect the examinee's ability to respond correctly to the skills portion of the question. Inaccurate facts, improbable circumstances, or unlikely consequences of a series of procedures or actions are not acceptable. An examinee who knows about a particular workplace should not identify any of the assessment content, circumstances, procedures, or keyed responses as unlikely, inappropriate, or otherwise inaccurate.

Given the wide range of employability skills assessed, verifying content accuracy for *ACT WorkKeys* is challenging. To help *ACT WorkKeys* staff detect any possible problems, the item writers write a justification for the best response and for each distractor (incorrect response) for each test item. Both the items and the justifications are checked and, if necessary, the test items are modified.

After the test questions and stimuli have been created and edited, and before administration of the pretesting forms, all items are submitted to external consultants for content and fairness reviews. Qualified experts in the specific skill area being assessed, usually persons using the skills regularly on the job, check for content and contextual accuracy. Members of minority groups review the items to make sure they will not be biased against, or offensive to, racial, ethnic, and gender groups. ACT provides all the reviewers with written guidelines and receives written evaluations back from them.

To provide data required for both classical and item response theory (IRT)–based statistics, each multiple-choice item is administered to a sample of about 2,000 examinees. For practical reasons, most of these examinees are students, although smaller samples of employees are also assessed for each pretest. Then ACT researchers evaluate the psychometric properties (such as reliability and scalability) of each item.

Additionally, statistical, differential item functioning (DIF) analyses of the items are carried out to determine whether items function differently for various groups of individuals (by seeing if responses to items can be correlated with the gender or ethnicity of the examinees). Items that show DIF are eliminated from the item pool. Based on data collected during pretesting for each skill area, no items in the *ACT WorkKeys* tests show DIF. Statistical studies can also locate problem items, which are identified during the analysis and are reevaluated by staff and, if necessary, outside experts.

Operational Forms

Pretest item analyses are considered carefully when constructing the forms for operational testing. Alternate and equivalent test forms for each assessment are developed from the pool of items that meet all the content, statistical, and fairness criteria. ACT staff constructs at least two equivalent test forms for each assessment. In these forms, both the overall characteristics of the test and the within-level characteristics for content, complexity, and psychometric characteristics are made as similar as possible.

In addition to developing the job-profiling procedure to link the content of the *ACT WorkKeys* assessments to a specific job, ACT achieves validity through creating well-designed tests. During the development of the assessments, ACT works to minimize the likelihood of adverse impact resulting from use of the *ACT WorkKeys* tests. Specifically, the assessments are designed to be job-related and fair by ensuring that the items go through a series of screens before they are made available to employers:

- The assessments are criterion-referenced (they use job requirements as the scoring reference, rather than population norms);
- The test specifications are well-defined;
- Items are written by people with employment experience in the workplace and thus the items tap a domain of workplace skill;
- Items measure a particular workplace skill;
- Content and fairness experts review the items to determine possible differences in responses among racial groups and gender; and
- Statistical analyses (for example, differential item functioning) at the item and test level are conducted to monitor the performance of various subgroups.

ACT WorkKeys Assessment Descriptions

Applied Mathematics

The *Applied Mathematics* skill involves the application of mathematical reasoning to work-related problems. The assessment requires the examinee to set up and solve the types of problems and do the types of calculations that actually occur in the workplace. This assessment is designed to be taken with a calculator. As on the job, the calculator serves as a tool for problem solving. A formula sheet that includes, but is not limited to, all formulas required for the assessment is provided. There are five skill levels measured by this assessment, with Level 7 requiring the most complex and Level 3 requiring the least complex mathematical concepts and calculations. The details of different level descriptions can be found in the table below.

Table 3.7. Skill Definition for *Applied Mathematics*

Level	Characteristics of Items	Skills
3	• Translate easily from a word problem to a mathematics equation • All needed information is presented in logical order • No extra information	• Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers • Add or subtract negative numbers • Change numbers from one form to another using whole numbers, fractions, decimals, or percentages • Convert simple money and time units (e.g., hours to minutes)
4	• Information may be presented out of order • May include extra, unnecessary information • May include simple charts, diagrams, or graphs	• Solve problems that require one or two operations • Multiply negative numbers • Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals • Add commonly known fractions, decimals, or percentages (e.g., 1/2, .75, 25%) • Add three fractions that share a common denominator • Multiply a mixed number by a whole number or decimal • Put the information in the right order before performing calculations

5	• Problems require several steps of logic and calculation (e.g., problem may involve completing an order form by totaling the order and then computing tax)	• Decide what information, calculations, or unit conversions to use to solve the problem • Look up a formula and perform single-step conversions within or between systems of measurement • Calculate using mixed units (e.g., 3.5 hours and 4 hours 30 minutes) • Divide negative numbers • Find the best deal using one- and two-step calculations and then comparing results • Calculate perimeters and areas of basic shapes (rectangles and circles) • Calculate percentage discounts or markups
6	• May require considerable translation from verbal form to mathematical expression • Generally require considerable setup and involve multiple-step calculations	• Use fractions, negative numbers, ratios, percentages, or mixed numbers • Rearrange a formula before solving a problem • Use two formulas to change from one unit to another within the same system of measurement • Use two formulas to change from one unit in one system of measurement to a unit in another system of measurement • Find mistakes in items that belong at Levels 3, 4, and 5 • Find the best deal and use the result for another calculation • Find areas of basic shapes when it may be necessary to rearrange the formula, convert units of measurement in the calculations, or use the result in further calculations • Find the volume of rectangular solids • Calculate multiple rates
7	• Content or format may be unusual • Information may be incomplete or implicit • Problems often involve multiple steps of logic and calculation	• Solve problems that include nonlinear functions and/or that involve more than one unknown • Find mistakes in Level 6 items • Convert between systems of measurement that involve fractions, mixed numbers, decimals, and/or percentages • Calculate multiple areas and volumes of spheres, cylinders, or cones • Set up and manipulate complex ratios or proportions • Find the best deal when there are several choices • Apply basic statistical concepts

Reading for Information

The *Reading for Information* skill involves reading and understanding work-related instructions and policies. The reading passages and questions in the assessment are based on the actual demands of the workplace. Passages take the form of memos, bulletins, notices, letters, policy manuals, and governmental regulations. Such materials differ from the expository and narrative texts used in most reading instruction, which are usually written to facilitate reading. Workplace communication is not necessarily well-written or targeted to the appropriate audience. Because the *Reading for Information* assessment uses workplace texts, the assessment is more reflective of actual workplace conditions. There are five skill levels, with Level 7 being the most complex and Level 3 the least complex. The details of different level descriptions can be found in the following table.

Table 3.8. Skill Definition for *Reading for Information*

Level	Characteristics of Stimuli and Items	Skills
3	• Reading materials include basic company policies, procedures, and announcements • Reading materials are short and simple, with no extra information • Reading materials tell readers what they should do • All needed information is stated clearly and directly • Items focus on the main points of the passages • Wording of the questions and answers is similar or identical to the wording used in the reading materials	• Identify main ideas and clearly stated details • Choose the correct meaning of a word that is clearly defined in the reading • Choose the correct meaning of common, everyday and workplace words • Choose when to perform each step in a short series of steps • Apply instructions to a situation that is the same as the one in the reading materials
4	• Reading materials include company policies, procedures, and notices • Reading materials are straightforward, but have longer sentences and contain a number of details • Reading materials use common words, but do have some harder words, too • Reading materials describe procedures that include several steps • When following the procedures, individuals must think about changing conditions that affect what they should do • Questions and answers are often paraphrased from the passage	• Identify important details that may not be clearly stated • Use the reading material to figure out the meaning of words that are not defined • Apply instructions with several steps to a situation that is the same as the situation in the reading materials • Choose what to do when changing conditions call for a different action (follow directions that include “if-then” statements)

5	• Policies, procedures, and announcements include all of the information needed to finish a task • Information is stated clearly and directly, but the materials have many details • Materials also include jargon, technical terms, acronyms, or words that have several meanings • Application of information given in the passage to a situation that is not specifically described in the passage • There are several considerations to be taken into account in order to choose the correct actions	• Figure out the correct meaning of a word based on how the word is used • Identify the correct meaning of an acronym that is defined in the document • Identify the paraphrased definition of a technical term or jargon that is defined in the document • Apply technical terms and jargon and relate them to stated situations • Apply straightforward instructions to a new situation that is similar to the one described in the material • Apply complex instructions that include conditionals to situations described in the materials
6	• Reading materials include elaborate procedures, complicated information, and legal regulations found in all kinds of workplace documents • Complicated sentences with difficult words, jargon, and technical terms • Most of the information needed to answer the items is not clearly stated	• Identify implied details • Use technical terms and jargon in new situations • Figure out the less common meaning of a word based on the context • Apply complicated instructions to new situations • Figure out the principles behind policies, rules, and procedures • Apply general principles from the materials to similar and new situations • Explain the rationale behind a procedure, policy, or communication
7	• Very complex reading materials • Information includes a lot of details • Complicated concepts • Difficult vocabulary • Unusual jargon and technical terms are used, but not defined • Writing often lacks clarity and direction • Readers must draw conclusions from some parts of the reading and apply them to other parts	• Figure out the definitions of difficult, uncommon words based on how they are used • Figure out the meaning of jargon or technical terms based on how they are used • Figure out the general principles behind the policies and apply them to situations that are quite different from any described in the materials

Locating Information

The *Locating Information* skill involves the locating, comparative, summarization, and analytic skills people use when they work with work-related graphics. The types of graphics used as stimuli include tables, data graphs, forms, charts, flowcharts, diagrams, maps, floor plans, instrument gauges, and blueprints. These graphics are based on materials that reflect the range of locating information demands found in the workplace. Because the *Locating Information* assessment uses workplace graphics, the assessment is more reflective of actual workplace conditions. There are four skill levels measured, with Level 6 being the most

complex and Level 3 the least complex. The details of different level descriptions can be found in the table below.

Table 3.9. Skill Definition for *Locating Information*

Level	Characteristics of Graphics	Skills
3	• Elementary graphics • Simple order forms, bar graphs, tables, flowcharts, maps, instrument gauges, and floor plans • One graphic used at a time	• Find one or two pieces of information in a graphic • Fill in one or two pieces of information that are missing from a graphic
4	• Straightforward graphics • Basic order forms, diagrams, line graphs, tables, flowcharts, instrument gauges, and maps • One or more graphics are used at a time	• Find several pieces of information in graphics • Notice how graphics are related to each other • Sum up information shown in straightforward graphics • Identify trends shown in straightforward graphics • Compare information and trends shown in straightforward graphics
5	• Complicated graphics with possibly unusual formats • Detailed forms, tables, graphs, diagrams, maps, and instrument gauges • One or more graphics are used at a time	• Sort through distracting information • Sum up information shown in detailed graphics • Identify trends shown in detailed graphics • Compare information and trends shown in detailed graphics
6	• Complicated graphics containing large amounts of information; may also have challenging formats, technical terms, or symbols • Very detailed graphs, charts, tables, forms, maps, and diagrams • One or more graphics are used at a time	• Analyze data in one complicated graphic or several related graphics • Apply the information to specific situations • Use the information to make decisions • Use the information to draw conclusions

Technical Characteristics of the ACT WorkKeys Tests

ACT has conducted extensive psychometric analyses on the *ACT WorkKeys* tests, including scaling and equating, reliability, and validity studies. Different equating methods are used in *ACT WorkKeys*; the common-item nonequivalent groups equating method is used in MME-related work. As an important reliability index, internal consistency reliability was found to be high for the *Reading for Information* and *Applied Mathematics* tests or moderately high for the *Locating Information* test. ACT has used a multi-faceted approach to collect validity evidence of the *ACT WorkKeys* tests. As part of criterion-related validity evidence, the studies showed positive correlations between the test scores of the three tests and job performance ratings ranging from 0.12 to 0.86, which compares favorably with the correlations found in the general research literature on criterion-related validity of employment tests The technical characteristics—the score scale, equating, reliability, and validity—of the *ACT WorkKeys* Tests is thoroughly documented in the *ACT WorkKeys* Technical Manuals of respective tests (ACT, 2008a, 2008b, and 2008c). The *ACT WorkKeys* Technical Manuals can be requested by calling 1-800/WORKKEY (967-5539) or from ACT's website at **www.act.org**.

Test Development for Day 3

Test Specifications

As noted in the previous chapter, all MME Day 3 subject tests are based on the Michigan High School Content Expectations (HSCEs). A general description of development activities for all MME Day 3 subject tests is provided below, followed by subject-specific descriptions.

MDE staff, contractors, and Michigan educators worked together to develop the tests. The test development cycle included the following steps:

- Specification Development
- Item Writer Training
- Item Development
- Item Review
- Field Testing
- Field Test Item Review
- Operational Test Construction

In addition to assessing student knowledge of subject-specific content, the MME tests also assess student thinking skills in each of the three components (i.e., Day 1 ACT Plus Writing, Day 2 *ACT WorkKeys* and Day 3 Michigan Component). Critical thinking skills are a primary focus of each of the three components of the MME. These skills are assessed through both multiple-choice (MC) and constructed-response (CR) items. CR items only appeared in ACT Writing section in the Spring 2014 test cycle. The blueprints included in the subject-matter sections of this document reflect the crossing of content with process.

Step 1: Specification Development

Following the yearly alignment process undertaken by MDE (see Chapter 5 for more information on the 2014 alignment process), MDE and its contractors develop Michigan Component test specifications. The test specifications identify the content and types of items to be included. These specifications include the High School Content Standards, general indicators of difficulty, and other psychometric characteristics as well as general physical indicators such as artwork parameters. Test item specifications are very detailed and identify content limits, item formats, and similar aspects of test items, typically including sample items of each format.

All MDE tests are designed to assess higher order thinking skills. Most items in all subject areas focus more on comprehension and application than on simple recall or recognition. Indeed, guidelines for item writing for each test clearly include admonitions for item writers to avoid simple recall of trivial or unrelated facts, and specific attention is given to ensure that tests include adequate higher-order thinking skills. The ways in which higher order thinking skills are included in each subject test are addressed by content area in the subsequent, content-specific sections.

Step 2: Item Writer Training

For Michigan-developed components, all item writers are Michigan educators who have curriculum and instruction expertise and who have been recommended by their administrators. All have relevant degrees and experience, and many have previous experience in MME-specific item writing.

Once test and item specifications are written, contractors and content consultants from DAS use these materials to train item writers to produce items specifically for MDE. The item-writing process begins over the summer. DRC holds one 3-day training in June for item writers. In some cases, veteran item writers are given their item writing assignments as much as a month before the actual face-to-face meeting. Teachers are trained by experienced DRC Content Specialist team members. Teachers engage in peer review of the items and continue working on their items once they leave the training. DRC Content Specialists provide extensive feedback to the writers and there is much back and forth in Michigan's web-based Item Bank System (IBS). Once the items are accepted, DRC and Michigan content staff reviews them before the items are banked in the system.

Step 3: Item Development

The Michigan item writers draft test items as described above in accordance with specifications approved by DAS. Once this is completed, DRC and Michigan content staff prepares the items for content and bias review to occur the following school year.

This internal review consists of items being evaluated using the following criteria:

Skill

- Item measures one skill level.
- Item measures skill in manner consistent with specification.
- Item uses appropriate (realistic) level of skill.
- Item makes clear the skill to be employed.

Content

- Item measures one content expectation.
- Item measures content expectation in a manner consistent with specification.
- Item measures the appropriate grade or Depth of Knowledge (DOK) level.
- Item makes clear the content expectation or problem to be solved.

Relevance

- Item calls for a realistic application of process to content.
- Item is not contrived.
- Item is appropriate for the grade level to be tested.
- Item groups reflect instructional emphasis.

Accuracy

- Item is factually accurate.
- Item contains only one correct or best response.
- If item pertains to disputed content, context for correct answer is clearly defined (e.g., "According to... the correct solution is...").
- Item is unambiguously worded.

Format

- Item contains no extraneous material except as required by the content expectation.
- Vocabulary is grade-appropriate and clear.
- Item contains no errors of grammar, spelling, or mechanics.
- Item is clearly and conveniently placed on the page.
- Item contains adequate white space for calculations as needed.

- Physical arrangement of item is consistent with benchmark or common practice (e.g., horizontal vs. vertical addition and subtraction, slash vs. horizontal fraction bar, notation, symbols, etc.).
- Keys for sets of MC items are balanced (i.e., equal numbers of As, Bs, Cs, and Ds).

Bias

- Item is free of race and sex stereotypes.
- Item contains no material known or suspected to give advantage to any group.
- Item is free of insensitive language.
- Item sets that identify race or sex either directly or indirectly are balanced with reference to race and sex.
- Item content and format are accessible to students with disabilities.
- Item content and format are accessible to students with limited English proficiency.

Step 4: Item Review

After the internal review takes place, all items are reviewed by committees of Michigan educators and Michigan citizens. This consists of bias/sensitivity review meetings (involving 10–15 Michigan educators on-site, the Bias and Sensitivity Review Committee [BSC]) and content review meetings (involving roughly the same number of educators, the Content Advisory Committee [CAC]). This allows grade-level educators to spend more time focusing on the nuances of each item and adjusting the items when necessary. DRC and Michigan DAS staff trains the CAC and BSC and facilitates the reviews. All items are first reviewed by the BSC and then the CAC.

Any item rejected by the BSC does not get passed on to the CAC for review. Each review is led by MDE and DRC staff, using prescribed guidelines and forms to indicate the final status of each item:

- **Accept:** Each of the following eight category conditions (importance, thematic, grammar, clarity, accuracy, validity, sound measurement, grade appropriate) has been met or exceeded and the item appears suitable for field testing.
- **Modify:** One or more of the category conditions have not been met or the item needs minor changes to make it acceptable. Reviewers provide recommendations on changes to be made to the item that will make the item suitable for field testing.
- **Reject:** Several category conditions have not been met, or are suspect, or need radical changes to make the item acceptable. In such cases, the item may be vague or ambiguous, inappropriate, or not clearly related to the text or to the standard. Without severe modifications it is unlikely to be salvaged. Reviewers provide comments as to why the item should be rejected.

Step 5: Content Lead Review

After this first round of reviews, Michigan and DRC content lead staff incorporate all changes to the items in the Item Banking System and the items are ready to be field tested. They are placed on forms and are composed by the DAS composition team. The items and forms are reviewed by the DAS content leads and other internal DAS staff and the composition team makes any necessary revisions. The items and forms are returned again to the DAS content lead and test development manager for overall quality control and sign-off before they are sent for printing.

Step 6: Field Testing

Items that have passed bias/sensitivity and content review are field tested. MME field testing is done in embedded operational test forms. All test forms consist of a certain number of operational items, along with a number of field test items. Field test items are distributed amongst the test forms. The process for field test item review is described in detail below.

Step 7: Field Test Item Review

After field testing, DAS and contractor staff analyzes item results and presents those results to content and bias review committees, which gives committee members the opportunity to review the items with field test statistics. Once these data reviews are concluded, surviving items are advanced to a "Ready for Operational" maturity, which allows them to be used operationally on later administration forms. The processes for field test item reviews are presented in greater detail below.

Field Testing Procedures: Item Development, Review, Field Test Design, and Statistics

This section provides an overview of the field testing procedures, conducted by DAS. The specific item review process at various test development stages is described in other sections of Chapter 3.

Field Testing Design

DAS conducts field testing by embedding matrix-sampled field test items across multiple forms of operational assessments such that, in general, each field test item appears on only one operational form. The total numbers of unique field test items and field test items embedded across forms are given in Table 3.10

Table 3.10 Number of Forms and Field Test Items by Subject

Subject	Number of Forms	Total Number of Unique Field Test Items	Total Number of Field Test Items
Mathematics	8	62	72
Science	8	97	112
Social Studies	8	102	128

Field Test Sampling

It is critical that field test items be calibrated with operational items in such a way that the obtained item parameters represent those parameters that would result if the field test items were administered to all students. For the MME, each form (1–6) is spiraled within each classroom in each school. Therefore, every school gets every form for some of its students, which helps to ensure that the field test item parameters are representative of those that would be obtained if the items were administered to all students.

Item Specifications

MDE employs *Standards for Educational and Psychological Testing* (AERA, APA, & NCME, 1999) as a primary source of guidance in the construction, field testing, and documentation of the tests. The introduction to the 1999 *Standards* best describes how those *Standards* are and were used in the development and evaluation of tests: "Evaluating the acceptability of a test or test application does not rest

on the literal satisfaction of every standard in this document, and acceptability cannot be determined by using a checklist." (*Standards*, p. 4).

Thus, the terms 'target' and 'goal' are used when referring to various psychometric properties of the tests. For example, while it is a goal of test development for each high school test to have a reliability coefficient of .90 or greater, it is not our intention to eliminate a test with a reliability coefficient of .89. Instead, the test results would be published, along with the reliability coefficient and associated standard error of measurement.

Item Statistics

Because the MME tests are used in making individual decisions about students, they must be very reliable, particularly at cut points (the score points that separate adjacent achievement level categories). Due to the fact that eligibility for Michigan Promise Scholarships[1] is involved at the high school level, the reliability for the scholarship cut score must be very high. Target reliability coefficients of .90 (or higher) are therefore set for each test. Other psychometric properties include item difficulty, item discrimination, and differential item functioning. General statistical targets are provided below.

For Multiple-Choice (MC) Items

- Percent correct: between 30 and 90 percent
- Point biserial correlation with total score: .25 or greater
- Mantel-Haenszel Differential Item Functioning (DIF) analysis: Few Category C items

It should be pointed out that the point biserial correlations for MC items assume embedded field testing and employ the base test total score, which is independent of the field tested item.

Differential Item Functioning

Items that disadvantage any identifiable subgroup of students are considered biased and detract from the validity of the tests. While only human judgment can determine whether or not an item is biased, item statistics can serve as a tool to help the BSC make these determinations. After field testing, the BSC reviews item statistics that detect differential item functioning (DIF). Specifically, Mantel-Haenszel statistics are used as measure of DIF. Mantel-Haenszel statistics are the industry standard methodology for DIF analyses, and correspond well with the categories used by Educational Testing Service (ETS). These analyses are conducted after field testing. The Mantel-Haenszel statistics are generated for each item, which alert DAS and the BSC committee to the possible presence of DIF. At this point, the BSC reviews the item further to substantiate the item statistic flag. If the item is found to indeed have DIF, it is not used in its current form in further assessments.

Field Testing Embedding

No released items are made for MME and pre-equating is not employed for the MME.

[1] Please note that, as of the spring of 2011, funding is not available for the Michigan Promise Scholarship. However, funding was available at the time of the 2009 test administration. Additionally, students are still encouraged to take the complete MME to establish their eligibility for the Promise Scholarship should funds become available.

Post Field Test Item Review

After field test administration, an item review process is undertaken to evaluate the items for further use. This section describes the steps of that process, which include: (1) preparing item statistics for internal use and for review committees; (2) internal and contractor review of statistics; (3) item review, including item statistics, by bias and content committees; and (4) potential item revisions.

Field Test Item Statistics and Data

All field test items were embedded in the live test forms for each test. After the calibration of live test forms, field test items were calibrated and put onto the same scale as the live operational items. The statistics for each field test item can be summarized into nine categories.

1. General test information: test name, subject, grade, level;
2. Administration related information: year cycle, administration year, released position;
3. Specific item information: MME item ID, CID, item type, answer key, maximal score, maturity, item function, character code, number of forms the item appears on, form numbers, test position, n-count (total, male, female, white, and black students), percent for each comment code, percent for each condition code;
4. Content-related information: strand, benchmark, grade level expectation, depth of knowledge, domain, scenario;
5. Option analysis: percent for each option and each score point (total, male, female, white, and black students), p-value or item mean (total, male, female, white, and black students), adjusted p-value, difficulty flag, item standard deviation, item-total correlation, biserial/polyserial correlation, corrected point-serial correlation, item-total correlation flag, option point-biserial correlation, flag for potential miskeying;
6. DIF analysis: Mantel Chi-square, Mantel-Haenszel Delta and its standard error, signed and unsigned SMD, SMD signed effect size, DIF category, and favored group for male versus female comparison and white versus black comparison;
7. IRT parameters: b-parameter and its SE, step parameters and their respective SE, item information at cut points;
8. Fit statistics: mean-square infit, mean-square outfit, mean-square fit flag, misfit level; and
9. Data for creating plots: conditional item mean for decile 1 to 10 for each student group (total, male, female, white, and black students) for creating conditional mean plots, 5th, 25th, 50th, 75th, 95th percentile for creating Box-and-Whisker plots for each student group (total, male, female, white, and black students) for each option and each score point.

The process of generating item statistics is as follows:
For Days 1 and 2, ACT completes all scoring and produces raw scores, which they send to DAS. For Day 3, Measurement Incorporated completes the scoring, and provides DAS with raw scores and with any necessary erasure analyses. DAS then creates a matched file, with data from Days 1, 2, and 3 and returns this to ACT. ACT calibrates the tests and calculates the scale scores, conducts IRT analyses, and produces the statistics listed above, which they then provide to DAS for further analyses and use by review committees and DAS psychometricians. Finally, Measurement Incorporated produces the final score reports, using the scale scores and other information generated by ACT.

Statistics Prepared for Review Committees

From the analyses listed above, the following statistics were used to create item labels for the post field test reviews. Different sets of statistics were prepared for MC for review committee. Figure 3.1 displays all the

statistics that were prepared for MME Day 3 MC items for CAC and BSC data review. These include five categories:

1. General administration information: program or test name, grade, subject, and administration cycle;
2. Item general information: ItemID, maturity, forms and positions and Michigan high school expectation or standard;
3. Item specific information: administration type, key, adjusted p-value, n-count, difficulty flag, item-total or point-biserial correlation, item-total correlation (ITOT) flag, mis-key flag;
4. Breakout group descriptive statistics and optional analysis: percent of students selecting each option, omitting the item (Omit) and selecting multiple options (Mult), option point-biserial correlations, and n-count for all and subgroups: male, female, white, and black students;
5. Differential Item Functioning: flag, and favored group for male versus female and white versus black.

When the p-value for an MC item was out of the desired range, a difficulty flag was shown. When item-total correlation or point-biserial correlation for an MC item was out of range, a point-biserial or item-total correlation flag was shown. If the DIF level for male versus female or white versus black comparison was higher than moderate, a DIF flag was turned on. When options did not function well or score point distribution was abnormal, a mis-key flag was turned on. The criteria used for flagging an MC item are presented in Table 3.11.

CAC Committee

Content Expectation: P2.2B

Cycle: Spring 2013

Administration Type	NCOUNT	Adjusted p-value	Difficulty Flag	Item-Total Correlation	ITOT Flag	Miskey Flag		Performance Statistics					
								Opt A*	Opt B	Opt C	Opt D	Omit	Mult
Standard	16,399	0.27	PL	0.36		F	Option Percent	26.52	51.78	16.10	5.27	0.26	0.05
							Correlation	0.36	-0.04	-0.25	-0.19	-0.04	NA

BSC Committee

Content Expectation: A1.2.1

Cycle: Spring 2013

Administration Type	Group	NCOUNT	Adjusted p-value	DIF Flag		Performance Statistics					
						Opt A	Opt B*	Opt C	Opt D	Omit	Mult
Standard	All	16,146	0.70	NA	Option Percent	4.80	70.14	22.44	2.55	0.07	0.01
					Correlation	-0.16	0.51	-0.42	-0.14	-0.03	NA
	Female	8,372	0.67		Option Percent	4.68	67.24	25.57	2.42	0.08	0.00
	Male	7,774	0.73	A	Option Percent	4.93	73.27	19.06	2.68	0.05	0.01
	Black	2,355	0.40		Option Percent	7.60	40.04	46.92	5.31	0.13	0.00
	White	12,071	0.76	C	Option Percent	4.35	76.19	17.33	2.08	0.04	0.01

Figure 3. MME Day 3 item information and statistics for CAC and BSC data review.

Table 3.11. Flagging Criteria

Statistic	Desired	Definition	Comments
P-value	> 0.3 and < 0.9	The percentage of students who answered the item correctly.	Outside this range and the item may be too difficult or too easy. The desired overall mean p-value on a test is around 0.6.
PB Correlation	> 0.25	The relationship between students' performance on an item and their performance overall on the test.	Any less than 0.25 and the item may be unreliable in discriminating well between the high and low achievers; if less, consider the response distribution and the item content.
DIF Flag	No Flag	DIF refers to the differences in performance on a studied item between the reference and the focal groups after the two groups have been matched by ability.	DIF only indicates that the examinees of equal proficiency from different subgroups have an unequal probability of responding correctly to an item. The items that exhibit DIF should be carefully examined for potential bias against particular groups.
Option Analysis	The option of key has the highest percentage	Option analysis (Score point distribution) shows the percentage of the total students and those in the gender and ethnicity subgroups who chose each option.	The keyed option should usually have the highest percentage. The keyed option point-biserial correlation should be larger than 0 while the non-key option should be smaller than 0.

Notes: Explanation of Flags:

PL p-value low
PH p-value high
CL correlation low between item and total
B moderate DIF
C substantial DIF
H highest percentage is not a keyed option
L low percentage of any option *(less than or equal to 2%*)
P positive pb-correlation for any non-keyed option
N negative pb-correlation for the keyed option
O omit has a positive pb-correlation greater than .03

Item Reviews

Bias/Sensitivity and Content Committee Review

DAS and DRC jointly planned and conducted Bias/Sensitivity committees (BSC) and Content Advisory committees (CAC) data review on field-tested items that were flagged either because of Differential Item Functioning (DIF) or any other content related item property (see flagging criteria on Table 3.11 and Appendix E for more details). The goal of these committees was to identify items that are eligible to be used as scorable items in future operational assessments. In these meetings, items may be either: a) accepted "as is" or b) discarded. The DAS identified the members of the BSCs and CACs using members previously involved in the development contractor committees.

DAS and DRC prepared items following field testing for reviews by a Bias/Sensitivity Committee and a Content Advisory Committee. ACT provided the field test statistics necessary to load into Michigan's IBS. DRC, in collaboration with DAS, assembled all materials for the meetings including the items, data, and analyses of the items, agenda, training materials, security agreements, and sign-in sheets. Each committee met for one or more days depending on the number of flagged items. The reviews were guided by checklists to ensure that the items meet the criteria for inclusion in the item bank and for potential use on future examinations. DRC reviewed the flagging and review criteria with DAS to be sure that all nuances of acceptability are captured correctly. The review panel examined each item and determined if it is of high quality and matches the intended assessment objective. The items were reviewed to ensure they are appropriate for the grade level. The determination of accuracy of all material, checking that each question has only a single right answer, was part of the review process. The item statistics for each item were presented, along with a general orientation to interpretation and the use of data in item approval. The bias and sensitivity committee focused additionally on issues that ensure items have no stereotypical statements, present no unfair advantage or disadvantage to any group, and are free of bias for race, ethnicity, gender, age, disability status, and any other category of individuals for whom the item may be unfair. These reviews occurred in face-to-face group meetings using Michigan's IBS. Separate review sessions were created for content and bias/sensitivity review. DAS and DRC worked collaboratively in the IBS to review all reviewers' comments and to make sure that the committee's decisions were recorded accurately in the system.

Item Revision Procedures

Generally, the field test data review committee examines items and either accepts them, recommends for revision, or rejects them. DAS must approve of any changes to the item, and if the committee or DAS believes significant changes are required to improve the item, it is rejected as ready for operational use.

The committee's recommendations are entered into the IBS. At this time, the field tested items are available for use on operational forms.

Item Banking Process

The following summarizes the general process of the DAS IBS that is used in MME Day 3 Michigan component test forms development.

The Michigan Item Banking System is a secure web-based application that dynamically supports in one system:

1) all item development processes throughout the entire life cycle of an item from assignment through retirement;
2) all test development processes from blueprint design through test map generation and approval, and subsequent uploading of item statistics for a test administration;
3) item maturity and version control throughout the item development and maturation cycles, controlling item availability within specific item pools (pilot testing, field testing, or operational);
4) all state-level summative assessment programs.

Access – Access to the Item Bank System (IBS) can be requested via the "Request access" link on the IBS home page (https://www.michiganitembanksystem.org/). Access to items within the IBS is based on user role permissions, item maturity, and specified assessment program (e.g., MME), content area (e.g., Science) and grade level permissions..

Item Assignment—The item development process begins in the IBS with the assignment of an item to a specific item writer. Item assignments are based on item inventory and blueprint design. The item assignment specifications include the content expectation being measured, item type, taxonomy level (DOK for MME items), and due date. When the item assignment is submitted, the system assigns a unique Item ID to the item. The item will retain this unique ID through its life cycle. The maturity of the item will be updated as it progresses through its life cycle, and the version of the item will be updated with each change to the item. Each version of the item is retained and viewable within the IBS history. The item writer can only access items assigned to them, and only in the item's submitted state.

Item Development—When the Item Writer submits the item, the Content Lead can accept the item, request further revision by the Item Writer, or reject the item. Once the Content Lead accepts the submitted item, they can make further revisions to the item text. If there is a graphic request, the item will be routed to the Composition Team to create the item graphic(s). When the graphic requests are fulfilled, the item will be routed back to the Content Lead to review the item and graphics. If revisions to the graphic are needed, this graphic revision and review process will continue until the Content Lead accepts the item for CACs and BSCs Committee Review.

CACs and BSCs committee members work within the Item Banking System to preview each item and provide their feedback with recommendation for acceptance, revision, or rejection. Committee Members are only able to view the items assigned to their committee, and they only see their own feedback. A Committee Facilitator is able to review all committee member feedback and initiate discussion on any item where there is not agreement. The Committee Facilitator will enter the consensus comment into the IBS. All committee feedback is also retained and viewable in IBS.

Following the Initial Committee reviews for BSC and CAC, the Content Lead can accept the item as is, or reject the item, flagging as Do Not Use (DNU), which will prevent it from progressing through the system. The Content lead can also edit the item based on committee feedback and route for graphic revisions if needed. Once the Content Lead has accepted the item, it is routed to a Composition Editor who reviews the item in the IBS for proofing and ensures that it meets the MME Style Guide specifications. The Editor can approve the item or suggest revision, but cannot alter the item. The Content Lead will determine whether to make the suggested revisions or not, but Editor feedback is retained in the IBS.

***Item Banking*—**Once the Content Lead and the Editor have approved the item content (there is no layout at this point), the Content Lead "banks" the item as is by routing it to the appropriate item pool, updating the maturity as Ready for Pilot Test or Ready for Field Test. The item never leaves the IBS. This process maintains maturity and version control of the item, while removing the item editing and revision process from the critical path of test development and form production.

The item is available for use in the applicable inventory pool based on its maturity. Item statistical data upload into the IBS will advance the maturity of the item to Pilot Tested or Field Tested and route the item for Data Review. The data review process is similar to the Initial Item Review process defined above with the addition of statistical data being available in the item bank for committee member review. An item may be routed to the Operational pool by the Content Lead following Data Review; the item may undergo suggested revision and be routed for Re-Field Testing; or the item may be rejected and flagged as DNU which removes it from any item pool availability.

***Test Development*—**The IBS provides the functionality for a Content Lead to build a test blueprint inside the item bank, specify the number of forms, quantity, and type of items by content expectation, determine item function (common, matrix, or field test), and identify equating or linking items for the test map.

The IBS will generate a test layout showing the content expectation, item type, and item function in each test position. The Content Lead can rearrange the item positions based on the preceding criteria. Once the Content Lead approves the test layout, the system will select the items to fill the test map based on the blueprint criteria and the selection algorithm.

The test map is then available for review and approval by the Content Lead. The Content Lead can rearrange or replace items during their review process. The most recent item statistics based on the administration type (standard, accommodated, make-up) will be displayed in the test map, and the system will generate for each form:

- a statistical summary for each test form including summary statistics for the adjusted p-value, item-total correlation, the three parameters and their standard errors, if available;

- Summary Frequency for Scoring keys, DIF ranges, and item types;

- Item Statistics Detail including Adjusted p-value, Item-Total Correlation, each of the three parameters and their standard error, if available; and

- Test Characteristic Curve, Test Information Curve, and Test Standard Error Curve compared to the Base Curves selected by the psychometrician.

***Psychometric Approval of Test Map*—**Once the Content Lead has approved the items in the test map, the lead psychometrician will receive notification from the IBS that there is a test map pending their review and approval. The psychometrician can approve the test map as is, or recommend revision. The Content Lead or the psychometrician can search the item bank to identify items that match the criteria to improve the test map. The Content Lead can replace items in the test map until both the Content Lead and the psychometrician have approved the test map. At that time the test map is "locked down" and no additional changes may be made to the test map.

***Creation of Test Forms* —**Once the test map has received both the Content Lead and Psychometric approval, the system will generate an export of the item elements (stem, options, and graphics) for each unique item in the test map.

The Composition Team will create a OnePer for each item. The OnePer is a single page layout presentation for each item (one item per page) to represent how that item will be displayed each time it appears in a test form. Each unique item in the test map will only be formatted once. This ensures consistency of item presentation across forms and test cycles.

The OnePers for the test map are uploaded into the IBS. The Content Lead will then compare the OnePer against the IBS to ensure content accuracy. Following Content Lead approval, the Editor will then review the OnePers to ensure item integrity with the Item Bank content. When the IBS system receives both OnePer approvals for the test map, the system will export the pre-composition materials (approved OnePers) in sequence for each form in the test map, for creation of the printed test booklets from the sequenced OnePers.

At this point in the process, the review of the individual test forms becomes external to the IBS. The cycle resumes in the IBS with the upload of Item Statistics after test administration, continuing the cycle of data review, items advancing in maturity, and selection for appearance in a test map at the appropriate maturity level. (For more information about the item development and item banking process, please refer to **Appendix A: Diagram of DAS Item Banking Process**).

Construction of MME Operational Test Forms

The Michigan Department of Education's Division of Accountability Services (DAS), formerly the Office of Educational Assessment and Accountability (OEAA), ACT, and DRC worked collaboratively to develop and construct the operational test forms for the Day 1, Day 2, and Day 3 Michigan-Developed components of the MME for the Spring 2014 test cycle. For the Day 1 ACT Plus Writing and Day 2 *ACT WorkKeys* forms, DAS and ACT staff worked together to select those items counting toward MME scoring and reporting. For the Day 3 Michigan components, DAS staff, with the assistance of DRC staff, developed the test forms by using the DAS Item Bank System.

Assessment Blueprints and Test Maps

As the name implies, the assessment blueprints include test design and content sampling plan (e.g., number of operational and field items) across forms of the test. Information on the blueprint also includes a number of common, matrix, and field test items and their available positions along with the content standards/expectations the items measure. Test maps are built based on the blueprint. In addition to the information provided by the blueprint, it provides more specifications of the test, including number of test forms, administration types (initial, makeup or accommodated), High School Content Expectations (HSCE) and standard strands, and basic classic and IRT statistics such as item difficulty (i.e., p-value), item discrimination index (i.e., item-total correlation), and estimated IRT parameters if the item has been used and calibrated before.

All MME assessments are designed to assess higher order thinking skills. Most items in all subject areas focus more on comprehension and application than on simple recall or recognition. Indeed, specifications for each assessment clearly include admonitions to avoid simple recall of trivial or unrelated facts.

For 2014, the MME Day 3 Michigan-developed assessment used multiple-choice (MC) items only. Each item is aligned to a specific domain, standard, and objective. The alignment information is used during the forms construction process to help ensure the forms match he blueprints.

This section provides an overview of the test blueprints for each subject, accommodated materials, and item specifications that guide the building of the operational test forms. The 2014 MME (Day 3 Michigan-developed) test contains three subject area tests: mathematics, science, and social studies. The test structures are summarized in this section.

Mathematics

The MME Day 3 Michigan-developed Mathematics Assessment is based on the Michigan High School Content Expectations. For 2014, each mathematics form includes a common set plus some matrix items and Field Test items (as needed). Six unique initial forms, one makeup form, and an accommodated form were constructed. In order to ensure comparability across all forms, each form is developed based on the carefully constructed test specifications and test development principles, outlined previously in this chapter. Equating methodologies are then used to ensure that the scales are on comparable levels (see Chapter 9 for more information on scaling and equating). These forms are spiraled within each classroom, so that all six initial forms are distributed across schools and students. The test structure for MME mathematics assessment is summarized in Table 3.12.

Table 3.12. Test Structure for the Spring 2014 MME Mathematics Core Test

Subject	# Common Operational	#Matrix	#Field Test	Total Operational Items
Mathematics	10	6	9	16

Science

For the 2014 MME (Day 3 Michigan-developed) Science test, each form consists of a common set of HSCEs (one item per Standard, for a maximum of 18 points from common items), plus a matrix of items that cover the other HSCEs (one item per Standard), and Field Test items. Six unique initial forms, one makeup form, and one accommodated form were constructed. As described in the mathematics section above, each form is comparable due to the test specifications and test development principles, and is then equated and scaled using the methodologies outlined in Chapter 9. The test structure for MME science tests is summarized in Table 3.13.

Table 3.13. Test Structure for the Spring 2014 MME Science Core Test

Subject	#Common Operational	#Matrix	#Field Test	Total Operational Items
Science	18	17	14	35

Social Studies

For the 2014 MME (Day 3 Michigan-developed) Social Studies tests, six initial forms, one makeup form, and one accommodated Form were constructed. As described in the mathematics section above, each form is comparable due to the test specifications and test development principles, and is then equated and scaled using the methodologies outlined in Chapter 9. The test structure for social studies tests is summarized in Table 3.14.

Table 3.14. Test Structure for the Spring 2014 MME Social Studies Core Test

Subject	#MC Operational	#Matrix	#Field Test	Total Operational Items
Social Studies	32	N/A	16	32

Accommodated Formats

Each operational test is available to students who require accommodations according to their IEP, section 504 Plan, or ELL instructional plan. Tests are available in Braille, large print, audio DVD, and video DVD. Form 12 is generally a unique form for accommodation for all three components of the MME. Students testing with accommodations take the MME in sequence within a two week accommodated testing window. For more detailed information regarding accommodated formats of the MME, see the *Spring 2014 MME Day 3 Administration Manual for Accommodated Testing*.

Item Selection

In addition to the content coverage requirements, the forms must also meet certain statistical targets. These targets are outlined in the next three sections below. For Spring 2014, Day 3 Michigan component items were selected through the DAS IBS.

Select Assessment Items to Match the Assessment Blueprints

Following field testing, the items are submitted for review to both the Bias and Sensitivity Review Committees (BSCs) and the Content Advisory Committees (CACs). These committees, composed of Michigan educators and Michigan citizens, sort the field-tested items and identify which items are eligible for inclusion in the operational item pool. There is a separate pool for each subject assessed. It is from these pools that items are selected to meet the requirements outlined in the assessment blueprints.

Test forms are developed using the selected items. In addition to overarching content requirements for each test form developed, content experts and psychometricians consider requirements related to subdomains, graphics and other visual representations, passage and content dependent items, and clueing concerns.

Assess the Statistical Characteristics of the Selected Assessment Items

The statistical process begins with the work of the Content Advisory Committees and Sensitivity Review Committees following the field test. The committees evaluate the field-test items using item statistics from classical measurement theory and item response theory models. From the work of these committees, a pool of items that are eligible to be used in constructing the operational forms is identified.

Because the MME assessments are used in making individual decisions about students, they must be very reliable, particularly at cut points (the score points that separate adjacent achievement categories). The targeted reliability coefficient is .90 (or higher) for each assessment. Other psychometric properties considered include item difficulty, item discrimination, and differential item functioning. General item and form level statistical targets are provided below:

<u>For Multiple-Choice (MC) Items</u>

- Percent correct: $.25 \leq$ p-value $\leq .95$.
- Point biserial: $\geq .25$.
- Mantel-Haenszel Differential Item Functioning (DIF) analysis: Few Category C items[2].

[2]For category C items, D's absolute value is significantly greater than or equal to 1.5.

To help ensure adequate coverage of a full range of achievement on the operational assessments, the draft forms are evaluated to see whether the following targets are met (see Table 3.15). As necessary, items are replaced on the draft forms until this distribution is approximately approached.

Table 3.15. Desired Range of Item Difficulty Distribution

Rasch Item Difficulty	% of items
-2.00 to -1.00	25
-0.99 to 0.00	25
0.01 to 1.00	25
1.01 *to* 2.00	25

Even with careful test form development, it is usually not possible to create alternate forms that are exactly equal with respect to difficulty. The MME assessments are being analyzed using Item Response Theory (IRT).

Review and Approve Test Forms

As the MME test forms are assembled in the DAS IBS, the statistics are easily available for review as the forms are built. Both classical and IRT statistics are included. The statistics available in the system include item p-values, correlations, and estimated IRT item parameters (i.e., item difficulty parameter for the Rasch model and item discrimination, item difficulty and guessing parameters for 3 PL model) for multiple-choice items and item means, standard deviations, and correlations. The above two steps require an iterative process to create test forms that are a combination of the content and psychometric information. Working together, Michigan psychometricians and content experts replace items until both groups are satisfied with the forms. Through this iterative process of item selection, item content takes precedence over statistical characteristics.

Once Michigan staff have reached consensus on a test form, the form along with the associated test map(s) and related information, is submitted in the IBS for final review and approval. DAS staff reviews the test forms to determine whether both content and statistical requirements are met.

Guidelines for test forms review include:

- confirm that all assessment items were accepted by DAS and the committees;
- confirm that all blueprint requirements are met;
- confirm that all content considerations including content/skill/topic balance, correct keys, no clueing, and correct graphics are met;
- confirm that the item and mean difficulty levels are accurate and meet requirements;
- confirm that the internal consistency reliability (Cronbach's alpha) is within the acceptable range for each form and IRT test characteristic and related curves look reasonably normal; and
- confirm that the assessments cover a full range of achievement levels.

As necessary, the Michigan content and psychometrician team work together to replace items that are identified by DAS as problematic, either from a content or psychometric perspective. As items are replaced, the match of the newly revised test form to the specifications is updated and reviewed. This process continues until the final approval of each form is completed.

Accommodated Test Forms

A testing accommodation is a change to the testing environment to assist a student with special needs so that assessment can mirror instruction as much as possible without invalidating test results. District and campus testing coordinators are responsible for communicating information about testing accommodations to test administrators and other interested individuals. Information about testing accommodations is also included in the test administrator manuals.

The decision to use a particular accommodation with a student should be made on an individual basis and should take into consideration the needs of the student and whether the student routinely receives the accommodation in classroom instruction and testing. All accommodations must be documented in the student's individualized education program (IEP), section 504 Plan, or ELL instructional plan.

Typically, accommodations allow for a change in one or more of the following areas:

- Presentation format
- Test setting
- Scheduling or timing
- Response format

The following accommodated testing materials are provided for the MME: Braille, Large Print, Oral Administration and Bilingual.

Accommodated Format Production: Day 1 ACT Plus Writing

For the MME Day 1 materials for the ACT Plus Writing, the Braille version is created from the unique accommodated form. This same form will be used for all students who take the ACT Plus Writing with accommodations. ACT test forms are designed from the outset according to principles of universal design, so that the tests are amenable to accommodations across the range of testing populations, conditions, and formats. ACT keeps tests as simple and straightforward as possible, consistent with curricular requirements—and this applies equally to vocabulary, graphics, typographic design, page layout, and the interrelationships among all these elements.

The accommodated form is provided to National Braille Press (NBP) for production of the Braille version. NBP is responsible for Braille transcription and creation of the raised line drawings included in the booklet. ACT does an additional proof of the Raised Line Drawings, but otherwise, NBP is responsible for all quality control checks.

Large Print

The Large Print format is developed from the unique accommodated form. ACT generally maintains the item layout of the regular type test booklet where possible; sometimes the layout of certain enlarged graphics must be adjusted so that the graphics do not cross over the binding and become obscured. ACT standard is 18-point font for large type. ACT produces and proofs the copy in-house before delivering it to The Brandt Company for printing. Brandt performs quality control checks in addition to the ones at ACT.

Oral Presentation

Students approved for oral presentation have the tests read to them, either by a live reader or from a recording, in the three formats outlined below.

Reader Scripts

Reader Scripts are used when a student will have the test read by a qualified member of the testing staff individually in a separate room. The Reader Script is created from the tapescript (see below) once the audio DVD masters have been approved. These scripts include detailed instructions to the reader on administration

procedures, how items are to be read, and guidelines to ensure a standardized administration no matter who is reading the tests. Reader Scripts are created from the unique accommodated form by ACT Test Development and proofed extensively before being delivered to RR Donnelley for printing. Reader Scripts are currently scanned directly from final camera-ready copy.

Audio DVDs
The audio recordings for audio DVDs are created from the unique accommodated form, using a tapescript written by ACT Test Development. The narrator is chosen by ACT. The audio recordings include a recitation of each item, as well as a recitation of all directions (stop, turn the page, etc.). They also include instructions for students on how to recheck their work or refer to passages in the test booklet students follow along with as needed. Once the masters are approved, a digital file is delivered to the audio DVD vendor to perform "tracking" that is unique to the audio DVDs. Tracking the discs enables students to efficiently refer back to items and recheck their work. Audio DVDs are only available in English for the ACT Plus Writing.

Translated and Video Formats: State-Allowed Administrations.

The ACT Plus Writing is also available as an English Video DVD. The video component consists of a test booklet on the screen, intertitles preceding the questions, and prominent arrows that follow the screen text in sync with the audio component, as a visual aid to students. Additionally, the ACT Mathematics and Science Tests, along with the directions for all tests, are translated into Spanish and Arabic, the top language groups represented in the state after English.

This translation is done from the unique accommodated form and is also presented as a video DVD using the same English video component as described above. ACT's subcontractor, Metro Studios, contracts out the translations, and is also responsible for synchronizing the English audio, translated audio, and English video components together. The translation team consists of a primary translator who also narrates the tests, a spotter who ensures the translated test is narrated exactly as shown in the Reader Script, and a proofer who compares the finished recording to the English version of the test and identifies any translation errors or questions. Metro Studios facilitates any necessary discussion between the original translator and the proofer, and revisions are made as needed. Metro Studios has primary responsibility for translation accuracy and performs quality control checks for all three video formats. Students testing with a translated format receive the accommodated test booklet, printed in English, with which to follow along. This booklet matches the one displayed on-screen in the video.

Accommodated Format Production: Day 2 *ACT WorkKeys*

In a particular administration, initial testing, make-up testing, and accommodated testing typically have different sets of questions. The test forms, however, are built to identical specifications and are fully equated to the other test forms administered in that testing situation as well as to forms used by the general population. Regardless of the accommodation, the same test form is used for the translated forms, Braille forms, large print forms, reader scripts, and other accommodations.

Translations

The International Test Commission has developed guidelines for test adaption, especially across cultures. The guidelines reference *Adapting Educational and Psychological Tests for Cross-Cultural Assessment* by Ronald K. Hambleton and colleagues (2005) regarding advantages and disadvantages of various translation methods. ACT's *ACT WorkKeys* Development team has chosen to use the back translation method of quality control.

ACT uses an outside company for the Spanish translations and a different source for the Arabic translations. ACT works with a local company that produces the translated materials of the *ACT WorkKeys* accommodated forms. Back translations are done by different personnel than those doing the original translation, for quality control. The *ACT WorkKeys* editor (MA, Foreign Language Education) then compares the back translation with the original reader script done by *ACT WorkKeys* personnel.

The company doing the Spanish translations has three staff members whose native language is Spanish, two of those with college degrees in communications and languages. The Arabic translation is also done by a staff member whose native language is Arabic, and who is a certified Arabic teacher and chair of a department for English Language Learners.

ACT WorkKeys Video DVDs are made available in English, Arabic, and Spanish. The same approach is used for these as for the ACT Plus Writing Video DVDs. However, in the case of the *ACT WorkKeys* test, *Reading for Information* is considered the language arts segment of the test and it is presented entirely in English. *The Applied Mathematics* and *Locating Information* segments (test questions, answer choices and Test Directions) are translated into either Arabic or Spanish for the audio component of each respective DVD.

Braille

ACT currently uses two vendors for the *ACT WorkKeys* assessments. Both vendors follow the codes set forth by the Braille Authority of North America (BANA) and the guidelines for proofreading as used for the National Library Service (NLS). You can find the NLS specifications and guidelines at its website: http://www.loc.gov/nls.

In short, the procedures for proofreading Braille are to have the document read after translation by a team consisting of a sighted person and a blind person. The blind person reads aloud to the sighted person, who follows the print. When that is completed, a correction sheet is returned to the translator. After those corrections are made, it goes to a different team to be re-read. All the text is re-read, keeping in mind the corrections from the first reading. After the test is corrected from the second reading and the corrections are approved, it goes to a QC person for review. The QC person compares the Braille to the hardcopy checking for any possible errors, which sometimes might be formatting Braille. When the document is approved, it is sent to have TA notes written, if applicable. The TA notes are then checked by the translator. When the test goes to the production floor, a percentage of the tests are checked by the same QC person before the final copies are produced.

It should also be noted that both vendors use transcribers and proofreaders that have been certified by the Library of Congress.

ACT also receives a proof copy of the Braille document. ACT staff review all tactile graphics and visually compare them to the original art to make sure everything is included.

Other media

Reader scripts are prepared by ACT for appropriate *ACT WorkKeys* assessments, indicating how each item should be read aloud (e.g., pronunciations of names, format of numbers, mathematical statements). Audio recordings are created using the reader script with a “spotter” following the script during the recording, and a “proof” copy is created for further checking by an *ACT WorkKeys* editor for exact match. For large print materials, text is typically enlarged 130%. As noted, all materials undergo several quality control checks.

Accommodated Format Production: Day 3 Michigan Components

The Spring 2014 MME Day 3 Michigan-developed accommodated forms, as the standard and makeup forms, were developed in house using the DAS IBS.

Braille

For the MME Day 3 materials, the Braille test is created from the accommodated form. Items for the accommodated form are selected specifically because of their adaptability to Braille (in addition to meeting test specifications). Doing this ensures that items do not have to be dropped from the Braille form and replaced with other items, which helps ensure the comparability of the Braille form to the accommodated form, and thus to the other test forms.

Once the accommodated form is produced, it is provided to an independent subcontractor, Cheeney Media Corporation, who is responsible for the production of all accommodated formats. Cheeney, in turn, subcontracts the Brailling and production of the Braille form to the American Printing House. After the American Printing House finishes translating the form into Braille, Cheeney Media conducts the appropriate quality control checks.

Large Print

Like the Braille format, the Large Print format is developed from the accommodated form. The items on this form are screened for adaptability to large print. Text is enlarged to one of four font sizes based on the degree of visual impairment. The font sizes offered reflect the sizes of print being used in current instructional situations. Mathematics diagrams requiring measurement are not enlarged.

Cheeney Media Corporation subcontracts the production of this format to the American Printing House as well and performs the appropriate quality control checks after the American Printing House produces the Large Print forms.

Oral Administration

Students may have oral administrations by having a test administrator read the script aloud or by using a pre-recorded audio version of the scripted test.

Reader Scripts

Reader Scripts are created for each test component for each day, indicating exactly how each item should be read aloud without compromising the quality of the item. For example, if a problem requires students to indicate the largest number, the answers would not be read aloud. These scripts include detailed instructions to the reader regarding how to administer the assessment fairly. They also include phonetic spelling and other guidelines to ensure that each Reader reads the script in exactly the same way, as this is important for a standardized administration. Reader Scripts are produced from the accommodated format, and are carefully checked by Cheeney Media Corporation and by DAS for accuracy (i.e. are all of the items the same on the accommodated form and in the Reader Script? Are there any errors in the spoken specification?)

Audio Recording

The audio recordings are created from the accommodated form, using the Reader Script as a script. The audio recordings include a recitation of each item, as well as a recitation of all direction (stop, turn the page, etc.). They also include instructions regarding how to review items if necessary. Audio recordings are available in English, Spanish and Arabic.

Bilingual Tests

The MME is printed in English, and is translated into Spanish and Arabic, the top language groups represented in the state after English. This translation is done from the accommodated form. For MME Day 3, Cheeney Media Corporation uses an independent subcontractor to perform the initial translations. These translations are then re-translated by a separate independent subcontractor to ensure accuracy. If there are any discrepancies, Cheeney Media facilitates the discussion between translators and produces a maximally accurate translation.

For the test administration, students receive an accommodated form with the questions printed in English, but are then provided with a DVD with the translation in Spanish or Arabic. Students may have the test interpreted on the day of testing for languages where a recorded bilingual version is not available.

Chapter 4: Administration

A valid and reliable MME assessment requires that assessments are aligned with the Michigan High School Content Expectations (HSCEs) and then administered and scored according to sound measurement principles. The MME is composed of three primary elements:

- Day 1 – The ACT Plus Writing;
- Day 2 – *ACT WorkKeys* (*Reading for Information*, *Applied Mathematics*, and *Locating Information*); and
- Day 3 – Michigan developed mathematics, science, and social studies.

Sound assessment practices require that schools administer all assessments in a standardized and consistent manner across the state to ensure that all students have a fair and equitable opportunity to attain MME scores that accurately reflect their achievement in each of the MME content areas:

- Reading;
- Writing;
- Mathematics;
- Science; and
- Social Studies.

Schools play a key role in administering the MME assessment in a manner consistent with established procedures, monitoring the fair administration of the assessment, and working with DAS to address deviations from required assessment administration procedures. School Test Supervisors, Backup Test Supervisors, Test Accommodations Coordinators, Room Supervisors, and Proctors play a key role in the fair and equitable administration of the MME Assessment.

Each public school and participating non-public school must designate the following Key MME testing staff: Test Supervisor, Backup Test Supervisor, and Test Accommodations Coordinator who meet the operational eligibility criteria to administer the MME. Each school building (or offsite testing facility) that administers the assessments must become established as an MME test center as approved by ACT. Key MME Staff were required view the MME administration webcast which was posted in the fall and designed to provide a standardized presentation of all the information necessary for administering both the Standard Time and Accommodated Spring 2014 MME assessment. The following test administration manuals provided the basis for the Power Point used in thewebcasts:

- *Spring 2014 – The ACT® Supervisor's Manual – State Testing;*
- *Spring 2014 – The ACT® Supervisor's Manual – State Special Testing;*
- *Spring 2014 – The ACT® Administration Instructions – State Allowed Accommodations;*
- *ACT WorkKeys – ACT WorkKeys® Supervisor's Manual for State Testing;*
- *ACT WorkKeys – ACT WorkKeys® Supervisor's Manual for State Testing – Special Testing;*
- *Spring 2014 – MME Day 3 Administration Manual for Standard Time Testing*; and
- *Spring 2014 – MME Day 3 Administration Manual for Accommodated Testing*.

In addition to the Key MME Testing Staff, Room Supervisors and Proctors are used to actually administer the tests. School staff eligible to administer the MME Assessments must meet the following criteria:

- Test (and Backup) Supervisors could NOT be related to any student taking the MME in 2013–2014 anywhere in Michigan.
- Room Supervisors and Proctors could NOT assist in a room where any relative was being tested.
- Test Accommodations Coordinators could NOT be related to or be a guardian of any student taking the MME accommodations anywhere in Michigan during the testing year.
- Test Accommodations Coordinators could NOT be an athletic coach when any student athlete was tested with accommodations.
- Room Supervisors could NOT be an athletic coach and administer the MME to a student athlete in a one-one-one situation (either Standard Time or Accommodated testing).
- Relatives or wards include children/stepchildren, grandchildren, nieces, nephews, siblings, in-laws, spouses and persons under Key Staff's guardianship.

Depending on the number of students in each room, trained Room Supervisors and Proctors were assigned to assist Test Supervisors or Test Accommodations Coordinators. The following staffing guidelines were required: A Proctor may be used to assist a Room Supervisor or the Test Supervisor if fewer than 25 students are testing. A Proctor is required (in addition to the Room Supervisor) for every 25 students (or portion thereof) after the first 25 in a room. A Proctor is required (in addition to the Room Supervisor) for every 10 students testing with accommodations, after the first 10 in a room.

Roles and responsibilities of the Test Supervisor, Backup Test Supervisor, Test Accommodations Coordinator, Room Supervisor, and Proctor are specified in the *Spring 2014–ACT Supervisor's Manual – State Testing, Spring 2014– ACT Supervisor's Manual—State Special Testing*, *Spring 2014 Administration Instructions State-Allowed Accommodations*, *ACT WorkKeys Supervisor's Manual for State Testing*, *ACT WorkKeys Supervisor's Manual for State Testing—Special Testing*, and the Day 3 Spring 2014 *MME Administration Manual for Standard Time Testing* and the *Day 3 Spring 2014 MME Administration Manual for Accommodated Testing*.

Michigan is committed to assessing all public school students as required by state policy and federal law and has provided the opportunity for non-public schools to participate on a voluntary basis. Consequently all Michigan students identified as 11th graders in the Michigan School Data System (MSDS) were either required to test or given the opportunity to take the MME. All eligible 12th grade students were offered the opportunity to take MME.

Preparation for Test Administration

The Test Supervisor, Backup Test Supervisor, and Test Accommodations Coordinator are required to protect the integrity of all secure test materials and ensure that all students at their school are tested under the same conditions as students at every other school administering the MME.

<u>Qualifications and Requirements for Test Supervisors and Backup Supervisors include:</u>

1. Not be related to or guardian of any student participating in State Testing with standard time anywhere in Michigan on either the initial or makeup test date this year. (Relatives or wards include children, stepchildren, grandchildren, nieces, nephews, siblings, in-laws, spouses, and persons under their guardianship.)
2. Be proficient in English.
3. Be experienced in testing and measurement.

4. Be a staff member of the school.
5. Have control over locked, limited-access storage at the school to secure the test materials.
6. Ensure that the tests are administered in strict compliance with all policies and procedures as documented in each Supervisor's Manual (one for each day of testing).
7. Not be engaged in test preparation activities for the ACT or *ACT WorkKeys* at any time during the current testing year (September through August), except as specifically required by school contract. The normal duties of a counselor or teacher are **not** a conflict of interest, provided they are part of job responsibilities specifically defined by one's employer and the employer is not a commercial enterprise.

Primary Responsibilities

1. Newly appointed Test Supervisors and Backup Test Supervisors must participate in a mandatory Q&A session conducted by ACT, Measurement Incorporated and Michigan Department of Education staff. Dates and times are provided to appropriate staff in correspondence from ACT.
2. Read and follow exactly all policies and procedures in each Supervisor's Manual (one for each day).
3. Arrange for all students to complete pre-test sections of their answer folders in a supervised session at school before test day. Affix barcode labels to student answer folders prior to test day.
4. Arrange for all students to test on the designated test dates with testing as the first activity of the morning. All room supervisors must begin reading the Verbal Instructions no later than 9:00 a.m.
5. Make arrangements for test rooms that meet standard testing requirements, including well-spaced seating facing the same direction, manageable security, good lighting and ventilation, adequate writing surfaces, and required space between students.
6. Ensure test rooms are free from distractions during the test session(s) (bells, public address system turned off, etc.) and separated from regular school activities.
7. Ensure standard time enrollment figures have been provided as directed.
8. Receive, check-in, and ensure security of test materials upon receipt until return. Take steps to protect materials from damage, theft, or loss, and from conditions that could allow prior access to the tests.
9. Identify a sufficient number of qualified assistants to serve as room supervisors and proctors. One room supervisor is required per room, plus one proctor for every 25 students in the room after the first 25. All testing staff must be proficient in English, may not be involved in commercial test preparation activities outside of normal school duties, and may not be enrolled in high school. No room supervisor or proctor may assist in a room where a relative is testing.
10. Conduct training for all room supervisors and proctors before the test dates, including a complete review of each Supervisor's Manual (one for each day).
11. Ensure all testing staff remain attentive to testing responsibilities throughout the entire administration, including accurate timing of test sections and breaks and monitoring for prohibited behavior.
12. Complete, verify, and return all required reports, seating diagrams, forms, answer folders, test booklets, and accommodated testing materials immediately after testing.
13. Document all irregularities and consult directly, and immediately if required, with ACT, DAS, and Measurement, Inc., as appropriate, regarding actions to be taken.
14. Cooperate fully with ACT, DAS, and Measurement, Inc., if applicable, to investigate and resolve suspected or documented irregularities.

Qualifications and Responsibilities for Test Accommodations Coordinators:

1. Not be related to or guardian of any student participating in State Testing with Accommodations anywhere in Michigan this year during the two week testing window for accommodations. (Relatives or wards include children, stepchildren, grandchildren, nieces, nephews, siblings, in-laws, spouses, and persons under their guardianship.)
2. Be proficient in English.
3. Be experienced in testing and measurement.
4. Be a staff member of the school.
5. Have control over locked, limited-access storage at the school to secure test materials.
6. Ensure that the tests are administered in strict compliance with all policies and procedures as documented in each Supervisor's Manual for accommodated testing (one for each day of testing).

To avoid the appearance of a conflict of interest and to protect both the student and testing staff from allegations of impropriety, the Test Accommodations Coordinator must also:

1. Not be a private consultant or individual tutor whose fees are paid by a student (or the student's family) for whom accommodations are requested.
2. Not be engaged in commercial test preparation activities at any time during the current testing year (September through August), except as specifically required by school contract. The normal duties of a counselor or teacher are not a conflict of interest, provided they are part of job responsibilities specifically defined by one's employer and the employer is not a commercial enterprise.
3. Not be involved in coaching high school or college athletics (applicable only if any student requesting accommodations participates in athletics). This qualification is in place to protect testing staff who receive and handle secure test materials and who administer the test to students individually or in very small groups without other testing staff present.

Primary Responsibilities

1. Determine which students need ACT-Approved Accommodations or State-Allowed Accommodations. Complete and submit ACT-Approved Accommodations applications and request State-Allowed Accommodations. The ACT-Approved Accommodations application requires gathering required signatures and compiling supporting documentation. Determine accommodations needed for Day 2 and Day 3 and provide the information to the Test Supervisor who then orders the materials from DAS Secure Site.
2. Provide timely response to requests from ACT for additional information about individual students.
3. Newly appointed Test Accommodations Coordinators must participate in a mandatory Q&A session conducted by ACT, Measurement, Inc., and Michigan Department of Education staff. Dates and times are provided to appropriate staff by ACT.
4. Train room supervisors and proctors who will assist with the administration of tests to students approved for accommodations.
5. Check-in all secure accommodated test materials and, in consultation with the Test Supervisor, maintain security of all accommodated testing materials.
6. Arrange for all students to complete pre-test sections of their answer folders in a supervised session at school before test day. Affix barcode labels to students' answer folders prior to test day.
7. Arrange for all students to test within the designated accommodations testing window using only the authorized accommodations and materials assigned to each student.
8. Assign students to test rooms, separated by timing code with a room supervisor for each room. Students with different timing codes cannot test in the same room.
9. Complete, verify, and return all required reports, seating diagrams, forms, answer documents, and test booklets/alternate formats as directed immediately following the end of the accommodated testing timeframe.

10. Document all irregularities and consult directly with ACT, DAS, or Measurement, Inc., as appropriate, regarding actions to be taken.
11. Cooperate fully with ACT, DAS, or Measurement, Inc. to investigate and resolve suspected or documented irregularities.

MME Spring 2014 Test Administration Days

MME was administered to all eleventh graders and any twelfth graders who were eligible for a retest. For initial tests, Day 1 administration of the ACT Plus Writing was on March 4, 2014, *ACT WorkKeys* Day 2 administration was on March 5, 2014, and Day 3 Michigan-developed Components administration was on March 6, 2014. For makeup tests, Day 1 ACT Plus Writing was administered on March 18, 2014, *ACT WorkKeys* Day 2 tests were administered on March 19, 2014 and Day 3 Michigan Components were administered on March 20, 2014. The dates for testing students with accommodations were as follows: Day 1 ACT Plus Writing: March 4–18, 2014; Day 2 *ACT WorkKeys*: March 5–19; Day 3 Michigan-developed components: March 6–20.

Table 4.1 below summarizes the number of students tested for each day component and all three days—the whole MME assessment:

Table 4.1. Number of Students Tested in Spring 2014 (ACT/*ACT WorkKeys*/MME Day 3)

	MME Testing – Spring 2014
Day 1 – ACT	114,599
Day 2 - *ACT WorkKeys*	114,066
Day 3 – MME	11,3807
All Three Days *	11,2258

*This includes those students who met the attemptedness requirements for all three day components.

MME Day 1 and Day 2: Materials Processing

Materials Orders—Day 1 and Day 2

ACT used enrollment numbers provided by DAS to calculate standard materials quantities for Day 1 and Day 2 of the MME. Materials quantities for accommodated students were produced using historical data from the previous year's accommodations application and request process for Day 1 and through the online ordering system for Day 2.

Shipping—Day 1 and Day 2

To provide DAS with secure and dependable services for the shipping of Michigan assessment materials, ACT's Distribution Center maintains the quality and security of material distribution and return by using such methods as sealed trailers and hiring reputable carriers with the ability to immediately trace shipments. ACT uses all available tracking capabilities to provide status information and early opportunities for corrective action.

Standard time materials are packaged by school and addressed to the Test Supervisors. Accommodations materials are packaged by school and addressed to the Test Accommodations Coordinator. Each shipment to a school contains a shipping document listing each school's materials.

Final standard time Day 1 and Day 2 materials quantities are packaged using information provided by the Test Supervisors when ordering test materials through DAS's secure website. Michigan educators also provide ACT with the Pre-Identification information needed to print barcode labels which are affixed to each answer document. Bar-coding of all secure materials during the pre-packaging effort allows the accurate tracking of these materials through the entire packing, delivery, and return process. It also enables ACT to inventory all materials throughout the packaging and delivery process and thus provide DAS with status updates at any time. For the Spring 2014 testing, secure and nonsecure materials shipped for Day 1 and Day 2 are summarized in Tables 4.2 through 4.5.

Day 1 Processing

Table 4.2. Total Secure Documents Shipped in Spring 2014 Administration

Test Booklets	Quantities
ACT Multiple Choice-Initial	152,079
ACT Multiple Choice-Makeup	6,814
ACT Writing-Initial	154,390
ACT Writing-Makeup	8,180
Total Accommodations	11,151
Total	332,614

Table 4.3. Total Nonsecure Documents Shipped in Spring 2014 Administration

Answer Folders	Quantities
ACT Plus Writing-Initial	163, 948
ACT Plus Writing-Makeup	1,544
Total	165,492

Day 2 Processing

Table 4.4. Total Secure Documents Shipped in Spring 2014 Administration

Test Booklets	Quantities
ACT WorkKeys Initial	149,150
ACT WorkKeys Makeup	7,395
ACT WorkKeys Accommodations	13,030
Total	169,575

Table 4.5. Total Nonsecure Documents Shipped in Spring 2014 Administration

Answer Folders	Quantities
ACT WorkKeys Initial	163,758
ACT WorkKeys Makeup	1,586
Total	165,344

Receiving and Processing—Day 1 and Day 2

Each school's shipment included a copy of the packing list along with other shipping information to permit the accurate inventory of materials upon receipt by the Test Supervisor or the Test Accommodations Coordinator. Day 1 and Day 2 materials were shipped via a secure carrier, with traceable means, to pre-

specified shipping addresses provided by the Test Supervisors and Test Accommodations Coordinators from each school. ACT standard shipping process does not allow for shipment to districts. These shipments were comprised of non-secure shipments followed by shipments of secure test materials. The nonsecure shipments included administration manuals, pre-printed barcode labels, and the answer documents students needed prior to the Day 1 and Day 2 assessments to complete the noncognitive sections of the ACT and *ACT WorkKeys* in a supervised in-school pre-test session.

ACT requested each school's Test Supervisor or Test Accommodations Coordinator inventory the materials sent, verify the shipping contents and call ACT's toll-free number to report any shipping problems or materials shortages. Instructions were provided for secure storage of materials until test day.

Test Security—Days 1 and 2

Secure test materials include all ACT and *ACT WorkKeys* test booklets and used answer folders. The Test Supervisor is responsible for the security of all test materials from the time the carrier delivers them to the school to the time they are in the return carrier's possession. The Test Supervisor must protect the materials from damage, theft, or loss, and from conditions that could allow prior access to the tests.

Test materials must be kept in a locked, secure area, such as a vault or nonportable cabinet in a locked, limited-access room. Only the Test Supervisor, Backup Test Supervisor, Test Accommodations Coordinator, and possibly a few specifically authorized persons may have access to the area. If the security of test materials is compromised, ACT will not report scores.

ACT and *ACT WorkKeys* test booklets are copyrighted and cannot be photocopied or used for any purpose other than testing. Under no circumstances is a test booklet seal to be broken by anyone other than the student as instructed on test day. Testing staff and students are prohibited from disclosing test questions, essay topics, or response choices to anyone.

Directions in the manuals note that testing staff who observe a student engaging in one or more prohibited behaviors should mark the student's answer folder VOID and complete an Irregularity Report. The Room Supervisor is instructed to immediately notify the Test Supervisor of the suspected prohibited behavior. Michigan School Scorecards and accountability requires the use of a valid assessment score. A student without a valid assessment score is considered "not assessed" for accountability purposes.

Materials Return—Day 1 and Day 2

Schools were provided with instructions and documentation for returning their materials.

The tracking numbers of the FedEx return labels were provided to each school and those numbers were entered into our internal tracking system database.

Materials were prepared for return by the Test Supervisor. They packaged the materials and used the cartons pre-labeled for FedEx pick up. On the day after the initial test day, FedEx was dispatched to each school that had been sent Day 1 and 2 materials to retrieve test materials. This process was repeated for each school on the day after make-up testing.

For accommodated materials, all materials must be returned after the close of the accommodated testing window. Test Accommodations Coordinators are provided with specific return instructions similar to those provided to Test Supervisors for non-accommodated materials.

Supervisor manuals provide clear instructions on how to assemble, box, and return testing materials after test administration. Because of the criticality of used test materials and quantities often involved, safety is also a major concern, not only for the materials but for the people moving them. Only single column boxes are used to distribute and collect test materials, so the weight of each carton is kept to a reasonable and manageable limit.

Preaddressed, prepaid labels are provided. The labels facilitate accurate and efficient sorting of each carton and its contents upon receipt.

Day 1 and Day 2 materials were returned directly to ACT.

Materials Discrepancy Checking Process—Day 1 and Day 2

ACT logged in the returned assessment materials from Day 1 and Day 2 of the MME during the check-in process. A check-in database was used for 2013-2014 to facilitate this process. The database tracked Day 1 and Day 2 standard time and accommodations materials. ACT followed up with schools to assure timely return of those testing materials, as well as tracked schools who did not return all testing materials.

Schools that have not returned any material
Detailed status reports are generated as test materials are received and checked in. These reports are monitored daily for missing or incomplete shipments, and follow-up occurs with schools missing materials.

Schools that have returned incomplete shipments
Detailed status reports, listing the number of boxes received from each school, are reviewed daily. An ACT team member will follow up with a phone call on quantities appearing to be less than expected as compared with FedEx tracking information.

Schools with missing secure test materials
After secure materials are scanned, reports indicating missing materials are generated. These reports identify materials and serial numbers and are provided to the ACT team for follow-up with the affected schools.

Schools Returning Answer Documents After Established 3/28/14 Cutoff Date
Documents were processed in accordance with late receipts processing guidelines mutually agreed upon by ACT and DAS.

Processing Assessment Materials Returned by Schools—Day 1 and Day 2

ACT logged in the returned assessment materials from Day 1 and Day 2 of the MME during the check-in process within 24 hours of receipt and the answer folders were prepared for scanning within 72 hours of receipt. ACT followed up with schools to assure timely return of all testing materials, as well as to track schools that had not returned all Day 1 and Day 2 testing materials. The status of each school was readily discernible from the database updated by check-in staff. ACT utilized standard processing procedures for the Day 1 and Day 2 assessments, in terms of transferring the documents from the check-in process to the scanning process.

MME Day 3 Michigan Components: Materials Processing

MATERIALS ORDERS

For Spring 2014 administration, Data Recognition Corporation (DRC) was in charge of the pre-test process including materials ordering, packing and shipping. Schools ordered all Day 3 materials through the DAS secure site. During the initial orders of materials, schools identified the number of standard-time assessment students and the number of students testing with each accommodated format of the test.

For approved schools that failed to place initial orders, DAS did not create an order for them. For these sites, DAS created an "empty" initial order so that they could place an additional order for all of their material needs.

Appropriate quantities of materials for each initial order were packed and shipped to each school in three shipments: one containing nonsecure materials; one containing secure standard-print materials; and one containing secure accommodated materials.

The initial nonsecure shipment to the Test Supervisor included: packing lists; school box range sheets; pre-ID student barcode labels; blank labels; answer documents (only in shrink-wrapped packs of 10); administration manuals for standard time testing (1 per 15 students); and administration manuals for accommodated testing (1 per 10 extended time only students and 1 for every school ordering any accommodated materials).

The initial secure shipment of accommodated materials to the Test Accommodations Coordinator included: all ordered accommodated format materials, including standard-print Form 12 test books for students testing with extended time.
The initial secure shipment of standard-print materials to the Test Supervisor included: packing lists; school box range sheets; security checklists; and test books.

Schools placed additional and makeup orders for specific quantities of specific items, rather than for the count of students testing. All additional and makeup orders were shipped to the Test Supervisors.

For all orders, Data Recognition Corporation combined the pull of data and the processing of those data into one step. This provided immediate feedback to DAS secure site about any orders that could not be filled immediately and eliminated duplicates of process data.

Packing

Data Recognition Corporation warehouse staff utilized a packaging application to generate an on-demand pick list. The pick list documented the specific materials and quantities to be included in an order, but not the exact barcode ranges for secure materials. After warehouse staff picked the materials for the order, the materials and pick list were delivered to a packing station. The staff member at the packing station initiated the packing process by scanning the order number on the pick list. The packing station employee then used a hand scanner to capture the barcode value on each secure material. As each material was scanned into the order, the packing application verified that it was the correct material and kept a running count of the quantity. After the packing station employee entered all order material information into the system, a validation check verified that the proper quantity of the correct materials had been packed.

All validation failures were displayed on the packing station screen. The packing station employee corrected any errors either by scanning more materials into the order, or by removing wrong or extra materials that were inadvertently placed next to the other materials within the order. Once all validation failures were corrected, and the material types and quantities matched the order information, the packaging application printed a packing list, school box range sheet, and if applicable, a security checklist to be included in the shipment.

Each packing station has its own UPS tracking label printer. By having this printer, each packing station remains independent of other orders during packaging and sealing. After each box is weighed and completed, buffer paper is added to the inside of it, and then it is sealed with heavy-duty plastic tape. Also, two labels are applied to the outside of the box: 1) a UPS tracking label, and 2) a DRC Carton ID label. The UPS tracking label has the following information on it: 1) UPS tracking #, 2) Recipient address, 3) UPS Service, 4) Weight, 5) Shipper address, 6) UPS box count (upper right side of label), 7) DRC box number (lower left side of label) 8) Project #, and 9) Project Name. The small DRC Carton ID label has the following information on it: 1) Carton ID number, 2) DRC box number, 3) Project name, 4) District code and school code, and 5) School name. The total number of boxes shipped for that school would be printed on the labels of the last box of the school, indicating "Box 8 of 8," for example.

All completed boxes were subjected to a random Lot Sample. Errors encountered in the Lot Sample were corrected, and error data was leveraged to recognize trends and promote additional training and correction.

Shipping

Data Recognition Corporation monitored UPS's distribution of materials to schools. Test Supervisors and Test Accommodations Coordinators were instructed to inventory all test materials, in order to ensure that they received an adequate supply of assessment materials. Test Supervisors were asked to call Measurement Incorporated's (MI) Call Center via a toll-free telephone number to report any problems. Questions that MI could not answer were forwarded on to Data Recognition Corporation for resolution.

Total Secure Documents Shipped in Spring 2014 Administration

Material Type	**Quantities**
MME Day 3 Initial Forms (01 – 06)	133,009
MME Day 3 Makeup Form (11)	7,058
MME Day 3 Accommodations Form (12) (includes forms within the accommodated kits)	14,398
MME Day 3 English Audio DVD Kits	5,024
MME Day 3 English Video DVD Kits	350
MME Day 3 Arabic Video DVD Kits	158
MME Day 3 Spanish Video DVD Kits	83
MME Day 3 English Reader Script Kits	1,086
MME Day 3 Braille Kits	13
MME Day 3 Form 12 Large Print Test Books	82

Test Security—Day 3

Procedures related to MME Day 3 (Michigan Components) test security are identical to those on MME Day 1 (ACT plus Writing) and Day 2 (WorkKeys). Upon arrival at the schools, test materials were to be inventoried and then kept in a locked, secure area, such as a vault or non-portable cabinet in a locked, limited-access room. Only the Test Supervisor, Back-up Test Supervisor, Test Accommodations Coordinator, and, possibly, a few specifically authorized persons were to have access to the area. Test booklets were not to be photocopied or used for any purpose other than testing. Under no circumstances was a test booklet seal to be broken by anyone other than the examinee as instructed on test day. Testing staff and examinees were prohibited from disclosing test questions or response choices to anyone.

One difference between Days 1 and 2 and Day 3 is the procedure followed should a Room Supervisor observe a student engaging in unethical practices. For Day 1 and Day 2 testing, prohibited behavior results in voided answer documents. For Day 3 testing, the Room Supervisors mark the "Prohibited Behavior" circle on the answer document and return the answer document. Measurement Incorporated scanned these answer documents and included them in data sent to MDE. However, Prohibted Behavior documents were not scored.

Materials Receiving and Processing—Day 3

For the 2014 test administration, Measurement Inc. was contracted for materials return items and consequent scoring and reporting.

Based on student counts, a Materials Return Kit was created for each initial order. A kit was sent to each Test Supervisor and to each Test Accommodations Coordinator at each school, at the same time that DRC shipped secure test materials to each school.

Each Materials Return Kit contained:

- a list of Materials Return Kit contents and instructions for materials return
- Test Administration Forms Envelopes
- Irregularity Report Envelopes
- Sealing Tape
- Paper Bands
- FedEx Labels
- Coding Stickers for return boxes
    - -Blue Measurement Incorporated Scorable Material Stickers
    - -Green Measurement Incorporated Non-scorable Material Stickers

The above items are placed in a plastic bag with a school identifying label applied to the top left corner. Additionally, MME Day 3 School Header Sheets were included in the Materials Return Kit shipments. Schools used these scannable header sheets to identify the school, form type, and quantity of answer documents returned to Measurement Inc.

Schools placed additional and makeup orders for specific quantities of specific items, rather than for the count of students testing. All additional orders of materials return items were shipped to the Test Supervisors.

Upon arrival at Measurement Incorporated, all boxes were scanned into the tracking system database where they were logged-in and checked against the pre-assigned school tracking numbers. This provided immediate information about the number of boxes received and their points of origin. Next, the boxes marked with a "Scorable" label were separated from the boxes marked with a "Non-scorable" label. Boxes without either label were processed as "Scorable."

Scorable Materials—Day 3

The boxes labeled "Scorable" were opened first to allow the removal of used answer documents. These answer documents, along with school headers, were then placed into bar-coded scan bins for IT Operations. (If there was no school header sheet, the Warehouse generated one, using information from the shipping label or from the answer documents.)

As the materials were transferred to IT Operations for scanning, the tracking number from the shipping box was scanned, along with the barcode for each associated scan bin. This procedure provided a permanent link between the school's box from which the answer documents were received and the scan bin that now contained those answer documents. When the scan bin was full, a scan batch ID sheet was placed on top and was linked to the scan batch ID label on the scan bin.

Non-scorable Materials—Day 3

Once the scorable materials boxes were processed, the boxes containing non-scorable materials were examined for removal of any incorrectly returned scorable materials. A separate, or "redundancy," check was performed on each box by a second individual to ensure that all scorable materials were discovered. Any scorable materials located during these searches were placed immediately into the appropriate scan bins according to the procedure outlined for other scorable materials. These scan bins of used answer documents were then forwarded to the IT Department for scanning and processing.

Security Check-In—Day 3

The security check-in process for the secure materials captured the security barcode number for each returned test booklet or accommodated format item. These materials were unpacked and scanned at a workstation equipped with a barcode reader and a PC. The scanned secure materials were then packed in barcoded boxes that linked the barcodes of each secure item to that box. All items were scanned twice by two different teams in order to ensure quality of the process and results.

Note: if any boxes, scorable or non-scorable, contained MME Day 1 (ACT) or Day 2 (*ACT WorkKeys*) materials, the worker first ensured that all Day 3 materials were removed from the box. Then, the box was sent to ACT, following the procedures outlined in the ACT document, "Process for Handling Misdirected MME Materials."

A report that listed security barcodes present in the master database, but not found during check-in, was produced.

Overall, 99.89% of secure materials sent were returned and checked-in. More specifically, of 177,282 secure materials sent, 177,077 were checked-in. This left 205 items "missing" for further investigation at the school level by DAS and Measurement Incorporated.

Scanning/Scoring of Answer Documents—Day 3

Once logged into the Operations Department, the scan bins were shifted to the cutting area, where one scan bin at a time was removed from the cart for cutting. The cutting operation converted the multi-page answer document into a stack of single sheets ready for scanning.

Note: when the answer documents were printed, each sheet was imprinted with a lithocode value unique to that document. Both a scannable and human-readable version of the lithocode were printed on every sheet of every answer document. In the unlikely event that a scan bin was dropped at the cutting or pre-scanning stage, the unique lithocode allowed the answer documents to be reassembled and the answer document integrity to be verified at the scanner and project database once these data were transferred. Software validations at the scanner ensured that all pages of each student's answer document were accounted for; thus, any pages that were out of order could be easily corrected prior to further processing.

Measurement Incorporated simultaneously image scanned all pages of a student's answer document using BancTec XDS IntelliScan color image scanners. The BancTec XDS IntelliScan is rated to scan 190 sheets per minute at an optical resolution of 240 dots per inch (DPI) and creates both JPEG and TIFF images for every page. These scanners utilize precision camera assemblies pressurized to minimize dust. This, plus low maintenance LED camera illumination, reduced the need for rescans. The scanner features a completely open paper path to dramatically improve document throughput. This paper path reduced the time to recover from paper jams and other common complications for scanners with more restrictive paper paths. Both sonic and vacuum double-sheet detection technology ensured that every sheet was scanned. In addition, BancTec has designed custom document integrity software for Measurement Incorporated. This application detects out-of-sequence pages. The scanner stops to allow operator correction before imaging, thus eliminating post scanning corrective action.

To ensure that all sheets in the scan bin were scanned, the last sheet in every bin was an "End of Batch" sheet. If the End of Batch record did not appear in the data file, an error alert was generated, and a technician made a visual check of the scan bin to verify that all answer documents were scanned. If necessary, the data file was re-opened, and any missing sheet(s) appended to the file, thereby creating a complete data file.

Data Correction—Day 3

Once all of the scanned data was combined to create the student records, data validation routines were executed. These routines analyzed these data and created error tables for answer documents containing questionable data. Common error detection routines included checks for the following situations:

- Inconsistencies in school, grade, or form
- Inconsistencies in headers and answer documents
- Duplicate student barcodes within the same bin or another bin of answer documents
- Missing student barcodes
- Missing or incomplete demographics (such as a blank name)
- Double marks in the demographic and/or multiple-choice grids

Measurement Incorporated utilized a double data correction process. Data correction operators used the Measurement Incorporated data correction application that retrieved flagged data records and highlighted the problem field on a computer screen so it could be resolved. The operator compared the highlighted data to the scanned image of the answer document, making any necessary corrections. Once an operator corrected a flagged record, the same flagged record was routed to a second data correction operator who

repeated the data correction process. After a flagged record was edited by two operators, the data correction application checked that both operators made identical corrections. In the event that the two corrections differed, the record was routed to a supervisory staff member for a third and final resolution. This process continued until all flagged records were examined.

To ensure accuracy, once a correction was written to the database, the document was validated again to ensure that the corrected edit had not created another error. All edits were recorded and tracked in Measurement Incorporated databases, along with the user ID of the staff member making the edits.

Multiple-Choice Scoring

After all flagged data were reviewed and corrected, the student selected responses were scored against the item answer keys. The Test Maps table, called tblTestMaps, was pulled from the DAS database in Michigan. Those data were converted into a set of 24 records; one set of correct answers (or answer key strings) for each of the three content areas, per each of the eight test forms. Then, those answer keys were applied to student responses to produce a string of ones and zeroes, indicating right and wrong answers. A validation process (key check) was used to detect any potential answer key problems. The students' selected responses and correct answer indicators were transmitted to MDE in a data file.

In all, 113,807 scored MME Day 3 student records were in the data files transmitted to MDE.

Table 4.8. Student Records Transmitted to MDE in Spring 2014 Administration

Form Type	Quantities
MME Initial	100,261
MME Makeup	3,693
MME Accommodations	9,832
Form Not Determined	21
Total	11,3807

Score Reporting

The basis for all report data was a student data "Match File" provided to Measurement Incorporated from DAS.

The MME score reports included: Individual Student Report, Parent Report, Student Roster, Student Record Label, ISD Comprehensive Report and District Comprehensive Report, State Demographic Report, ISD Demographic Report, District Demographic Report, School Demographic Report, State Summary Report, District Summary Report, and School Summary Report.

Measurement Incorporated provided each of the reports as a static or dynamic Adobe Acrobat PDF on the Electronic Report Hosting website. These PDF files were electronically transmitted to the MDE. The PDF files were divided into batches based on the report type, and the PDF files of each batch were placed in their own sub-directories. HOV Services (HOVS) produced PDF files separated by school. In addition to the electronic distribution of reports, the PDFs of reports were printed and distributed to the schools.

For schools in districts that selected the green option for reporting, the Individual Student Reports, Parent Reports, and Student Record Labels were printed. All other reports were available only online as PDFs.

The PDFs were extensively reviewed before the preliminary reports were printed and mailed. Labels and district reports were printed inline and sorted with the related school reports. Labels were printed on inventory label material. The reports were segmented by color card stock.

Reports packages were shrink-wrapped and packaged for traceable ground delivery throughout the state. Depending on the size of the report, the reports were placed in appropriate shipping boxes or envelopes. The packages were matched against a distribution list for accuracy and completeness of the cycle run.

Description of Reports

Parent Report

The Parent Report presented individual test results for all students in grades 11 and 12 who tested in a subject.

The Parent Report contained the following information:

- Scale score for each subject area
- Performance level for each subject area
- Subscore values for each subscore strand for each subject area, including the number of points the student earned, the number of points possible, and the percent correct
- Text, including a letter from the State Superintendent, performance level definitions, subject descriptions, assessment descriptions, and ACT and *ACT WorkKeys* descriptions
- Scale score graphs
- ACT test scores
- *ACT WorkKeys* level scores
- National Career Readiness Certificate Eligibility with footnotes to ACT websites

The Parent Report provided information for the following subjects: MME Reading, MME Writing, MME Mathematics, MME Science, and MME Social Studies.

Individual Student Report

The Individual Student Report (ISR) provided a detailed description of each student's performance in the subject areas assessed by the MME. This report was designed to help educators identify the academic strengths of their students and the areas that may need improvement. Schools may include these reports in student record files.

The Individual Student Report contained the following information:

- Scale score for each subject area
- Performance level for each subject area
- Subscore values for each subscore strand for each subject area, including the number of points the student earned, the number of points possible, and the percent correct
- ACT test scores
- Work Keys level scores
- National Career Readiness Certificate Eligibility with footnotes to ACT websites

The Individual Student Report provided information for the following subjects: MME Reading, MME Writing, MME Mathematics, MME Science, and MME Social Studies.

Student Roster

The Student Roster presented individual test results for all students in grades 11 and 12 who tested in a subject. It listed those students by class/group who took the test in the subject --regardless of what form they took.

The Student Roster contained the following information for each subject area:

- Scale Score
- Performance Level
- Subscore values for each subscore strand, including the number of points the student earned and the number of points possible

The last line of each subject of the report showed the number of students tested, defined as the number of students reported on the roster for that group.

The Student Roster provided information for the following subjects: MME Reading, MME Writing, MME Mathematics, MME Science, and MME Social Studies.

Student Record Labels

The Student Record Label provided a summary description of each student's performance in the subject areas assessed on the MME.

The Student Record Label consisted of the following information for each student:

- Demographic information
- Scale score and performance level for subjects tested

Student Labels provided student information in different subjects in the following order:

- Reading
- Writing
- Mathematics
- Science
- Social Studies

State Demographic Report, ISD Demographic Report, District Demographic Report, School Demographic Report

The Demographic Report was a statistical summary of twenty student demographic areas for all the subjects in a grade, aggregated in a student group. There were eighteen types of student groups, derived by combining the following modes, populations, and grades:

Modes:

- State
- District
- School

Student Populations:

- All Students
- Students with Disabilities
- All Except Students with Disabilities

Grades:

- 11
- 12

The Demographic Report provided data for the following subjects: MME Reading, MME Writing, MME Mathematics, MME Science, and MME Social Studies.

In calculating the percentage of students with scale scores at a certain performance level, both the numerator and denominator were expressed as a float, and the result of that calculation was rounded in the manner of the SQL function ROUND (numeric_expression, length).

State Summary Report, District Summary Report, School Summary Report

The Summary Report consisted of two pages:
1—A summary of performance levels achieved, compared to previous years
2—A distribution of scores by subject and strand in a grade

Both of the report pages were produced for all eighteen types of student groups reported, which were derived by combining the following modes, populations, and grades:

Modes:

- State
- District
- School

Student Populations:

- All Students
- Students with Disabilities
- All Except Students with Disabilities

Grades:

- 11
- 12

The Summary Reports provided data for the following subjects: MME Reading, MME Writing, MME Mathematics, MME Science, and MME Social Studies.

Any mean score in these reports was the average score calculated by summing the applicable scores and dividing that sum by the total number of those scores. Percentages were calculated by dividing the number in a category by the total number of students tested. In any division calculation, both the numerator and denominator were expressed as a float, and the result of that calculation was rounded in the manner of the SQL function ROUND (numeric_expression, length).

ISD Comprehensive Report and District Comprehensive Report

The Comprehensive Reports provided summary score data by subject and grade for public schools, aggregated in a student group. The District Comprehensive Report listed data for the district, followed by data for each school within the district. The ISD Comprehensive Report listed data for the ISD, followed by data for each district.

There were twelve types of student groups, derived by combining the following modes, populations, and grades:

Modes:
- ISD
- District

Student Populations:
- All Students
- Students with Disabilities
- All Except Students with Disabilities

Grades:
- 11
- 12

The Comprehensive Reports provided data for the following subjects: MME Reading, MME Writing, MME Mathematics, MME Science, and MME Social Studies.

In calculating the mean scale score or the percentage of students with scale scores at a certain performance level, both the numerator and denominator were expressed as a float, and the result of that calculation was rounded in the manner of the SQL function ROUND (numeric_expression, length).

Career and Technical Education (CTE) Reporting

CTE Centers received school-level Student Roster and Summary Reports of the MME scores for all students enrolled in CTE programs in their buildings. It is important to note that these reports were for informational purposes only and that CTE students' scores did not affect the aggregate scores for the students enrolled at schools where the CTE Centers may be located.

CTE reports were clearly marked as pertaining to Career and Technical Education so that districts could route the reports to the correct person(s) in the district. The Student Roster reports were broken out by Classification of Instructional Programs (CIP) Code—CIP Name and Class Group Code. The Summary Reports displayed the label "Career and Technical Education." Otherwise, the details of the formats for the Student Roster and Summary Reports followed the standard formats for those reports.

Printed reports were distributed via FedEx and, in most cases, sent directly to the schools. For contracted programs with operating building codes of '00000,' the printed reports were sent to the districts. CDs with CTE scores were sent to DAS. The Office of Career and Technical Preparation received copies of all reports in the event that the initial delivery was lost or misrouted.

Accommodations for Students with Disabilities (SWD) and English Language Learners (ELL)

All students are to participate in the assessment programs approved by the State Board of Education. For some students, accommodations that are customarily used during routine classroom activities may be considered for use during the administration of the MME assessments. The State Board of Education has approved standard and nonstandard assessment accommodations for the Michigan Educational Assessment System including MME, MI-Access, and ELPA.

The MME Accommodation Summary Table (pp. 83-110) identifies standard and nonstandard accommodations for students with disabilities, Section 504 students, and/or students with limited English proficiency (also referred to as English language learners, or ELL). Standard accommodations do ***not*** change the construct that the assessment is measuring and ***do*** provide a valid score. Nonstandard accommodations change the construct that the assessment is measuring, rendering scores that are not valid. Accommodations not listed in the table are considered nonstandard.

The Michigan Merit Examination (MME) consists of three major components administered over three days: the ACT Plus Writing, three *ACT WorkKeys* tests (*Reading for Information*, *Applied Mathematics*, and *Locating Information*), and Michigan-developed items for mathematics, science and social studies. Table 4.9 outlines the Spring 2014 test organization.

Table 4.10 outlines which components contribute to each MME score. The MME scores will play a role in qualifying for the Michigan Promise scholarship and will be the foundation for the accountability and EdYES! calculations and accountability reports for high schools.

The Michigan Merit Examination (MME) consists of three major components administered over three days: the ACT Plus Writing, three *ACT WorkKeys* tests (Reading for Information, Applied Mathematics, and Locating Information), and Michigan-developed items for mathematics, science, and social studies. The table below outlines the Spring 2014 test organization.

Table 4.9 MME Spring 2014 Test Organization

Spring 2014 Test Organization						
Day*	**Assessment**	**Subject Session**	**Number of Parts**	**Total Items**	**Testing Time (minutes)**	**Estimated Time Required for Administration**
Day 1 March 4 (Makeup March 18)	**ACT Plus Writing**	English	5	75 MC items	45	Total test administration time - including check in, instructions, breaks, and collection of materials – 5 hours
		Mathematics		60 MC items	60	
		Reading		40 MC items	35	
		Science		40 MC items	35	
		Writing		1 Prompt	30	
Day 1 Standard Testing Time 205 minutes (3 hours / 25 minutes)						
Day 2 March 5 (Makeup March 19)	***ACT WorkKeys***	Reading for Information	3	33 MC Items	45	Total test administration time - including check in, instructions, breaks, and collection of materials – 3.5 hours
		Applied Mathematics		33 MC Items	45	
		Locating Information		38 MC items	45	
Day 2 Standard Testing Time 135 minutes (2 hours / 15 minutes)						
Day 3 March6 (Makeup March 20)	**Michigan Components**	Mathematics	3	25 MC items	30	Total test administration time - including check in, instructions, breaks, and collection of materials – 2.5 hours
		Science		49 MC items	35	
		Social Studies		48 MC items	35	
Day 3 Standard Testing Time 100 minutes (1 hour / 40 minutes)						
				TOTAL MINUTES	440	
				TOTAL HOURS	7.33	

*More detailed information about this schedule and the MME program is available on the MME Web page at www.michigan.gov/mme

The table below outlines which components contribute to each MME score. The MME scores are required for the Michigan School Scorecards and accountability reports for high schools.

Table 4.10 Components Contributing to MME Scores

			Components Contributing to MME Scores				
Day	**Test**	**Subject Session**	**Reading**	**Writing**	**Mathematics**	**Science**	**Social Studies**
Day 1	ACT Plus Writing	English		Selected items			
		Mathematics			Selected items		
		Reading	Selected items				
		Science				Selected items	
		Writing		ALL			
Day 2	*ACT WorkKeys*	Reading for Information	Selected items				
		Applied Mathematics			Selected items		
		Locating Information			Selected items		Selected items
Day 3	Michigan Components	Mathematics			ALL		
		Science				ALL	
		Social Studies					ALL

MME Test Accommodations Window and Testing Staff Requirements

All accommodated testing must be administered within the two-week window that begins on the initial test date for that component of the MME and ends on the makeup date for that component. Testing may be scheduled on any days during the window, but each student must take the tests in prescribed order – all of Day 1 (the ACT Plus Writing) in order, followed by the Day 2 ACT WorkKeys tests in order, followed by the Day 3 Michigan components in order. All testing staff must meet ACT's requirements. If testing occurs outside the authorized window, or with procedures that conflict with ACT directions, or under supervision of testing staff who do not meet ACT's requirements, then the answer documents will not be scored. If the misadministration is discovered after scoring, then the scores will be canceled.

ACT-Approved vs. State-Allowed Accommodations on the ACT (Day 1 of the MME)

ACT is committed to ensuring that official ACT scores reported to colleges and other entities from MME testing are comparable to scores earned through other forms of ACT testing involving the application of ACT's test accommodations policies. Therefore, ACT supports the following two forms of accommodations on the ACT when it is administered as Day 1 of the MME:

1) **ACT-Approved accommodations** result in ACT scores that are fully reportable to colleges, scholarships, and other entities *in addition to* being used for MME scores. Only students with professionally diagnosed and documented disabilities who receive accommodations in school should apply for ACT-approved accommodations.
2) **"State-Allowed" accommodations** result in ACT scores that are not college reportable; they are used only for MME scores. English language learners who do not have a disability but receive accommodations in school should request State-Allowed accommodations.

Requesting Accommodations on the ACT (Day 1 of the MME)

In general, all accommodations on the ACT must be requested and reviewed by ACT. However, there are limited exceptions. For example, because testing will normally occur at the local school rather than a separate test center, some arrangements do **not** require review or prior approval from ACT (e.g., placement at the front of the room). Such arrangements are noted on the attached accommodations summary table as "local decision" meaning they do **not** require ACT review or approval.

All schools must appoint a Test Accommodations Coordinator (TAC) who will submit requests for accommodations to ACT. The TAC has access to two different forms specifically designed for the MME administration of the ACT:

1) **ACT-Approved Accommodations**—This form is used to request ACT approval of accommodations on the MME for students who meet ACT eligibility requirements. (See information about ACT's review of these requests in the next section below.)
2) **State-Allowed Accommodations**—This form is used to order test materials for students who will test with "State-Allowed" accommodations. These students are those who do not meet ACT's eligibility requirements (e.g., English language learners with no disabilities) or whose requests for ACT approval have been denied. ACT will ship the materials ordered for each student; no review or approval process will be conducted.

ACT Review of Requests for ACT-Approved Accommodations on the ACT (Day 1 of the MME)

ACT will review requests for ACT-Approved Accommodations by applying the Americans with Disabilities Act (ADA) standards that are used for all such requests. Not every request for an accommodation listed on the attached accommodations summary table as available will be approved. Approval is dependent on submission of all required documentation by the stipulated deadline and review by ACT. It is possible for ACT to approve an accommodation for one student, while the same accommodation may be denied for a different student. ACT's decision whether to approve the requested accommodations under the ADA will determine whether resulting ACT scores can be reported to colleges *in addition to* being used for MME scores.

Ordering State-allowed Accommodations Materials for the ACT (Day 1 of the MME)

Students who do not meet ACT eligibility requirements (e.g., English learners with no disabilities) or whose requested accommodations are denied by ACT have two options: 1) Test under standard conditions and receive college reportable ACT scores, or 2) submit an order for "State-allowed" accommodations materials resulting in ACT scores that are NOT college reportable. IMPORTANT NOTE: TACs must submit an order for "State-allowed" accommodations for each applicable student so that ACT can ship the correct ACT test materials – which are *different* from those used by students testing with ACT-Approved accommodations.

ACT scores resulting from testing with "State-allowed" accommodations are **not** college reportable, but will be used for MME scores. Thus, some students will achieve ACT scores that are college reportable because their accommodations have been approved by ACT, while others using the same accommodations will achieve ACT scores that are *not* college reportable because their use of those accommodations was not approved by ACT.

Ordering test materials for students testing with accommodations on MME Day 2 (*ACT WorkKeys*) and Day 3 (Michigan Components)
All accommodated test materials, including extended time test booklets, for MME Day 2 and Day 3 must be ordered from the DAS Secure Site December 2, 2013—January 10, 2014. There is no request or approval form for accommodations on Day 2 and Day 3. Testing with accommodations on Day 2 and/or Day 3 is determined locally based on the accommodations used during a student's regular instruction and supported by the student's IEP, 504 Plan, or EL instruction. ACT's approval of accommodations applies **only** to materials for and the administration of the ACT Plus Writing (Day 1). Schools may provide accommodations on the ACT WorkKeys and Michigan components of the MME consistent with the accommodations listed in the "MME Day 2 or Day 3" columns of the attached accommodations summary table, even if the student tests without those accommodations on the ACT. Accommodated test materials for MME Day 2 and Day 3 must be ordered on the DAS Secure Site. Please pay close attention to whether the accommodation is standard or non-standard, and what impact the accommodation may have on student eligibility for National Career Readiness Certification (NCRC) and/or ACT WorkKeys score results.

ACT WorkKeys National Career Readiness Certificate (NCRC) Eligible Scores
ACT WorkKeys scores achieved during Day 2 of the MME **may** be eligible for the NCRC provided a student satisfies the criteria associated with one of the 4 achievement levels. Four levels of achievement are possible: Bronze, Silver, Gold, or Platinum, based on scores earned on the three *ACT WorkKeys* tests.

ACT WorkKeys-Ineligible Accommodations on Day 2 *ACT WorkKeys*
ACT WorkKeys scores will not be issued for students using accommodations marked as "No" under the column "MME Day 2." Use of these accommodations will also result in ineligibility for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated as "MME eligible". Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or ELL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Students testing with accommodations identified as "MME ineligible" will not be counted as assessed and will not receive MME scores in the affected subject areas.

Standard/Nonstandard Accommodations on MME Day 3
It is important to know whether an assessment accommodation is considered standard or nonstandard for the MME since it can impact whether a school or district meets the accountability requirements. At the district, school, and subgroup (ethnicity, economically disadvantaged, English Learners, and Students with Disabilities) levels, a minimum of 95% of the students enrolled in Grade 11 must be assessed, either on the MME or MI-Access.

A standard assessment accommodation is one that does not change what the specific assessment is measuring. The score achieved by a student using a standard assessment accommodation does count when calculating NCLB participation and proficiency rates. A nonstandard assessment accommodation changes what the assessment is measuring and results in an invalid score. **If a student takes the MME Day 2 or Day 3 test using a nonstandard accommodation, the student will not count as assessed and will not receive MME scores in the affected subjects**. Please see the attached MME accommodations summary table to determine if the student's accommodation is standard or nonstandard for MME Day 2 or Day 3. There is one column for accommodations supported by an IEP or 504 Plan. There is a separate column for accommodations supported by a student's EL instruction.

Any assessment accommodations not listed in the MME Accommodations Summary Table are considered nonstandard.

Use of accommodations on any section of the MME, Day 1, Day 2, and/or Day 3 must be recorded on the student answer document for that day, following instructions in the MME Day 1 and Day 2 Answer Document Supplements, *ACT WorkKeys Supervisor's Manual for State Testing – Special Testing* and the *Day 3 Administration Manual for Accommodated Testing*

Important Day 2 notes for TACs –

1. Students testing with accommodations must use the *ACT WorkKeys* test books with red covers. They will have three test form numbers in the lower left hand side, each beginning with an "R". Test forms beginning with any other letter are **not** to be used for testing with accommodations.
2. For each student tested with accommodations, the TAC must be sure that an admin code is written and gridded on Page 3 of the student's answer document for each test administered with accommodations.
3. For each student tested with accommodations, the TAC must provide responses to the Local Items in Box 26 on Page 2 of the answer document. DAS cannot determine eligibility/ineligibility for MME scores without a response to Local Items in Box 26.
4. Because only the instructions are translated on the Reading for Information test, a "700" admin code should not be entered for this test. TACs must record the proper Admin Code from the 500 or 600 range. Admin codes in the 700 range are valid for the Applied Mathematics and Locating Information tests.

New in 2014 Day 2 ACT WorkKeys
English as a Second Language (ESL) and English learners (ELs) do not qualify as disabilities under the Americans with Disabilities ACT (ADA). Accommodations such as extended time, or use of a reader script or audio DVD, are not available for ESL and EL students for ACT WorkKeys Testing. If accommodations are provided to ESL or EL students a "900" admin code must be entered for this test, score reports will not be generated at the student and school level, and will not be available for the National Career Readiness Certificate (NCRC).

Reading the MME Accommodations Summary Table

The attached Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table is arranged in columns, explained below.

Column	Explanation
Accommodation	Each accommodation that appears on the MME Assessment Accommodations Summary Table has been approved by the Michigan State Board of Education.
MME Day 1 (The ACT Plus Writing)	
May Request	ACT has indicated whether or not each accommodation may be requested for the ACT Plus Writing (Day 1 of the MME), or whether State-Allowed accommodated formats may be ordered instead. • Accommodations for which local decisions may be made without a request to ACT are specifically noted as a "Local decision." • Some formats or accommodations are noted as State-Allowed only. • A few accommodations are not permitted for the ACT. If any "not permitted" accommodations are used, ACT scores will not be issued. • Some accommodations do not apply to the ACT. Additional details about some accommodations may be needed by ACT before a decision can be made for an individual request.
ACT Comments	These comments clarify ACT's understanding of each accommodation and any associated restrictions for Day 1.
College Reportable ACT Scores	ACT has noted whether each accommodation that requires approval will result in ACT scores that are fully reportable to colleges and other entities ***when approved by ACT for an individual student with disabilities***. If specific restrictions must be met or documentation from the test administration provided, these are also noted. The use of accommodations that require approval and which have not been approved by ACT for an individual student are eligible for State-Allowed accommodations testing. Taking the ACT Plus Writing with State-Allowed accommodations will result in ACT scores that are reportable ***only*** for MME scores. If a student uses a combination of accommodations and ***any*** of those accommodations are State-Allowed (not ACT-Approved), the resulting scores will ***not*** be college reportable but can be used for MME Scores. NOTE 1: State-allowed accommodations must be requested (ordered) from ACT for that student so that the school will receive Day 1 accommodated test materials assigned to that student. Please note the deadlines associated with requesting ACT-Approved and State-Allowed accommodations given in the Checklist of Dates. NOTE 2: The use of accommodations considered Standard (S) for MME Day 2 or Day 3 will result in valid MME scores that may be used for school accountability. This is true in combination with both ACT-Approved and State-Allowed accommodations.
MME Day 2 (*ACT WorkKeys*)	
ACT WorkKeys NCRC Eligible Scores	ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for *ACT WorkKeys* scores. Some formats or accommodations do not apply to *ACT WorkKeys*, and some require additional details for ACT before a determination can be made.

	The use of an *ACT WorkKeys*-ineligible accommodation must be reported on the *ACT WorkKeys* State Testing Answer Folder Document through the use of specific 3-digit Administration Codes. Additionally, MDE will review administrators' responses to the *ACT WorkKeys* Local Items, as recorded in Box 26 of the *ACT WorkKeys* State Testing Answer Documents, to determine eligibility for MME scores. For a list of those Admin codes and further instruction please see page 5 of the Day 2 *ACT WorkKeys State Testing Supervisor's Manual for Special State Testing*. Use of *ACT WorkKeys*-ineligible accommodations must be described in detail on the Testing Time Verification Form and Administration Report on page C-10 of the *ACT WorkKeys Supervisor's Manual for State Testing—Special Testing*. The use of a WorkKeys-ineligible accommodation must be reported on the ACT WorkKeys State Testing Answer Folder.
MME Day 3 Standard/Nonstandard	
	With respect to valid MME scores, MDE has indicated whether each accommodation listed is considered Standard (S) or Nonstandard (NS) for Day 3 of the MME. Separate notations have been made for two groups – IEP/504 and EL. Assessment accommodations not listed in the MME Accommodations Summary Table are considered nonstandard. A standard assessment accommodation is one that does not change what the specific assessment is measuring. The score achieved by a student using a standard assessment accommodation does count when calculating NCLB participation and proficiency rates for accountability purposes. A nonstandard assessment accommodation changes what the assessment is measuring and results in an invalid score. **If a student takes the MME Day 3 using a nonstandard accommodation, the student will not count as assessed and will not receive MME scores in the affected subjects**. Please see the attached MME accommodations summary table to determine if the student's accommodation is standard or nonstandard for MME Day 3. There is one column for accommodations supported by an IEP or 504 Plan. There is a separate column for accommodations supported by a student's EL instruction. Use of a nonstandard accommodation on any section of MME Day 3 must be reported on the student answer document following instructions in the *Day 3 Administration Manual for Accommodated Testing*.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table

Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
A. Timing/Scheduling						
1. Administration of the assessment at a time most beneficial to the student, with appropriate supervision	Yes	Must be within the designated two-week window that begins on initial state test day for ACT Plus Writing and ends on the makeup day for ACT Plus Writing. Testing may be scheduled for any days during the window, but each student must take the sections of the ACT Plus Writing in prescribed order: English, Mathematics, Reading, Science, and finally, Writing.	Yes	Yes Must be within the designated two-week window for Day 2. Day 2 testing may not begin until Day 1 testing is complete.	S	S
2. Administer the parts within a content area in any order	No	ACT tests must **always** be administered in prescribed sequence.	No	No *ACT WorkKeys* tests must **always** be administered in prescribed sequence. MME Eligible -- TACs are required to enter the appropriate Admin code from the range of 900-953	S	S

1. "Yes" in the "College Reportable ACT Scores" column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
3. Extended assessment time NOTE: All MME tests are timed. Timing codes are assigned by ACT for Day 1. For Day 2 and Day 3, schools may allow time-and-a-half, double time, or a maximum of 3 hours for each test.	Yes	Normally time-and-a-half in single self-paced session using regular or large-print. For certain formats and disabilities, ACT will assign a timing code for the ACT based on the test format and disability, up to triple time (and testing over multiple days, one test per day). Oral presentation (e.g., audio DVD, or reader), and Braille normally *require* triple time.	Yes Only if testing complies with timing code assigned by ACT	Yes Only if *ACT WorkKeys* timing guidelines are followed.	S	S
4. Frequent supervised breaks	Yes	Interpreted as "stop-the-clock" breaks; normally available only with standard time. If requested with extended time, must provide documentation to support need for "stop-the-clock" breaks *in addition to* extended time.	Yes	Yes	S	S
5. Method of informing students of remaining time (e.g., clock or timer)	Local decision-but must adhere to all ACT directions	Five minutes remaining announcement routinely part of verbal instructions for all students on ACT. Students approved for time extensions on the ACT are given hourly announcements of time. **No other assistance in monitoring time is allowed**.	Yes	Yes Must adhere to directions in Manual.	S	S
B. Setting						

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
6. Administration of the assessment in an alternate education setting (in school) with appropriate supervision e.g., • Bilingual/English as a Second Language (ESL) setting • Special education setting • In a distraction free space or alternate location such as separate room or location within the room	Local decision unless requesting off-site	If setting is off-site, appropriate off-site application must be approved by ACT.	Yes	Yes If off-site application for Day 1 is approved by ACT.	S	S
7. Administration of the assessment in an alternate education setting (out of school) with appropriate supervision e.g., • Home when student is homebound • Care facility when it is medically necessary	Yes	Appropriate off-site or home-bound application must be approved by ACT.	Yes	Yes If off-site or home-bound application for Day 1 is approved by ACT.	S If off-site or home-bound application for Day 1 is approved by ACT.	NS

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table

Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
8. Administration of the assessment in an **interim** alternative education setting (out of school) with appropriate supervision (e.g., juvenile facility)	Local decision unless requesting off-site	If setting is off-site, appropriate off-site application must be approved by ACT.	Yes	Yes If off-site application for Day 1 is approved by ACT.	S If off-site application for Day 1 is approved by ACT	NS If off-site application for Day 1 is approved by ACT
9. Administration of the assessment individually or in a small group	Local decision unless requesting off-site or required by approved accommodation	If setting is off-site, appropriate off-site application must be approved by ACT. Note that individual testing is **required** for selected accommodations (e.g., if approved accommodations could disturb others or if approved for a reader).	Yes	Yes If off-site application for Day 1 is approved by ACT.	S	S
10. Placement of student where he/she is most comfortable (e.g., front of the room, back of the room)	Local decision unless requesting off-site	If setting is off-site, appropriate off-site application must be approved by ACT.	Yes	Yes If off-site application for Day 1 is approved by ACT.	S	S
11. Use of accommodated seating, special lighting, or furniture	Local decision	Provided by the school.	Yes	Yes For EL students this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
12. Able to move, stand or pace during assessment in a manner where others' work cannot be seen and is not distracting to others (e.g., kneeling, constant movement)	Local decision		Yes	Yes	S	S
13 Use of concentration aids (e.g., stress balls, T-stools, background music or noise buffers)	Submit details with request	Requests considered individually based on documentation submitted. Music and noise buffers not normally approved. Approval and reportable status depend on detailed information about the tools/buffers proposed for use.	Depends on details	Yes If approved for Day 1, may also be used for Day 2. For EL students this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
14. Placement of teacher/proctor near student	Local decision		Yes	Yes	S	S
C. Presentation						
15. Reading all assessment directions in student's native language	Yes (State-Allowed only)	Includes spoken instructions and directions printed in the test booklets. If student's reason for accommodations is English language proficiency, "State-Allowed" accommodations materials must be ordered.	No	Yes TACs are required to enter the appropriate Admin code from the range of 550-553 or 600-640.	S	S
16. Qualified person familiar to the student administers the assessment (e.g., Special Education Teacher, Bilingual/ESL staff)	Local decision-staff must meet all ACT requirements	Only if not a relative or athletic coach (if student is an athlete). Only if all directions for test administration are read verbatim **in English** with no clarifications in another language.	Yes	Yes Staff qualifications for Day 1 apply.	S	S

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2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table

Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
17A. Assessment directions • Teacher may emphasize key words in directions • Teacher may repeat directions exactly as worded in administrator manual	Yes	Directions in the test booklet not normally read aloud can be read to students. Permitted for college reportable ACT scores only if approved for reader or audio version of test and directions are read **verbatim** in English. Emphasis only as marked in the printed directions; must be read verbatim without signals regarding right or wrong.	Yes	Yes	S	S
17B. Assessment directions • Student may restate directions in his/her own words • Student may ask for clarification of directions	Yes (State - Allowed only)	Only if tested individually.	No	Yes Only if tested individually.	S	S
18. Teacher provides visual, auditory, or physical cues to student to begin, maintain, or finish task	Yes	If cues will disturb other students, must test individually.	Yes	Yes If cues will disturb other students, must test individually.	S	S

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2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
19.	Reading aloud the English, Reading, and Writing assessments to an individual student using a readers script	Yes	ACT-produced audio version must be used or reader's script read verbatim in **English**. For college reportable ACT scores, student must test individually if not using audio version with headset (see #22 for audio version).	Yes	Yes ACT-produced audio version used or readers script read verbatim in English.	S	S
20.	Reading aloud the Mathematics, Science, and Social Studies assessment to an individual student using a readers script	Yes	ACT-produced audio version must be used or reader's script read verbatim in **English**. For college reportable ACT scores, student must test individually if not using audio version with headset (see #22 for audio version).	Yes	Yes ACT-produced audio version used or readers script read verbatim in English.	S	S

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
21. Reading content and questions in the student's native language (Mathematics, Social Studies, Science, and Writing) • Student must be dominant in a native language other than English; **and** • Student's English proficiency is determined to be basic or lower intermediate; **and** • Student receives bilingual instruction in that native language for the maintenance of that language	Yes (State-Allowed only)	If student's reason for accommodations is English language proficiency, "State-Allowed" accommodations materials must be ordered.	No	No MME eligible TACs are required to enter the appropriate Admin code from the range of 900-954.	S	S
22. Use of state-produced audio versions of the assessments	Yes	Must use headset if testing in a group. ACT produces audio version.	Yes	Yes ACT produces audio version.	S	NA Refer to conditions listed in #23

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
23. Use of state-produced video or audio versions of assessment in English, for English language learners • Student must be dominant in a native language other than English; **and** • Student's English proficiency is determined to be basic or lower intermediate.	Yes (State-Allowed only)	If student's reason for accommodations is English language proficiency, "State-Allowed" accommodations materials must be ordered. ACT produces video or audio versions for the state.	No	No If student's reason for accommodations is English language proficiency. ACT produces video or audio versions for the state. Is eligible for MME. TACs are required to enter the appropriate Admin code from the range of 900-954	S	S

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
24. Use of state-produced video versions of assessment in a language other than English for English language learners • Student must be dominant in that language; **and** • Student's English proficiency is determined to be basic or lower intermediate; **and** • Student receives bilingual instruction in that native language for the maintenance of that language.	Yes (State-Allowed only)	If student's reason for accommodations is English language proficiency, "State-Allowed" accommodations materials must be ordered. ACT produces video DVDs in Spanish and Arabic for the state. No other languages are offered.	No	No ACT produces video DVDs for the Applied Mathematics and Locating Information tests in Spanish and Arabic for the state. No other languages are offered Is eligible for MME TACs are required to enter the appropriate Admin code from the range of 900-954.	S	S
25. Directions provided using sign language - American Sign Language (ASL) or Exact English signing (EES)	Yes	Applies only to spoken instructions exactly as provided in the administration manual.	Yes	Yes Day 1 restrictions apply.	S	S

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table

Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
26 Sign the Reading and Writing assessments in: • American Sign Language (ASL) • Exact English Signing (EES)	Yes – ASL (State-Allowed only) Yes – EES	Signing of items with American Sign Language (ASL) is not ACT-approved. Exact English Signing (EES) of test items may be requested and approved in specific cases for college reportable scores.	No – ASL Yes – only if EES approved by ACT	No ASL not permitted. Use of ASL will result in student not receiving *ACT WorkKeys* scores or MME scores. TACs are required to enter the appropriate Admin code from the range of 900-954 and must provide a response to Local Item Question #2. Yes – only if EES. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	NS - ASL S - EES	NS – ASL NS – EES
27. Sign the Listening and Speaking sections of WIDA - American Sign Language (ASL) or Exact English Signing (EES)	NA			NA		

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table

Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
28. Sign the Reading and Writing sections of the WIDA- American Sign Language (ASL) or Exact English Signing (EES)	NA			NA		
29. Sign the Mathematics, Locating Information, Science and Social Studies assessments in: • American Sign Language (ASL) • Exact English Signing (EES)	Yes – ASL (State-Allowed only) Yes - EES	Signing of items with American Sign Language (ASL) is not ACT-approved. Exact English Signing (EES) of test items may be requested and approved in specific cases for college reportable scores.	No – ASL Yes – only if EES approved by ACT	No ASL not permitted Use of ASL will result in student not receiving *ACT WorkKeys* scores or MME scores. TACs are required to enter the appropriate Admin code from the range of 900-954 and must provide a response to Local Item Question #2. Yes – only if EES For EL students, this accommodation may not be eligible for MME purposes. A response to Local Item #2 is required.	NS - ASL S - EES	NS - ASL NS - EES

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
30. Use of calculator/talking calculator on the noncalculator sections of the Mathematics assessment	NA	There are no "noncalculator" sections of the ACT Mathematics test.	NA	NA	NA	NA
31. Use of a calculator on the Science and Social Studies assessments	No	Calculators are permitted only on the ACT Mathematics, not any other tests.	No	NA	NS	NS
32. Use of arithmetic tables	No	Arithmetic tables are not allowed for the ACT.	No	No All students may use the ACT- developed *ACT WorkKeys* Formula Sheet provided only on the *ACT WorkKeys* Applied Mathematics test. Use of any other table will result in student not receiving *ACT WorkKeys* scores or MME scores. TACs are required to enter the appropriate Admin code from the range of 900-953 and must provide a response to Local Item Question #2.	NS	NS

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2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
33. Use of manipulatives (e.g., actual coins and bills, base 10 blocks, and concrete objects)	NA	Items do not involve this kind of manipulation.	NA	No For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required. TACs are required to enter the appropriate Admin code from the range of 900-954 and provide a response to Local Item #2.	S	NS
34. Use of an abacus	Yes	Provided by school or student; student must test individually.	Yes	Yes For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
35. Use of rulers as provided by the State	NA	Items do not require rulers.	NA	NA	NA	NA

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2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table

Accommodation		MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
36.	Use of adapted rulers, protractors, Braille and large print rulers and protractors.	NA	Items do not require rulers or protractors.	NA	NA	S	NS
37.	Use of auditory amplification devices or special sound systems	Submit details with request	Used only for spoken instructions. Requests considered individually based on documentation submitted. Approval and reportable status depend on detailed information about proposed devices or systems.	Depends on details	Yes If approved for Day 1, may also be used for Day 2. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
38.	Use of visual aids (e.g., closed circuit television, magnification devices)	Yes	Provided by school or student. Depending on the device used, student may have to test individually.	Yes	Yes For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS

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2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
39.	Use of state-produced Braille and enlarged print versions of assessment	Yes	ACT produces Braille and enlarged print versions.	Yes	Yes ACT produces Braille and enlarged print versions. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
40.	Use of a page turner	Local decision-staff must meet all ACT requirements	Page turner must meet same requirements as all testing staff.	Yes	Yes Staff qualifications for Day 1 apply. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
41.	Use of non-skid surface that will not damage the answer document or scanning equipment (DO NOT use tape or other adhesive)	Yes	Provided by school or student.	Yes	Yes For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
42.	Use of acetate colored shield, highlighters, highlighter tape, page flags, and reading guides on test booklets.	Local decision	Provided by school or student. "Reading guides" are interpreted as place-keepers. May require student to test individually (e.g., highlighters).	Yes	Yes	S	S
43.	Use of bilingual dictionaries that define or explain words or terms	Yes (State-Allowed only)	Provided by school or student.	No	No This accommodation is not MME eligible TACs are required to enter the appropriate Admin code from the range of 900-954 and must provide a response to Local Item Question #2.	NS	NS

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
44. Use of dictionary, thesaurus, spelling book, or grammar book for Mathematics, Science, Social Studies, Reading, and Writing	No	Not permitted.	No	No This accommodation is not MME eligible. TACs are required to enter the appropriate Admin code from the range of 900-954 and must provide a response to Local Item Question #2.	NS	NS
45. Use of bilingual word-for-word non-electronic translation glossary for English language learners	Yes (State-Allowed only)	Provided by school or student.	No	Yes	S	S

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2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
46. Use of screen reader/text-to-speech on reading assessment	No	Not permitted	No	No This accommodation is not MME eligible. TACs are required to enter the appropriate Admin code from the range of 900-954 and must provide a response to Local Item Question #2.	NS	NS
47. Use of screen reader/text-to-speech on WIDA • Listening, Writing and Speaking sections only • Writing: grades 3-12	NA		NA	NA	NA	NA
D. Response						
48. Student responds in his/her native language to the constructed response items on assessments.	No	The only constructed response is the ACT Writing Test, and it must be written in **English**. If student is approved for oral responses, responses must be in **English**. (See #54.)	NA	NA	NA	NA

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
49.	Student responds in sign language for Reading and Writing or Functional Independence Assessing Print and Expressing Ideas (Exact English only)	Yes	Only if tested individually and responses marked on scannable document by testing staff. For college reportable ACT scores, video documentation of test session must be returned to ACT. Sign language response to ACT Writing Test must be Exact English Signing (EES).	Yes – only if recording of test session returned to ACT and Writing Test signed EES	Yes Only if tested individually and responses marked on scannable document by testing staff.	NA	NA
50.	Student responds in sign language for the WIDA Listening and Speaking sections - American Sign Language (ASL) or Exact English Signing (EES)	NA		NA	NA	NA	NA
51.	Student responds in sign language for the WIDA Reading and Writing sections (Exact English Signing [EES] only)	NA		NA	NA	NA	NA

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
52.	Student responds in sign language for Mathematics, Science and Social Studies assessments - American Sign Language (ASL) or Exact English Signing (EES)	Yes	Only if tested individually and responses marked on scannable document by testing staff. For college reportable ACT scores, video documentation of test session must be returned to ACT.	Yes – only if recording of test session returned to ACT	Yes Only if tested individually and responses marked on scannable document by testing staff. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
53.	Student points to answers or writes directly in assessment booklet (transferred to answer document by teacher)	Yes	If student points to answers, student must test individually. Responses must be transcribed to scannable answer document by testing staff while student observes.	Yes	Yes If student points to answers, student must test individually. Responses must be transcribed to scannable answer document by testing staff while student observes.	S	S

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
54.	Student responds orally (e.g., student tells assessment administrator which answer choice they are selecting)	Yes	Only if tested individually, responses are in **English**, and responses marked on scannable document by testing staff.	Yes	Yes Only if tested individually, responses are in **English**, and responses marked on scannable document by testing staff. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
55.	Use of a scribe for constructed response items (student must indicate punctuation, format and spell all key words) for Writing or Functional Independence Expressing Ideas	Yes	Applies only to ACT Writing Test. Only if tested individually.	Yes	NA	NA	NA

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
56.	Use of augmentative /alternative communication devices, e.g., • Picture/symbol communication boards • Speech generating devices	Submit details with request	Requests considered individually based on documentation submitted. Approval and reportable status depend on detailed information about the devices proposed for use.	Depends on details	Yes If approved for Day 1, may also be used for Day 2. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
57.	Use of speech to text word processor for responses to Writing, Functional Independence Expressing Ideas, and WIDA	Submit details with request	Applies only to ACT Writing Test. Requests considered individually based on documentation submitted. Approval and reportable status depend on detailed information about the proposed speech to text processor.	Depends on details	NA	NA	NA
58.	Use of special adaptive writing tools such as pencil grip or larger pencil	Local decision	Provided by school or student.	Yes	Yes For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	S

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table							
	Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
		May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
59.	Use of adapted paper, additional paper, lined or grid paper for recording answers	Yes	Provided by school. Student must test individually and responses transferred to scannable answer document by testing staff while student observes.	Yes	Yes For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
60.	Use of alternative writing position (e.g., desk easel, student standing up)	Local decision	If position will disturb other students, must test individually.	Yes	Yes For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS
61.	Use of computer or word processor for Writing or Functional Independence Expressing Ideas with the following features disabled • spell check • thesaurus • grammar check.	Yes	Applies only to ACT Writing Test. ACT instructions for printing and returning essay must be followed precisely.	Yes	NA	NA	NA

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

Spring 2014 Michigan Merit Examination (MME) Accommodations Summary Table						
Accommodation	MME Day 1 (The ACT Plus Writing)			MME Day 2	MME Day 3 Standard/Nonstandard	
	May Request	**ACT Comments**	**College Reportable ACT Scores[1]**	***ACT WorkKeys* Eligible Scores[2]**	**IEP/504**	**EL**
62. Use of Braillewriter or electronic Braillewriter for Writing or Functional Independence Expressing Ideas with the following features disabled • spell check • thesaurus • grammar check	Yes	Provided by school or student. Applies only to ACT Writing Test. ACT instructions for printing and returning essay must be followed precisely.	Yes	NA	NA	NA
63. Use of computers with alternative access for an alternative response mode e.g., • Switches • Alternative keyboards • Eye-gaze motion sensors • Voice recognition software • Head or mouth pointer • Specialized trackballs or mice	Submit details with request	Requests considered individually based on documentation submitted. Approval and reportable status depend on detailed information about the proposed alternative access. If approved, responses must be transferred to scannable answer document by testing staff. Required documentation of original responses to be determined on case-by-case basis for college reportable ACT scores.	Depends on details	Yes, if approved for Day 1, may also be used for Day 2. For EL students, this accommodation is not eligible for MME purposes. A response to Local Item #2 is required.	S	NS

1. "Yes" in this column means ACT scores will be college reportable ONLY IF that accommodation: 1) is shown as "local decision" or 2) was approved by ACT for an individual student **with a disability.** If the accommodation requires approval, but was not approved by ACT, the ACT scores achieved using that accommodation will not be college reportable. ACT scores are college reportable only if ALL accommodations that require ACT approval are ACT-Approved for that student.
2. Under the "MME Day 2" column, ACT has indicated whether each accommodation is eligible (Yes) or not eligible (No) for ACT WorkKeys score results. Accommodations designated "No" are also ineligible for the National Career Readiness Certificate (NCRC). HOWEVER, the student will receive valid MME scores if the accommodation is designated "MME eligible." Accommodations eligible for MME scores are also indicated by a standard accommodation in the IEP/504 or EL column, and the accommodation is supported by the student's IEP, 504 Plan, or EL instruction. Accommodations identified as "MME ineligible" will not count as assessed and will not receive MME scores in the affected subjects.

State Use Questions

If the student used accommodations to take any of the three days of testing (Day 1—ACT Plus Writing, Day 2—*ACT WorkKeys*, and Day 3—Michigan Component), the Test Accommodations Coordinator had to indicate this on the student's answer document by gridding the answers to questions found in either the Day 1 Answer Folder Supplement, the Day 2 Answer Folder Supplement, or the Day 3 Administration Manual for Students Testing with Accommodations. These answers would be entered in the School Use Only/Local Items Boxes on the answer document for each applicable subject.

Following are copies of the Day 1 Answer Folder Supplement, the Day 2 Answer Folder Supplement, and the applicable text from the Day 3 Administration Manual showing the questions developed by Michigan to capture the information about accommodations used by the student.

The ACT

The ACT Answer Document Supplement

MME Day 1—Spring 2014

Overview

This document is designed to provide schools with guidance about additional information that may be required to be submitted on a student's ACT answer document. It also includes instruction about collecting state-specific information from your school and/or students.

The instructions below are in addition to those provided in the Supervisor's Manual(s). If these directions are not followed, results from your school are at risk of being inaccurately reported on student, school, and accountability reports; and may prevent students from being included in files that are shared with the state for the purpose of scholarship opportunities.

Student Transfers

Follow the guidelines listed below for students who are transferring:

If a student transfers …	Then …
In during the time of testing, already started testing at the former school, or is too late to start testing at the new school	• Do not submit an answer document.
Out during the time of testing or before the pre-test session and had not yet started testing	• Do not submit an answer document. • Discard the barcode label *If such a student completed any pre-test portions of an answer document, securely destroy that answer document.*

Block C – Social Security Number

Provision of the student's Social Security number is optional. ACT will not add this information later to the state's file. Please do not place any other number in this block.

Block K – ACT High School Code

Disregard the instructions for High School Code (Block K) in the "Completing the Non-test Portions Before Test Day" section of the Supervisor's Manual. Use the following instructions instead:

1. This section should only be completed for home-schooled students who participate in the MME at your school. Enter and fill in the ovals 969-999 in Block K. These student scores will not be included in the scores for your school.
2. Leave Block K blank for all other students.

Blocks I and J – Grade Level and Year of Graduation

ACT has pre-gridded the Grade Level in Block I and the Year of Graduation in Block J on the front page of the answer document. Please disregard. ACT will use the grade level from the student barcode label for all students. (Your eligible grade 12 students will be correctly reported in grade 12 if the grade level is correct on the student barcode label.)

Block M – College Planning / Reporting Scores

Please inform students that their ACT scores from the MME will automatically be provided to the state of Michigan. They do not need to use code 2076 – State of Michigan Scholarship Program – as one of their four score reporting choices.

Block S – Local Student ID Number

This field is not required for MME reporting.

Block U – State Assigned Student ID Number

This block is not used in Michigan for the MME.

Barcode Labels

Each ACT Day 1 answer document submitted for scoring must have a student barcode label affixed in the designated box on the back page of the answer document. Barcode labels are used to match a student's MME Day 1, Day 2, and Day 3 answer document to derive their MME subject scores. Your school will be charged a **$50 processing fee** by the Michigan Department of Education for **each** answer document returned for processing without a barcode label.

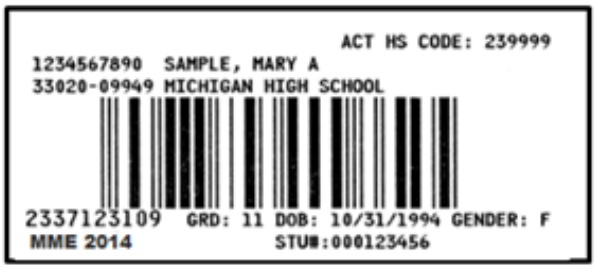
What to Grid on the Answer Document

Whether or not a barcode label is present, students must still grid ALL of the identifying information (e.g., name, address, etc.) on the front and back pages of their answer document during the pre-test session. If this is not done accurately and completely, the student's ACT score report may be undeliverable.

Note: It is recommended that you complete the pre-test session as soon as possible.

Sample Barcode Label

A sample barcode label is shown below, as well as the area to affix it on the back page of the answer document.



Using the Labels

For each label you receive:

If the barcode is:	Then …
Correct	• Affix the label on the back page, lower right corner of the ACT State Testing answer document. Look for the shaded area marked "BARCODE LABEL PLACEMENT" (sample shown above). *Important! Do not place the label on the front page or in any other location on the answer document.*
Incorrect	• Securely destroy the label. • Reprint barcode label from the BAA Secure Site.

Replacement Answer Documents

If a student needs a replacement answer document for any reason, go to the BAA Secure Site to locally print a new label for the replacement answer document.

The student must complete ALL of the identifying information (e.g., name, address, etc.) on the front and back page of their answer document and grid the corresponding ovals.

Block V – School Use Only—State Questions

The state agency has requested that ACT collect additional information using Block V on the answer document.

Collecting this specific student information will ensure the results of state assessments are accurately reported for each student, school, and district. If a student tests with accommodations on Day 1, this section must be completed. Authorized school or district personnel must provide information as follows:

- There are seven questions. Responses will be gridded for Questions 3-9.
- Questions 1-2, and 10-15 should all be left blank.
- Mark only one oval for each question. Please respond with information about the accommodations actually used for ACT Day 1 testing.
- This section is required only for students testing with accommodations.

Number	Question	Response
1.	Do not use – Reserved for ACT use with other states	
2.	Do not use – Reserved for ACT use with other states	
3.	Which of the following most accurately describes this student's **reason for using test accommodations?**	A. IEP B. Section 504 Plan C. ELL instruction D. Rapid Medical Onset
4.	Under what **testing time** did this student take the ACT Plus Writing tests?	A. Standard time in single session with standard breaks B. Standard time with stop-the-clock breaks or testing over multiple days C. Extended time - 50% extended time in self-paced single session D. Extended time - 50% extended time over multiple days E. Extended time - More than 50% extended time F. Extended time on Writing test only (standard time for multiple-choice)
5.	Which **test booklet format** did this student use for the ACT Plus Writing tests?	A. Regular type (10-point) B. Large type (18-point) C. Large type (larger than 18-point) D. Braille/raised line drawings
6.	Which audio, video, or sign language **presentation of test items**, if any, did this student use for the ACT Plus Writing tests?	A. Audio DVD in English B. Reader's script in English C. Video or audio in English **for ELL** D. Video or audio in Arabic **for ELL** E. Video or audio in Spanish **for ELL** F. Translation of reader's script into student's native language **for ELL** G. Exact English Signing (EES) of test items H. Signing of test items in any sign language other than EES I. Closed circuit TV J. None of the above

7.	Which **accommodated presentation of test directions**, if any, did this student use for the ACT Plus Writing tests?	A. Student restatement or clarification of test booklet and administration directions B. Test booklet and administration directions in sign language C. All directions read in student's native language **for ELL** D. Read/repeat directions exactly as worded in test booklet with emphasis on key words in directions E. Auditory amplification devices/sound systems F. Closed circuit TV G. None of the above
8.	Which **accommodated response mode**, if any, did this student use for the ACT Plus Writing tests?	A. Oral responses, dictation into tape recorder, or pointing to answers B. Scribe for ACT Writing Test **only** C. Respond in sign language D. Augmentative communication devices E. Computer for Writing Test with certain functions disabled F. Computer for Writing Test with functions not disabled G. Braillewriter H. Computer with alternative access for alternative response mode I. Speech to text word processor J. Mark answers in test booklet K. None of the above
9.	Which **specialized tools**, if any, did this student use for the ACT Plus Writing tests?	A. Concentration tools or noise buffers B. Bilingual glossary/dictionary C. Dictionary, thesaurus, spelling, grammar book D. Visual, auditory, or physical cues to stay on task E. Magnification devices F. None of the above

ACT WorkKeys

ACT WorkKeys Answer Document Supplement

MME—Spring 2014

Overview

This document is designed to provide schools with guidance about other information that may be required to be submitted on a student's ACT WorkKeys answer document. It also includes instruction about collecting state-specific information from your school and/or students.

The instructions below are in addition to those provided in the Supervisor's Manual(s). If these directions are not followed, results from your school are at risk of being inaccurately reported on student, school, and accountability reports; and may prevent students from being included in files that are shared with the state for the purpose of scholarship opportunities.

Student Transfers

Follow the guidelines listed below for students who are transferring:

If a student transfers …	Then …
In during the time of testing, already started testing at the former school, or is too late to start testing at the new school	• Do not submit an answer document.
Out during the time of testing or before the pre-test session and had not yet started testing	• Do not submit an answer document. • Discard the barcode label *If such a student completed any pre-test portions of an answer document, securely destroy that answer document.*
If a student needs a replacement answer document for any reason	• Go to the BAA Secure Site to locally print a new label for the replacement answer document

Barcode Labels

Each ACT WorkKeys Day 2 answer document submitted for scoring must have a student barcode label affixed in the designated box on the back page of the answer document. Barcode labels are used to match a student's MME Day 1, Day 2, and Day 3 answer document to derive their MME subject scores. Your school will be charged a **$50 processing fee** by the Michigan Department of Education for **each** answer document returned for processing without a barcode label.

Affix the label on the back page, top right corner of the ACT WorkKeys State Testing answer document. Look for the shaded area marked "BARCODE LABEL PLACEMENT." *Important!* Do not place the barcode label on the front page or in any other location on the answer document.

What to Grid on the Answer Document

For the MME, students MUST complete demographic information on the answer document in a pre-test session completed before test day. The following fields must be completed in the pre-test session:

- Block 1—School
- Block 2—Name*
- Block 4—Date of Birth*
- Block 5—Gender
- Block 6—Racial or Ethnic Group

*These fields along with the Student-UIC number provided on the student barcode label constitute the matching criteria for National Career Readiness Certificate (NCRC) eligibility. Exact matches are required when creating an online ACT WorkKeys account and/or submitting certificate requests. These fields will be displayed on your *ACT WorkKeys Memo to Examinee* reports.

DO NOT complete the following blocks:

- Block 3—ID Number: This number is populated via the barcode label.
- Blocks 7 – 15

ACT WorkKeys

ACT WorkKeys Answer Document Supplement

MME—Spring 2014

The following blocks are to be completed on test day. (The verbal instructions in the ACT WorkKeys supervisor manuals include instructions to have students grid these blocks on test day before testing begins):

- Block 16—Type of Testing
- Block 25—Student Signature and Date

The Michigan Department of Education is required to collect specific student information to ensure the results of state assessments are accurately reported for each Michigan student, school, and district. The following blocks are to be completed by the room supervisors. Students are not to complete any part of these blocks.

- **Block 17—Report Codes:** You must fill in all applicable ovals for each of your students as appropriate. (For example, if a student is home-schooled, you would grid the appropriate oval in Block 17 on that student's answer document or if a student's primary language is something other than English, you would grid the appropriate oval.)

Completing Local Items

The state agency has requested that ACT collect additional information using Block 26 on the answer document.

Complete items 1 – 17 of Block 26 for each student testing with accommodations on any part of MME Day 2—ACT WorkKeys. Use the questions that start on this page to complete these items. Respond with information about the accommodations **actually used** for testing. Do not use Questions 18-20.

Number	Question	Response
1.	Which criteria most accurately describes this student's reason for testing with accommodations?	1. IEP 2. Section 504 Plan 3. ELL instruction 4. Rapid Medical Onset
2.	If the student tested using nonstandard accommodations on any section of the ACT WorkKeys (MME Day 2), mark all that apply (Refer to the MME Accommodations Summary Table to identify nonstandard accommodations—extended time is NOT a nonstandard accommodation).	1. Non-Standard Accommodations for Reading for Information 2. Non-Standard Accommodations for Applied Mathematics 3. Non-Standard Accommodations for Locating Information
3.	Which of the following accommodations was used to aid in the presentation of test items for the ACT WorkKeys Reading for Information test?	1. Reader Script or audio in English 2. Video in English for ELL 3. Video in Arabic for ELL (admin code must begin with a "5" or "6") 4. Video in Spanish for ELL (admin code must begin with a "5" or "6") 5. Translation of reader's script into student's native language for ELL (admin code must begin with "9")
4.	Which sign language presentation of test items, if any, did this student use for the ACT WorkKeys Reading for Information test?	1. Exact English Signing (EES) of test items 2. Signing of test items in any sign language other than EES (admin code must begin with "9")

5.	Which of the following accommodations was used to aid in the presentation of directions for the ACT WorkKeys Reading for Information test?	1. Student restatement or clarification of test booklet and administration directions 2. Test booklet and administration directions in sign language 3. All directions read in student's native language for ELL 4. Read/repeat directions exactly as worded in test booklet with emphasis on key words in directions 5. Auditory amplification devices/sound systems
6.	Which of the following accommodations was used to aid in capturing student responses for the ACT WorkKeys Reading for Information test?	1. Oral responses, dictation into tape recorder, or pointing to answers 2. Respond in sign language 3. Augmentative communication devices or computer with alternative access for alternative response mode 4. Mark answers in test booklet
7.	Which specialized tools, if any, did this student use for the ACT WorkKeys Reading for Information test?	1. Concentration tools or noise buffers 2. Bilingual glossary 3. Dictionary, thesaurus, spelling, grammar book (admin code must begin with "9") 4. Visual, auditory, or physical cues to stay on task 5. Magnification devices
8.	Which of the following accommodations was used to aid in the presentation of test items for the ACT WorkKeys Applied Mathematics test?	1. Reader Script or audio in English 2. Video in English for ELL 3. Video in Arabic for ELL (admin code must begin with "7") 4. Video in Spanish for ELL (admin code must begin with "7") 5. Translation of reader's script into student's native language for ELL (admin code must begin with "9")
9.	Which sign language presentation of test items, if any, did this student use for the ACT WorkKeys Applied Mathematics test?	1. Exact English Signing (EES) of test items 2. Signing of test items in any sign language other than EES (admin code must begin with "9")
10.	Which accommodated presentation of test directions, if any, did this student use for the ACT WorkKeys Applied Mathematics test?	1. Student restatement or clarification of test booklet and administration directions 2. Test booklet and administration directions in sign language 3. All directions read in student's native language for ELL 4. Read/repeat directions exactly as worded in test booklet with emphasis on key words in directions 5. Auditory amplification devices/sound systems

ACT WorkKeys

ACT WorkKeys Answer Document Supplement

MME—Spring 2014

11.	Which accommodated response mode, if any, did this student use for the ACT WorkKeys Applied Mathematics test?	1. Oral responses, dictation into tape recorder, or pointing to answers 2. Respond in sign language 3. Augmentative communication devices or computer with alternative access for alternative response mode 4. Mark answers in test booklet
12.	Which specialized tools, if any, did this student use for the ACT WorkKeys Applied Mathematics test?	1. Concentration tools or noise buffers 2. Bilingual glossary 3. Dictionary, thesaurus, spelling, grammar book (admin code must begin with "9") 4. Visual, auditory, or physical cues to stay on task 5. Magnification devices
13.	Which audio presentation of test items, if any, did this student use for the ACT WorkKeys Locating Information test?	1. Reader Script or audio in English 2. Video in English for ELL 3. Video in Arabic for ELL (admin code must begin with "7") 4. Video in Spanish for ELL (admin code must begin with "7") 5. Translation of reader's script into student's native language for ELL (admin code must begin with "9")
14.	Which sign language presentation of test items, if any, did this student use for the ACT WorkKeys Locating Information test?	1. Exact English Signing (EES) of test items 2. Signing of test items in any sign language other than EES (admin code must begin with "9")
15.	Which of the following accommodations was used to aid in the presentation of directions for the ACT WorkKeys Locating Information test?	1. Student restatement or clarification of test booklet and administration directions 2. Test booklet and administration directions in sign language 3. All directions read in student's native language for ELL 4. Read/repeat directions exactly as worded in test booklet with emphasis on key words in directions 5. Auditory amplification devices/sound systems
16.	Which of the following accommodations was used to aid in capturing student responses for the ACT WorkKeys Locating Information test?	1. Oral responses, dictation into tape recorder, or pointing to answers 2. Respond in sign language 3. Augmentative communication devices or computer with alternative access for alternative response mode 4. Mark answers in test booklet
17.	Which specialized tools, if any, did this student use for the ACT WorkKeys Locating Information test?	1. Concentration tools or noise buffers 2. Bilingual glossary 3. Dictionary, thesaurus, spelling, grammar book (admin code must begin with "9") 4. Visual, auditory, or physical cues to stay on task 5. Magnification devices

The following text is used to capture information regarding accommodations testing for Day 3 (excerpted from the *Spring 2014 MME Day 3 Manual for Accommodat*ed *Testing,* pp. 71-72).

Accommodations Documentation

If the student took any part of the MME with an accommodation, Room Supervisors must grid the answers to questions 1–5 below in Box 15 for Mathematics, Box 17 for Science, and Box 19 for Social Studies. The questions are the same for each subject, but it is necessary to grid the answers separately for each subject, based on the actual accommodations used for each subject. For example, if the student used a Reader Script for Social Studies, but not for Mathematics or Science, fill in circle B under 2 in Box 19 (Social Studies) on the Answer Document. Do not fill in any circle under 2 in Box 15 (Mathematics) or under 2 in Box 17 (Science), but fill in circle B under number 2 in Box 19 (Social Studies).

Questions to Answer to Complete Boxes 15, 17, and 19

Question 1—Which of the following most accurately describes this student's reason for using test accommodations?

A. IEP

B. Section 504 Plan

C. ELL

D. Rapid Medical Onset

Question 2—Which audio or sign language presentation of test items, if any, did this student use for the test?

A. Audio DVD in English

B. Reader Script in English

C. Video with English audio for ELL

D. Video with Arabic audio for ELL

E. Video with Spanish audio for ELL

F. Translation of Reader Script into student's native language for ELL

G. Exact English Signing (EES) of test items

H. Signing of test items in any sign language other than EES

Question 3—Which accommodated presentation of test directions, if any, did this student use for the test?

A. Student restatement or clarification of Test Booklet and administration directions

B. Test Booklet and administration directions in sign language

C. All directions read in student's native language for ELL

D. Read/repeat directions exactly as worded in Test Booklet with emphasis on key words in directions

E. Auditory amplification devices/sound systems

Question 4—Which accommodated response mode, if any, did this student use for the test?

A. Oral responses, dictation into tape recorder, or pointing to answers

B. Respond in sign language

C. Augmentative communication devices

D. Computer with alternative access for alternative response mode

E. Mark answers in Test Booklet

Question 5—Which specialized tools, if any, did this student use for the test? (Select all that apply.)

A. Concentration tools or noise buffers

B. Bilingual glossary/dictionary

C. Dictionary, thesaurus, spelling, or grammar book

D. Visual, auditory, or physical cues to stay on task

E. Magnification devices

Chapter 5: Test Development Analyses

MME Components

The MME is composed of the following components for each subject. This structure is based on the results of alignment analyses between the ACT Plus Writing, *ACT WorkKeys* assessments, and Michigan High School Content Standards, as well as mandates from Michigan legislation. See Table 5.1.

Table 5.1. Components of MME Test Scores for Spring 2014 Administration

			Components Contributing to MME Scores				
Day	**Test**	**Subject Session**	**Reading**	**Writing**	**Mathematics**	**Science**	**Social Studies**
Day 1	**ACT Plus Writing**	English		X			
		Mathematics			X		
		Reading	X				
		Science				X	
		Writing		X			
Day 2	***ACT WorkKeys***	*Reading for Information*	X				
		Applied Mathematics			X		
		Locating Information			3 items		6 items
Day 3	**Michigan Mathematics, Science and Social Studies**	Mathematics			X		
		Science				X	
		Social Studies					X

Note that the ACT Plus Writing was given on Day 1 of the assessment, the *ACT WorkKeys* tests were given on Day 2, and the Michigan components were given on Day 3. For each subject (column), students needed to complete a certain portion to meet the attemptedness criteria for each section shown with an "X" to obtain a valid score on an MME subject.

Three of the *ACT WorkKeys Locating Information* items count towards MME Mathematics and six of the *ACT WorkKeys Locating Information* items count towards MME Social Studies. This occurs because these items align well with Michigan's high school mathematics or social studies content expectations.

Test Specifications and Alignment Between Contributing Components

Because intact ACT Plus Writing and *ACT WorkKeys* (*Reading for Information*, *Locating Information* and *Applied Mathematics*) assessments must be included in the Michigan Merit Examination (MME), the MME test specifications must start with an analysis of the combined alignment of the ACT Plus Writing and *ACT WorkKeys* assessments. This analysis is the foundation for creating the augmentation needed to assure sufficient alignment of the MME as a whole in each subject to Michigan's high school content standards.

To ensure that the augmented portion of the MME fulfills the requirements for alignment to Michigan's high school content standards, a yearly alignment process is undertaken. This process is described in detail below. In addition, several in-depth alignment analyses were conducted during the development of the Michigan Merit Examination. These are detailed below in the "Historical Alignment Analyses" section, and are adapted from the materials submitted to the United States Department of Education for peer review of the MME prior to the first implementation in 2007. The evidence referenced in this section is provided as addenda to this technical report.

Alignment of the 2014 MME with HSCEs: Item Selection for Day 1 and Day 2 Scoring

In June of 2013, specialists in English language arts, mathematics, science, and social studies at DAS conducted an alignment coding analysis of the ACT and *ACT WorkKeys* test forms to be used on the Spring 2014 MME. DAS staff reviewed secure copies of the test booklets and coded each test item to the High School Content Expectation (HSCE) the item most clearly measured. (Specialists in both mathematics and social studies reviewed the *ACT WorkKeys Locating Information* forms.) If an item did not appear to measure an HSCE, the item was left uncoded. A tally of the assigned codes was made for each test form, by standard, to determine the breadth of standards coverage for each form. For both the ACT and *ACT WorkKeys* tests, these tallies differed across the three administration types (initial, makeup, and accommodated). Upon reviewing the tallies DAS determined how many ACT and *ACT WorkKeys* items would be selected from each form and in each subject area to count toward students' MME scores. These numbers of items were chosen so that the three ACT forms (i.e., initial, makeup and accommodated) would have a common distribution of MME-scored items by standard, and likewise for the three forms of each *ACT WorkKeys* test. This ensured that the MME–scored items taken by each student covered the standards identically, regardless of the combination of Day 1 and Day 2 forms the student took.

Once the number of items for each standard was decided, DAS content specialists conducted a second review of the Day 1 and Day 2 forms to select these items. Table 5.2 shows the number of items on each Day 1 and Day 2, and how many were selected for MME scoring. Note that at least half of the items on each ACT English, Mathematics, and Science Test, and each *ACT WorkKeys Reading for Information* Test, were selected. Nearly all (32 out of 40) ACT Reading Test items were selected. For each *ACT WorkKeys Locating Information* form, three items were selected to count toward MME Mathematics scores, and six were selected to count toward MME Social Studies scores.

As mentioned above, the purpose of selecting items for MME scoring was to ensure that the MME-scored items taken by every student would cover the standards identically. Table 5.3 shows how the selected items from each Day 1 or Day 2 test were distributed across the standards for that content area.

Table 5.2. Number of items and number of selected items on each MME Day 1 or Day 2 test

Test	Number of items	Number of items scored for MME
ACT English	75	45
ACT Writing	one prompt	one
ACT Reading	40	32
ACT Mathematics	60	36
ACT Science	40	20
ACT WorkKeys Reading for Information	33	19
ACT WorkKeys Applied Mathematics	33	7
ACT WorkKeys Locating Information (scored as Mathematics)	38	3
ACT WorkKeys Locating Information (scored as Social Studies)	38	6

Table 5.3. Number of selected items by Day 1 and Day 2 test and by standard

Test	Standard	Number of selected items
ACT English	W1.1	17
	W1.3	17
	W1.4	0
	LAN4.1	11
ACT Writing	W1.3	one prompt (12 points)
ACT Reading	R2.1	17
	R2.2	10
	L3.1	5
ACT WorkKeys Reading for Information	R2.1	11
	R2.2	8
ACT Mathematics	L1	3
	L2	1
	A1	11
	A2	2
	A3	1
	G1	14
	G2	2
	S1	1
	S4	1
ACT WorkKeys Applied Mathematics	L2	4
	G1	2
	S1	1
ACT WorkKeys Locating Information (scored as Mathematics)	L1	2
	S1	1
ACT Science	R1	20
ACT WorkKeys Locating Information (scored as Social Studies)	P2	4
	CE1	2

Test Development for Michigan Components

In developing the augmentation of ACT Plus Writing and *ACT WorkKeys* to produce the overall MME, it was not feasible to apply many of the procedures that the Michigan Department of Education typically employs for test development because the spring 2007 administration of the Michigan Merit Examination (MME) was the first administration of a new assessment using a new scale, and because two components of the MME are pre-designed by ACT. Therefore, there did not exist any IRT-based item parameter estimates for items to be used on the spring 2007 administration (with the exception of items used to link to the pilot study of spring 2006). All analyses used to support test development had to be performed using classical test theory (CTT) statistics. However, for the spring 2008 administration, IRT parameter estimates were available for many items. The inclusion rules were, in order of decreasing importance, the following:

1. Alignment to content standards needing augmentation.
2. Positive corrected point-biserial correlations with either the MME pilot or past MEAP high school scores (preferably above 0.25, but no negatives) where statistics were available.
3. Creation of a reasonable distribution of classical item difficulty where statistics were available, meaning approximately one third of the items in each of the following ranges: 0.26–0.50, 0.51–0.75, and 0.76–1.00. Generally, we do not select items in the range of 0.00–0.25 unless such items are absolutely needed for content alignment.
4. IRT parameter estimates were reviewed when available.

Because classical statistics were gathered from different sources (the MME pilot versus previous assessments) the distributions that are not presented as the statistics do not all come from the same population.

For future cycles of the MME, more sophisticated analyses will be run for developing the assessments to ensure that they will be equitable. These include analyses of the distribution of IRT parameters, projected SEM/Information curves, projected reliability, and projected classification accuracy. The comparison with the baseline (previous year) will be included with current projections to evaluate the overall similarity of each year's assessment to the previous year.

NOTE: Item development for the augmented portion of the MME occurred during the period of the previous High School assessment (i.e., the Michigan Educational Assessment Program, or MEAP). The item development protocols and quality assurance checks are detailed in the 2005/2006 final MEAP technical report.

Historical Alignment Analyses Prior to 2014 Administration

Three independent alignment studies were conducted on the ACT and *ACT WorkKeys* against Michigan High School content standards before the pilot of the MME was created.

First, Norman L. Webb, a senior research scientist with the Wisconsin Center for Education Research and the National Institute for Science Education, conducted a preliminary alignment study of the ACT and *ACT WorkKeys* to the Michigan content standards in December, 2004 as a first step in determining the feasibility of combining a college-entrance exam with an NCLB-compliant, standards-based exam. The evidence in these reports was used to target augmentation to the ACT and *ACT WorkKeys* to maximize alignment to the Michigan standards in the pilot of the MME. These reports indicated that of the Michigan ELA standards that are assessable on a large scale, the ACT and *ACT WorkKeys* combination was well aligned to Michigan's high school standards, with some minor improvements possible. The reader is referred to page 15 of *Alignment Analysis of Language Arts Standards and Assessments: Michigan Grades 9–12*. (Webb, 2005). These reports documented some areas of weakness in mathematics and science. The weaknesses in mathematics are summarized on page 13 of *Alignment Analysis of Mathematics Standards and Assessments: Michigan High School*. (Webb, 2005). The weaknesses in science are summarized on pages 15-16 of *Alignment Analysis of Science Standards and Assessments: Michigan Grades 9–12*. (Webb, 2005). Augmentation was targeted to the weak areas.

Second, John Dossey of Illinois State University evaluated the Mathematics and Science ACT Test items and *ACT WorkKeys* items in comparison to the Michigan Mathematics and Science High School Content Standards. He identified remarkable consistency between the ACT/*ACT WorkKeys* and the Michigan content standards, with a few areas of weakness. The weaknesses he identified were in mathematical content coverage of patterns, functions, probability and discrete mathematics, as described on page 14 of *Comparison of the ACT and ACT WorkKeys Assessments with the Mathematics and Science Content Expectations in the Michigan Curriculum Framework*. (Dossey, 2005). Although science was well covered, identified weaknesses in life, physical, and earth science are summarized on page 20 of the same document (Dossey, 2005). Augmentation was targeted to maximize alignment on these areas.

Third, Timothy Shanahan of University of Illinois at Chicago evaluated the ACT and *ACT WorkKeys* items in comparison to the Michigan English Language Arts (ELA) content standards. In summary, Shanahan clearly states on page 7 of *Review of ACT Coverage of Michigan Language Arts Standards* (Shanahan, 2005) that the ACT English and Reading assessments are strongly aligned with the Michigan ELA content standards. Although the alignment study suggested no need to further augment the ELA portion of the assessment, DAS chose to augment the Writing portion. Specifically, in order to resolve an issue with balance of representation, a score for Social Studies Decision Making (constructed response item) was added to the Writing total score. This addition offset the large number of English multiple choice points that were being counted as part of the Writing score.

Norman L. Webb from the University of Wisconsin led another alignment study for the Michigan Merit Examination pilot in May, 2006, involving curriculum, instruction and assessment experts from within and outside of the State. For the English Language Arts (ELA) and mathematics portions of the MME, alignment was considered in regard to both the current (2004) Michigan Curriculum Framework Standards and Benchmarks and the soon-to-be-implemented (2006) High School Content Expectations. Below, findings are presented only from the alignment with the 2004 Michigan Curriculum Framework Standards and Benchmarks.

Members of the alignment teams were solicited from a diverse group of educators who had not previously taken part in developing the assessment instruments, in order to ensure the objectivity of the study.

The alignment studies indicated the following for the individual content areas:

- For ELA, seven of the twelve (2004) standards were reasonably addressed by an on-demand assessment, as stated on page 10 of *Alignment Analysis of Reading and Language Arts Standards and Michigan Merit Exam: Michigan High School* (Webb, 2006). The MME demonstrated Categorical Concurrence for all seven standards (see page 9). Five standards showed Depth-of-Knowledge Consistency and Range of Knowledge, and all but one had an appropriate Balance of Representation.
- For mathematics, there were six (2004) standards, all of which were addressed in an on-demand assessment. As described in *Alignment Analysis of Mathematics Standards and Michigan Merit Exam: Michigan High School* (Webb, 2006), the MME demonstrated Categorical Concurrence on all six standards. Four standards showed Depth-of-Knowledge Consistency, two had an acceptable Range of Knowledge, and all but one had an appropriate Balance of Representation.
- For science, the panel concluded that the alignment is reasonable if only the benchmarks that are more suitably assessed by an on-demand assessment are considered. These analyses are described in *Alignment Analysis of Science Standards and Michigan Merit Exam: Michigan High School* (Webb, 2006). Of the five 2004 standards, all but "Reflecting on Scientific Knowledge" demonstrated Categorical Concurrence. This was corrected beginning with the Spring 2007 MME by adding six items assessing Reflecting on Scientific Knowledge. These items were selected to also address depth of knowledge, range of knowledge, and balance of representation. Of the remaining standards, all showed Depth-of-Knowledge Consistency, three had an acceptable Range of Knowledge, and all had an appropriate Balance of Representation.

The new Michigan Merit Examination (MME) is based on the ACT Plus Writing and three *ACT WorkKeys* assessments (*Reading for Information*, *Applied Mathematics* and *Locating Information*), with Michigan-developed augmented portions designed to address standards not covered by the ACT tests and the *ACT WorkKeys* assessments. In assembling the Michigan-developed component for MME, the post-hoc alignment studies were used to indicate areas where the ACT and *ACT WorkKeys* tests need to be augmented.

From the results of the post-hoc alignment studies, it appears that the targeted augmentations of the Mathematics and Science assessments were effective.

Post-Hoc Alignment Studies of the 2010 Michigan Merit Examination

Norman L. Webb conducted an alignment study of the 2010 Michigan Merit Examination in May, 2010. Six reviewers in each of three content areas—English Language Arts (ELA), mathematics, and science—reviewed the Michigan High School Content Expectations and standards with two forms (initial and makeup) of the 2010 MME. For either form, only the selected Day 1 and Day 2 items and the operational Day 3 items were reviewed. The reviewers came from within and outside the state, and included content experts, assessment experts, and state curriculum consultants. As in the previous study, members of the alignment teams were solicited from a diverse group of educators who had not previously taken part in developing the assessment instruments, in order to ensure the objectivity of the study.

The following summarizes the findings and conclusions from this alignment study.

English Language Arts

The alignment between Strand 2 (reading, listening, and viewing) of the Michigan English language arts standards and the ACT/*ACT WorkKeys* reading assessments administered in 2010 with selected items for Michigan needed slight improvement. The most critical alignment issue was with Range-of-Knowledge Consistency. On the average, reviewers found 45 items on the two forms (R1 and R2) of the 51 item reading assessment that mapped to content expectations under Strand 2. The assessment items were weak with regards to the DOK levels compared to the level of complexity expected by the content expectations. Reviewers found that the two forms of the assessments had items that only matched about one-fourth of the content expectations under Strand 2. This was too low of a percentage to be considered to have an acceptable level for range. Reviewers found some differences between the two forms in how the items were distributed among the six or seven content expectations. The assessment items on Form R1 were judged to primarily target two content expectations and were not considered to be evenly balanced among the content expectations. Reviewers judged that the items on Form R2 were more evenly distributed among four or five content expectations. Overall, to attain full alignment about six items would need to be replaced or added to target additional content expectations.

The alignment between the two forms of the English ACT assessment and Strand 1 (writing, speaking, and visual expressions) for the Michigan English language arts standards for high school needed slight improvement. The ACT assessment with selected items for the Michigan analysis included one writing prompt worth 12 points and 45 other multiple-choice items, each assigned one point. Nearly all of the item/points, 75, mapped to about seven of the content expectations under Strand I. The DOK levels of the items were sufficiently complex in relationship to the complexity required by the corresponding content expectations. The assessment items, however, were judged to only map to seven (23%) of the content expectations underlying Strand 1. This was an unacceptable level for the range criterion. Balance was acceptable for both assessment forms. Overall, about 10 items would need to be added or replaced to attain full alignment by targeting more of the content expectations under Strand 1. Reviewers were limited to only mapping the writing prompt to three content expectations. They indicated that the writing prompt measured more expectations under Content Expectation CE 1.3 than they were allowed to code. Thus, the range between the Michigan standards and the ACT English assessments E1 and E2 probably was better than indicated here, but still would need improvement.

Mathematics

The alignment between the Michigan high school standards and expectations and the two combined assessment forms (M1 and M2) of the ACT, *ACT WorkKeys*, and Michigan augmented form depended on the level of analysis performed. If the analysis was performed at the content expectation level, as normally done, then the alignment between the two assessment forms and the Michigan standards needed major improvement as indicated in the summary table below. If the analysis was done at the benchmark level—the level below the standard level (e.g. L.2.1 or A.2.1)—then the alignment only needed slight improvement for each form. Assessment Forms M1 and M2 had nearly the same number of items that corresponded to each of Strands 1, 2, and 3, over 20 items for most strands. This was sufficient to have an acceptable level for the Categorical Concurrence criterion (six or more items) for these three strands. Neither Form M1 nor M2 had more than two items that reviewers mapped to content expectations under Strand 4, an insufficient number of items for Categorical Concurrence for this strand.

The Depth-of-Knowledge Consistency criterion was acceptable for two or three strands for each form that had a sufficient number of items to be analyzed. The DOK levels of items from Form M1 targeting Strand 3 and from Form M2 targeting Strand 2 were too low.

Overall, the alignment for mathematics and the full assessment needed improvement—major improvement if the analysis was done at the content expectation level and slight improvement if the analysis was done at the benchmark level. The augmented item set targeted some content expectations that were not addressed by forms M1 and M2 and had a DOK level that was acceptable.

Science

The science reviewers concluded that the alignment between the Michigan science expectations and standards and the 2010 MME science assessments needed slight improvement. Both forms of the assessment demonstrated Categorical Concurrence and Range of Knowledge in each of the five major areas: biology, chemistry, physics, Earth science, and Inquiry, Reflection, and Social Implications (R1). In addition, both forms demonstrated Depth-of-Knowledge Consistency and Balance of Representation in biology, chemistry, physics, and Earth science. For R1, neither form had a sufficient number of items with a complexity level comparable to the expectations in that area to satisfy the Depth-of-Knowledge Consistency criterion. In addition, most of the R1 items on either form targeted the inquiry content statement (R1.1), while only one or two items mapped to the reflection content statement (R1.2), so that Balance of Representation was not met. The analysis concluded that about six to eight items would need to be replaced on either form in order to attain full alignment.

More details and full documentation of the 2010 MME alignment studies can be found from the following DAS documents: (1) Alignment Analysis of Mathematics Standards and Two Forms of ACT, *ACT WorkKeys*, and Augmented Assessments (Forms M1 and M2), One Form of Augmented Assessment with Sixteen Common and Unique Items (Form 1011), and Eight Forms of Augmented Assessment with Six Unique Items (Forms 1003-1010) (Webb, 2011); (2) Alignment Analysis of English Language Arts Standards and Two Forms of ACT/*ACT WorkKeys* Reading Assessment and Two Forms of ACT English Assessment (Webb, 2011); and (3) Alignment Analysis of Science Standards and Two Assessment Forms of ACT and Michigan Items (Forms S1.1 and S2); Nine Assessments Each with Sixteen Unique Items (Forms 1002-1010) (Webb, 2011).

Chapter 6: Erasure Analyses

Description and Purpose

Erasure analysis (also known as mark darkness analysis) is the study of the degree to which certain groups of students tend to mark and then erase those marks on multiple choice items. The purpose is to identify unusually low or unusually high rates of answer-changing behavior as circumstantial evidence to support investigations in situations where allegations of widespread cheating have been received and to identify plausible targets for on-site monitoring.

Data and Methods

The data captured to analyze erasure patterns is described here. In a data file with one row per student per subject, the following data are captured:

- DistrictCode (NULL for state rollup)
- BuildingCode (NULL for district rollup)
- Grade (NULL for all grades rollup)
- Subject (NULL for all subjects rollup)
- NW2W (Number of wrong to wrong erasures)
- NW2R (Number of wrong to right erasures)
- NR2W (Number of right to wrong erasures)

Based on the form of the assessment and upon data already in the file, the following two fields are added to the student-level file:

- Nerase (Total number of erasures, or NW2W+NW2R+NR2W)
- Ntotal (Total number of MC items responses)

From these data, summary data files are created with one row for each district/school/grade/subject combination. Each row of the file contains the following data:

- DistrictCode
- BuildingCode (NULL for district rollups)
- Grade
- Subject
- DistrictCode (NULL for state rollup)
- BuildingCode (NULL for district rollup)
- Grade (NULL for all grades rollup)
- Subject (NULL for all subjects rollup)
- NW2W (Number of wrong to wrong erasures over all students)
- NW2R (Number of wrong to right erasures over all students)
- NR2W (Number of right to wrong erasures over all students)
- Nerase (Total number of erasures, or NW2W+NW2R+NR2W)
- Ntotal (Total number of MC items responses)

From these data in the summary file, two additional fields are created for each row as follows:

R1 (ratio of all erasures to all responses in the combination, or Nerase/Ntotal)
R2 (ratio of wrong-to-right erasures to all erasures in the combination, or NW2R/Nerase)

Based upon data in this file, four threshold values are calculated for each statistic and each subject at the district level and at the school level. These thresholds are based on the distributions of the ratio statistics at the district and school level. These thresholds may change based on their usefulness in operation, but current plans are that they will be:

1. 3SDlow (3 standard deviations below the mean or zero, whichever is greater)
2. Prcntlow (The 5th percentile)
3. 3SDhigh (3 standard deviations above the mean)
4. Prcnthigh (The 95th percentile)

The following flags are applied in the summary data files, based on the thresholds above:

- R1LowSD (1 if less than 3SDlow, 0 otherwise for R1)
- R1LowPct (1 if less than Prcntlow, 0 otherwise for R1)
- R1HighSD (1 if greater than 3SDhigh, 0 otherwise for R1)
- R1HighPct (1 if greater than Prcnthigh, 0 otherwise for R1)
- R2LowSD (1 if less than 3SDlow, 0 otherwise for R2)
- R2LowPct (1 if less than Prcntlow, 0 otherwise for R2)
- R2HighSD (1 if greater than 3SDhigh, 0 otherwise for R2)
- R2HighPct (1 if greater than Prcnthigh, 0 otherwise for R2)

Based on these flags, district/school/grade/subject combinations with unusually low or unusually high ratios are identified. The criteria for identifying individual combinations will need to be determined through more experience with operational data.

However, there will be at least two uses of these data. First, these data will be used as evidence in investigations following up on allegations of unethical behavior. Second, these data will be used to target individual schools and/or districts for on-site monitoring by MDE and/or contractor staff during the next assessment cycle. It is expected that these erasure data will also be useful in research on erasure patterns as related to item characteristics.

Because the behaviors of these summary statistics are not well known, either in a univariate or bivariate fashion, summary statistics will also be presented to inform DAS understanding. These summaries will display both graphically and numerically the univariate and bivariate distributions of the ratio statistics, thresholds, and flags where the displays are reasonable. These displays will aid in future construction of erasure analysis indices.

Day 1 and 2 Analysis

Overview

The Day 1 and Day 2 systems employed by ACT each generated an item response file for DAS's use in erasure analysis. The files include one record, representing one answer document, for each Select record provided.

Input

Three types of files are input to the process:

Mark Intensity Files
These contain data from the original scanning of the answer documents, including mark intensities for the test items. There is a mark intensity value for each possible test item response (oval), using a 16 intensity level scan. The lowest mark intensity values (0–3) are not used.

Mark Intensity Files do not identify erasures per se; they identify scan intensity values. Scan intensity is based on a number of factors such as area completed and darkness (light reflection). There is no automated way to distinguish a light mark from an erasure or dark erasure from a true mark. The scanner can only measure that one item response has more intensity (or the same intensity) as another. For building of the erasure patterns, the process assumes the item response with the least intensity is an erasure within an item.

Select File(s)
These contain student records, including the item responses (one response for each item) that were used for scoring. For each item, the scored response is the one for which the darkest mark was scanned (unless there is a double grid, defined below).

Scoring Keys
To identify the correct response to each item.

Output

Match to mark intensity files
For each Select record, the matching mark intensity record is found using the batch and PAS or UIN (a unique identifier for the answer document) for Day 1 and the batch and UIN for Day 2.

Create item response record
An item response record, containing response analysis values, is created for each Select record.

Response analysis values and item response file layout are shown in Tables 6.1 and 6.2 below.

Table 6.1. Day 1 and Day 2 Response Analysis Values for Erasure Analysis

Categories	Proposed Response Analysis Value	How determined
"No item response or no erasure detected (normal mark)"	0	There is no more than one mark intensity value for the item.
"Incorrect response changed to correct response"	1	The scored response is correct, and there are one or more marks with a lesser intensity value for the item.
"Correct response changed to an incorrect response"	2	The scored response is incorrect, and there is a lesser mark intensity value for the correct response (but not a double grid).
"Incorrect response changed to another incorrect response"	3	The scored response is incorrect (and is not a double grid), and there are one or more marks with a lesser intensity value for the item that are also incorrect and the correct response has not been marked (i.e., erased).
"Double grid"	4	The two highest mark intensity values for the item are equal intensity or side-by-side on the intensity scale.

Table 6.2. Day 1 and Day 2 Erasure Data Item response file layout

Pipe-Delimited Field #	Fixed Field Start	Fixed Field End	Field Name	ACT (Day 1)		*ACT WorkKeys* (Day 2)	
				Length	Content	Length	Content
1	1	1	Program	1	"1"	1	"2"
2	2	11	Student Barcode Number	10	Select file pos. 412–421	10	Select file pos. 458–467
3	12	19	Student Batch/Process Number	4	Select file pos. 1016–1019	8	Select file pos. 475–482
4	20	25	Student PAS	6	Select file pos. 1029–1034	0	n/a for Day 2 as a separate field (Day 2 PAS is included in field #5 below.)
5	26	45	Student UIN	20	Select file pos. 686–705	6	Select file pos. 469–474
6	46	120	Test 1 Response Analysis	75	Calculated from Select file pos. 436–510	33	Calculated from Select file pos.192–224
7	126	185	Test 2 Response Analysis	60	Calculated from Select file pos. 511–570	33	Calculated from Select file pos. 279–311
8	186	225	Test 3 Response Analysis	40	Calculated from Select file pos. 571–610	38	Calculated from Select file pos. 366–403
9	226	265	Test 4 Response Analysis	40	Calculated from Select file pos. 611–650	0	n/a for Day 2
10	266	271	Test Site ACT Code	6	Select file pos. 204–209	6	Select file pos. 136-141

Day 3 Erasure Analysis

Erasure Analysis for Day 3 components was performed on all operational multiple-choice responses once all scanning, data correction, and multiple-choice scoring was completed.

Data for each student multiple-choice response were programmatically analyzed to determine if the response contained a mark that exceeded the mark threshold and if the lighter marks were potential erasures. Statistics were captured and aggregated by Content, District, and School level to determine whether these District/School data were outside the state norm. Final results were provided in table format to DAS. During the DAS review process of these data, DAS could request images in JPEG/TIFF format of student answer documents down to the individual student level or by P/C/G in specific District(s)/School(s). These images could be posted to SharePoint and or secure FTP depending on the number and sizes of the images that were requested. The goal for DAS is to have these data soon after

delivery of student data giving them ample time to send letters of anomalous erasures/results to schools prior to public release.

A program processed a JPEG grayscale image and assigned a Hex value for each multiple-choice bubble. The Hex range is 0 – 15; where Hex 0 is the lightest and represented no shading contained in the bubble, and Hex 15 is the darkest and represented a dark, filled bubble. A student selected response is captured when the Hex value for the bubble is Hex 12 (definite mark threshold) or above. A bubble detected in the range of 9 – 11 is captured as the student response, if no other bubble for the multiple-choice question is above an 8. A bubble is considered an erasure if the Hex value for the bubble is greater than 5 and less than 12 and not identified as the student response. The following diagram demonstrates the student response and erasure identification process.

Table 6.3. Mark Identification Examples

	Minimum Hex value	Maximum Hex Value	Examples						
Valid Student Selected Response	9	15		**A**	**B**	**C**	**D**	**Mark**	**Erasure**
			Hex	15	2	3	4	A	No
			Hex	3	11	3	3	B	No
			Hex	9	2	2	4	C	No
			Hex	3	3	1	13	D	No
Multiple Student Selected Response				**A**	**B**	**C**	**D**	**Mark**	**Erasure**
			Hex	2	9	9	3	BC/Multiple	No
			Hex	1	13	2	15	BD/Multiple	No
			Hex	9	1	10	3	AC/Multiple	No
			Hex	2	11	13	3	BC/Multiple	No
Student Selected Response with Erasures				**A**	**B**	**C**	**D**	**Mark**	**Erasure**
			Hex	9	13	3	3	B	A
			Hex	3	6	3	9	D	B
			Hex	7	11	13	3	BC/Multiple	A
			Hex	1	13	7	6	B	CD
			Hex	1	1	14	6	C	D

The answer key for each test was used to compare the student selected response, the correct answer, and the erased bubble to determine multiple-choice erasure results. There are three possible results for an erased multiple-choice question: wrong answer to correct answer; correct answer to wrong answer; or wrong answer to wrong answer. A result flag was set for each erased multiple-choice case. Using the image processed Hex value for each bubble in a multiple-choice question; each Hex value was analyzed to determine if an erasure is present. A flag was set for each bubble that is detected as an erasure. The iErasureA flag was set if the A bubble was erased; iErasureB was set if the B bubble was erased; and so on.

All multiple-choice erasure information was tabulated for aggregation into various result sets. Determining the erasure results was a multi-step process. The first step was to capture these data at the student answer document level during the scanning and scoring processes. During these procedures the following data elements were captured:

Table 6.4. Tabulated Data Format

Data Field	Type	Description
District Number	5 Byte Text	Unique numeric district identifier; (e.g. 73903)
School Number	5 Byte Text	Unique numeric school identifier; (e.g. 08294)
Grade	2 Byte Text	NA – for MME, value is “?”
Subject	1 Byte Text	A = Mathematics, B = Science, C = Social Studies
Class Group Number	4 Byte Text	Captured from the answer document
Student Litho	8 Byte Text	Unique student document identifier
Item Position	2 Byte Text	Item position within form (e.g.01, 02)
Erasure A	Bit	Indicates bubble contains an erasure
Erasure B	Bit	Indicates bubble contains an erasure
Erasure C	Bit	Indicates bubble contains an erasure
Erasure D	Bit	Indicates bubble contains an erasure
Wrong to Right	Bit	Indicates response changed from wrong to right
Right to Wrong	Bit	Indicates response changed from right to wrong
Wrong to Wrong	Bit	Indicates response changed from wrong to wrong

These data captured during scanning and scoring were then matched against the scored student data file to link the answer document records with the student UIC and the student's values for the P/C/G level valid flags. Once these tabulated erasure count data had been merged with the student data file, several calculations occurred prior to the flagging of any student level results. First, mean and standard deviation were calculated for each subject for each program (P/C/G). For MME in which grade 11 and grade 12 are reported together, using only students who have an affirmative valid flag for that P/C/G were calculated. This calculation applied to both total erasure counts and wrong-to-right erasure counts. Second, a student level total erasure z-score for that P/C/G was calculated. This is defined as (student total erasures-mean P/C/G total erasures)/ Standard Deviation Total Erasures P/C/G . Additional steps included calculating the proportion of student erasures that are wrong to wrong, wrong to right, and right to wrong. Once all calculations had taken place and had been applied to all student level records, two files were the resultant deliverables: a data file that contains erasure information for all the students and a data file that contains erasure information for those flagged students based on the state flagging criteria. Table 6.5. below contains a list of erasure information for all students.

Table 6.5. Psychometric Data File

Data Field	Type	Description
TestCycleID	Integer	Current Test Cycle ID for MME
DistrictCode	Varchar(5)	Unique numeric district identifier; (e.g. 73903)
DistrictName	Varchar(255)	District Name
SchoolCode	Varchar(5)	Unique numeric school identifier; (e.g. 08294)
SchoolName	Varchar(255)	School/Building Name
Grade	Varchar(2)	NA – grades 11 and 12 reported together. File value = "?"
Subject	Varchar(1)	A=Mathematics, B=Science, and C=Social Studies
Class	Varchar(4)	Blank. Formerly captured from the answer document
LastName	Varchar(25)	Student's last name (Provided from Student Data File)
FirstName	Varchar(25)	Student's first name (Provided from Student Data File)
UIC	Varchar(10)	Student's unique identifier code (Provided from Student Data File)
Barcode	Varchar(10)	Student's barcode, captured from the answer document

Form	Varchar(4)	Form the student was administered, captured from the answer document
TestLithocode	Varchar(10)	Unique student document identifier
ErasureCount	Integer	Number of erasures on the student test
W2RCount	Integer	Number of erasures where response was changed from an incorrect to a correct choice.
W2WCount	Integer	Number of erasures where response was changed from an incorrect to a different incorrect choice.
R2WCount	Integer	Number of erasures where response was changed from the correct choice to an incorrect choice.
MeanErasureCount	Real	Mean total erasure count using all valid cases for the P/C/G
SDErasureCount	Real	Standard deviation of total erasure count using all valid cases for the P/C/G
ErasureZscore	Real	An indication, in standard deviation units, of a student's total erasure count relative to the statewide mean (ErasureCount – MeanErasureCount/SDErasureCount)
Proportion W2R	Real	Proportion of total erasures that are wrong-to-right. (W2RCount/ErasureCount)
ProportionW2W	Real	Proportion of total erasures that are wrong-to-wrong. (W2WCount/ErasureCount)
ProportionR2W	Real	Proportion of total erasures that are right-to-wrong. (R2WCount/ErasureCount)
MeanW2R	Real	Mean wrong-to-right erasure count using all valid cases for the P/C/G
StandardDevW2R	Real	Standard deviation of wrong-to-right erasure count using all valid cases for the P/C/G
iDocID	Integer	Unique Identifier in the MI Database

Another data file for flagged student erasure data only, formatted in the same way as in Table 6.5., was also provided to DAS, which contains only students meeting the following conditions:

a. Student has a valid score in that P/C/G

b. Student's ErasureZscore is greater than or equal to 2.00

AND ratio of wrong to right erasure as against the total erasure is greater than or equal to 0.75.

Chapter 7: ACT Writing Training and Scoring

Results of Constructed Response Scoring Procedures

The MME assessment includes the written essay component of the ACT Writing Test. The procedure for scoring ACT Writing responses is outlined below. This is the scoring process that Pearson Educational Measurement Performance Scoring Center follows.

Rangefinding

The goal of the rangefinding sessions is to identify a sufficient pool of student responses which illustrate the full range of student performance in response to the prompt, and for which consensus scores can be resolved. This pool of responses includes borderline responses—ones that do not fit neatly into one of the score levels and that, therefore, represent some of the decision-making problems that scorers may face—as well as drawing a line between two score points.

All contracted scorers are trained and qualify to score ACT Writing Test responses using the Baseline Prompt training. The Baseline prompt is chosen from a retired operational prompt that performed well in operational scoring. The Baseline prompt and training materials are selected to represent the range and types of responses scorers will see during prompt-specific operational scoring.

Papers are chosen for the Baseline Anchor from operational student responses. The Baseline Anchor Set consists of three papers at each score point, for a total of eighteen papers. Baseline training also consists of four Practice sets, each with ten papers. Contract scorers must then pass two of three ten-paper Qualification sets. Rangefinding sessions for the Baseline Anchor Set are held biennially.

In addition to training and qualifying on the Baseline Anchor set, contracted scorers undergo prompt-specific training on each operational prompt. Prompt-specific training consists of an Anchor Set of nine papers and a Practice Set of four papers.

Rangefinding sessions for prompt-specific training sets are held annually in a separate session from Baseline Training rangefinding.

Prior to all Baseline and Prompt-Specific rangefinding sessions, the Contractor compiles rangefinding papers for prompts into proposed training sets, including writing annotations for all Anchor and Practice papers. ACT staff attends all rangefinding sessions and has final approval of scores assigned to all rangefinding papers.

Rater Training

Thorough training is vital to the consistent application of the scoring rubric and, therefore, accurate scores. The primary goal of training is to convey to the contract scorers the decisions made during training paper selection about what type(s) of responses correspond to each score point and to help scorers internalize the scoring protocol so that they may effectively apply those decisions.

Scorers are better able to comprehend the scoring guidelines in context, so the rubric is presented in conjunction with the anchor papers. Anchor papers are the primary points of reference for scorers as they internalize the rubric. Trainers draw scorers' attention to the score point description from the rubric,

as well as the illustrative anchor papers encouraging scorers to immediately connect the language of the rubric with actual student performance. Each anchor paper is also annotated with a scoring explanation that describes why the paper earned the given score. Annotations are meant to further illustrate the connection between the rubric descriptors and the elements present in a given essay.

After presentation and discussion of the anchor papers, each scorer is shown a practice set. Practice papers represent each score point and are used during training to help scorers become familiar with applying the rubric. Some papers clearly represent the score point. Others are selected because they represent borderline responses. Use of these practice sets provides guidance to scorers in defining the line between score points.

Training is a continuous process, and scorers are consistently given feedback as they score. With the help of the reliability reports, the scoring lead staff can closely monitor each scorer's performance.

Scoring

All responses are blind-scored by two scorers using a 6-point holistic scale. If the scores between the two scorers differ by more than 1, the paper is routed for resolution scoring. The resolution scorer will assign a holistic score using a scale of 1–6 inclusive of 0.5, representing adjacent scores. Resolution scoring is non-blind.

Comment Codes

Essay comments, derived from the scoring rubric, are selected by contract scorers to help student writers understand the strengths and weaknesses of their essays. ACT has developed five comment codes per each whole- and half-point score points. During operational scoring, one of the two contract scorers and the resolution scorer, if resolution is required, must assign at least one and not more than four comment codes to each response. Comment code training occurs on the Baseline prompt.

Contractor will identify validity responses for ACT approval.

Rater Monitoring

Pearson Educational Measurement (the Contractor) is responsible for the management and overall monitoring of the operational rangefinding and scoring, but ACT has ongoing access to performance reports.

Rater Validity Checks

An additional set of data, known as validity scoring, are collected daily to check for reader drift and reader consistency in scoring to the established criteria. When scoring supervisors identify ideal student responses, they route these to the scoring directors for preview. Scoring directors review the responses and choose appropriate papers for validity scoring. Validity responses are usually solid score point responses. ACT approves all validity responses and has access to ongoing calibration responses and annotations.

Readers score a validity response approximately every 30 responses for ACT Writing.
Validity scoring is blind; because image based scoring is seamless, scorers do not know when they are scoring a validity response. Results of validity scoring are analyzed regularly by scoring directors. The

Contractor provides scorers who perform below the standard validity percentage with constructive feedback, close monitoring, and/or recalibration in the form of calibration papers. Calibration papers are used to correct scorer drift or to illustrate differences between problematic score points for struggling scorers. Appropriate intervention measures are initiated as needed, including the retraining or releasing of scorers who continue to perform below project standards.

Inter-Rater Reliability

Inter-rater agreement is expressed in terms of exact agreement (Reader Number One's score equals Reader Number Two's score) plus adjacent agreement (+/- 1 point difference). The Contractor must obtain a cumulative inter-rater reliability ("IRR") level of 0.60 at the conclusion of each scoring window.

In addition, the Contractor must obtain a perfect plus adjacent agreement of 0.95 at the conclusion of each scoring window—that is, 5% or less of resolution scoring.

Contractor staff monitors the accuracy of scoring to maintain the agreed upon inter-rater reliability through back reading, validity, and calibration papers. The validity percentage is 3%.

Chapter 8: Model Fit

This chapter presents the item-model fit and person-model fit analyses for MME.

Item-Model Fit

Item-Model Fit Indexes

The MME Writing, Mathematics, Reading, and Science assessments were scaled and equated using PARSCALE (Muraki & Bock, 1997) and a three parameter logistic IRT/generalized partial credit model for item calibration. (The methods used for estimating student scores are discussed later in the chapter on scaling and equating.) The MME Social Studies assessment was scaled with the Rasch model using WINSTEPS.

The MME calibration runs for Writing, Mathematics, Reading and Science were conducted using PARSCALE under the generalized partial credit model for constructed response items and the three parameter logistic model for dichotomous items. Two model fit indices were used for the dichotomous and polytomous items. They are the Chi-square (χ^2) statistics provided in PARSCALE phase 2 output, and Orlando & Thissen's (2000) S–X^2 statistics. To compute the Chi-square index, the number of ability groups defined was 10, which coincides with the MME item analysis practice of using 10 deciles. Tables 8.1 to 8.4 contain the item fit statistics of all MME scored items on the initial forms for the test subjects of Writing, Reading, Mathematics and Science, respectively.

To test the goodness of fit for each item, a significance level (α) of .05 was used. If the observed p-value associated with the fit indices for an item was lower than .05, the item was considered a "poorly" fitting item. The χ^2 tests of item fit are, however, extremely sensitive to sample size, which is very large for MME. Based on the S–X^2 statistics, approximately 28%, 29%, 51% and 38% of the scored items for MME Mathematics, Science, Reading and Writing, respectively, were found to be significant. For all subjects, the Pearson χ^2 statistics tended to be significant.

One plausible reason for the observed misfit is the degree of multidimensionality in the assessments that occurs. A consequence of multidimensionality is that it is more difficult to obtain assessment results that load heavily on the first principal component. Given more complete control over test design and development, it is possible to construct a more unidimensional test that would have better goodness of fit indices for each item.

However, this does not invalidate these measures. This simply indicates that beyond the strong overall achievement measured by the MME subject tests, there are also some minor dimensions of achievement that impact the individual item scores of individual students. That the overall dimensions (or principal components) measured by each subject assessment are very strong is demonstrated by both (1) strong Cronbach's alpha internal consistency reliabilities (a Classical Test Theory index of measurement precision of the overall dimension), and (2) strong empirical IRT-model-based reliabilities (a measure of measurement precision of the overall dimension derived from the IRT model). For these measures of reliability, see Chapter 10 where all internal consistency and empirical IRT reliabilities are reported.

In addition, Yen and Fitzpatrick (2006) indicate that item misfit is typically caused by using an underspecified psychometric model (such as the Rasch or 2-PL model when items provide differing levels of information about the principal component, or when guessing is prevalent).

Yen and Fitzpatrick (2006) describe additional causes of item misfit, including differential item functioning, small sample sizes, poorly estimated item parameters, item stem quality, item miskeys, and item distractor quality. All of these potential causes were carefully investigated and rectified through both ACT and Michigan processes. Therefore, we are confident that these are not contributing factors in the fit statistics presented above.

Given that other possible sources of item misfit have been carefully addressed, and given that the Generalized Partial Credit Model is the most highly specified psychometric model that has been validated for use in large-scale assessment, the use of that model for MME is the best possible choice available to increase item fit.

Finally, the matrix plots of item characteristic curves of items employed for MME scoring are presented in Figures 8.1 to 8.4. In these plots, there are some item characteristic curves (ICCs) that have flat ICCs.

For MME Social Studies, the mean square fit (MNSQ) statistics obtained from WINSTEPS were used to determine whether items were functioning in a way that is congruent with the assumptions of the Rasch mathematical model. Two types of MNSQ values are presented, OUTFIT and INFIT. MNSQ OUTFIT values are sensitive to outlying observations. MNSQ INFIT values are sensitive to behaviors that affect students' performance on items near their ability estimates. According to the item analysis specification, the model is considered to be moderately misfit if the values are between 1.5 and 2.0, and highly misfit if the values are greater than 2.0. These fit indices are presented in Table 8.5. Based on the MNSQ INFIT and MNSQ OUTFIT statistics, zero percent of items was flagged as moderately or highly misfit.

Table 8.1. Item Fit Statistics – Writing for Spring 2014

ITEM	SX^2	df_SX^2	p_SX^2	χ^2	df	p
AE02	64.23	56	0.21	76.52	9	0.00
AE03	66.21	53	0.11	275.14	8	0.00
AE06	119.53	58	0.00	47.30	9	0.00
AE07	47.58	57	0.81	95.03	9	0.00
AE08	70.51	56	0.09	245.51	9	0.00
AE10	52.98	51	0.40	56.20	8	0.00
AE11	95.39	58	0.00	19.24	9	0.02
AE14	128.27	56	0.00	303.51	9	0.00
AE15	66.75	55	0.13	108.78	9	0.00
AE16	58.17	58	0.47	93.23	9	0.00
AE17	60.12	56	0.33	114.96	9	0.00
AE19	89.22	54	0.00	65.17	8	0.00
AE24	51.61	58	0.71	94.70	9	0.00
AE25	78.84	59	0.04	53.07	9	0.00
AE27	59.56	54	0.28	127.72	8	0.00
AE29	120.00	55	0.00	17.53	9	0.04
AE31	58.48	50	0.19	172.53	8	0.00
AE32	94.33	59	0.00	26.73	10	0.00
AE33	73.27	57	0.07	184.66	9	0.00
AE34	132.64	54	0.00	42.49	9	0.00
AE38	80.88	56	0.02	131.97	10	0.00
AE39	52.79	56	0.60	116.51	9	0.00
AE40	35.30	52	0.96	214.30	8	0.00
AE41	135.71	57	0.00	16.16	9	0.06
AE42	54.27	59	0.65	51.78	9	0.00
AE43	66.29	58	0.21	89.89	9	0.00
AE45	66.84	58	0.20	114.73	10	0.00
AE47	58.42	49	0.17	214.03	7	0.00
AE49	61.33	56	0.29	73.17	9	0.00
AE51	51.23	54	0.58	205.36	9	0.00
AE53	78.33	53	0.01	128.23	8	0.00
AE54	42.51	55	0.89	234.39	9	0.00
AE55	58.66	60	0.52	70.72	10	0.00
AE58	56.10	59	0.58	61.70	10	0.00
AE60	55.73	53	0.37	354.22	8	0.00
AE61	68.46	54	0.09	412.05	9	0.00
AE63	95.49	59	0.00	145.75	10	0.00
AE64	60.34	58	0.39	113.98	10	0.00
AE66	87.92	58	0.01	104.91	9	0.00
AE68	109.35	56	0.00	248.95	10	0.00
AE70	90.62	56	0.00	370.96	8	0.00
AE71	106.77	55	0.00	521.80	9	0.00
AE72	137.85	59	0.00	268.08	10	0.00
AE74	58.24	57	0.43	213.56	9	0.00
AE75	98.48	57	0.00	342.91	9	0.00
AE76	127.16	146	0.87	240.85	38	0.00
AE77	142.28	146	0.57	195.65	38	0.00

Table 8.2. Item Fit Statistics – Reading for Spring 2014

ITEM	SX^2	df_SX^2	p_SX^2	χ^2	df	p
AR01	53.98	41	0.08	44.19	9	0.00
AR02	50.76	38	0.08	98.22	9	0.00
AR03	83.52	40	0.00	4.19	9	0.90
AR04	96.10	37	0.00	14.83	9	0.10
AR06	61.94	38	0.01	54.31	9	0.00
AR07	78.12	39	0.00	17.34	9	0.04
AR08	52.74	40	0.09	39.44	9	0.00
AR10	83.17	36	0.00	77.23	9	0.00
AR11	62.09	38	0.01	34.56	9	0.00
AR13	50.90	39	0.10	137.04	9	0.00
AR14	41.97	39	0.34	77.33	9	0.00
AR16	107.32	40	0.00	251.23	9	0.00
AR17	41.27	39	0.37	140.13	9	0.00
AR18	34.73	41	0.74	51.08	10	0.00
AR19	47.51	37	0.12	56.76	9	0.00
AR21	34.63	32	0.34	175.29	8	0.00
AR22	50.58	34	0.03	187.59	9	0.00
AR23	47.59	35	0.08	164.72	9	0.00
AR24	54.36	37	0.03	152.93	9	0.00
AR25	55.72	41	0.06	63.50	10	0.00
AR26	42.37	41	0.41	50.18	10	0.00
AR27	59.58	34	0.00	249.92	8	0.00
AR29	71.36	39	0.00	85.30	9	0.00
AR30	82.79	34	0.00	126.85	9	0.00
AR31	84.32	35	0.00	345.29	9	0.00
AR32	76.00	36	0.00	255.61	9	0.00
AR33	66.08	35	0.00	302.52	9	0.00
AR34	88.52	37	0.00	269.99	9	0.00
AR35	85.26	39	0.00	217.87	9	0.00
AR38	61.39	40	0.02	99.85	9	0.00
AR39	67.12	38	0.00	173.30	9	0.00
AR40	63.07	41	0.01	165.49	9	0.00
WK02	33.07	31	0.37	34.54	8	0.00
WK03	22.37	18	0.22	37.93	8	0.00
WK04	6.36	4	0.16	26.01	6	0.00
WK05	30.74	14	0.01	9.87	7	0.20
WK06	11.32	4	0.01	15.79	6	0.02
WK07	57.94	30	0.00	10.46	8	0.23
WK08	59.61	36	0.01	12.70	9	0.18
WK09	35.77	36	0.48	42.59	9	0.00
WK10	31.61	32	0.49	86.36	8	0.00
WK11	52.42	20	0.00	40.92	8	0.00
WK12	52.80	40	0.08	25.03	9	0.00
WK15	35.95	36	0.47	86.53	9	0.00
WK16	39.35	40	0.50	71.56	9	0.00
WK28	51.25	39	0.09	30.21	10	0.00
WK29	35.73	37	0.53	52.32	10	0.00
WK30	56.03	44	0.11	20.02	10	0.03
WK31	59.74	41	0.03	58.49	9	0.00

WK32	43.67	39	0.28	54.22	10	0.00
WK33	54.25	41	0.08	37.48	10	0.00

Table 8.3. Item Fit Statistics – Mathematics for Spring 2014

ITEM	SX^2	df_SX^2	p_SX^2	χ^2	Df	p
AM01	70.79	57	0.10	37.91	9	0.00
AM02	51.02	61	0.82	83.95	9	0.00
AM03	60.50	43	0.04	75.25	7	0.00
AM06	72.02	64	0.23	94.01	9	0.00
AM07	75.23	48	0.01	90.36	8	0.00
AM09	117.25	53	0.00	82.56	8	0.00
AM10	110.78	47	0.00	167.50	7	0.00
AM11	72.81	62	0.16	66.13	9	0.00
AM13	74.54	59	0.08	77.81	8	0.00
AM15	77.96	58	0.04	48.72	8	0.00
AM17	108.73	60	0.00	61.35	9	0.00
AM18	113.13	52	0.00	173.09	8	0.00
AM20	97.02	63	0.00	173.07	9	0.00
AM22	81.58	70	0.16	118.53	9	0.00
AM23	105.65	52	0.00	114.74	8	0.00
AM24	414.24	55	0.00	643.21	8	0.00
AM28	35.48	53	0.97	87.10	7	0.00
AM29	65.79	60	0.28	109.95	8	0.00
AM30	56.13	55	0.43	387.71	8	0.00
AM33	69.68	56	0.10	73.55	8	0.00
AM34	120.52	60	0.00	142.73	8	0.00
AM35	55.85	63	0.73	123.83	9	0.00
AM37	114.78	67	0.00	176.41	9	0.00
AM41	96.78	69	0.02	112.75	9	0.00
AM42	80.96	69	0.15	134.19	9	0.00
AM45	72.59	67	0.30	186.30	9	0.00
AM46	79.85	70	0.20	188.31	9	0.00
AM48	68.59	72	0.59	101.30	10	0.00
AM51	109.81	75	0.01	136.65	9	0.00
AM53	127.38	59	0.00	54.58	9	0.00
AM54	100.14	62	0.00	179.96	9	0.00
AM55	126.76	68	0.00	192.93	9	0.00
AM57	122.23	73	0.00	75.34	10	0.00
AM58	77.39	64	0.12	76.73	10	0.00
AM59	67.58	68	0.49	159.91	9	0.00
AM60	63.27	51	0.12	124.65	10	0.00
WK02	30.64	23	0.13	14.58	6	0.02
WK07	26.77	35	0.84	18.62	7	0.01
WK14	61.63	55	0.25	71.01	8	0.00
WK19	35.15	40	0.69	13.96	7	0.05
WK27	43.55	57	0.91	249.73	9	0.00
WK28	95.11	69	0.02	133.93	10	0.00
WK29	80.43	59	0.03	172.38	9	0.00
WL02	15.88	15	0.39	11.42	6	0.08
WL17	64.63	47	0.04	23.86	8	0.00
WL20	62.11	62	0.47	53.23	9	0.00
MI01	75.69	59	0.07	147.66	9	0.00
MI02	78.55	75	0.37	99.38	9	0.00
MI03	64.13	56	0.21	150.48	8	0.00

MI04	60.47	64	0.60	125.70	9	0.00
MI05	59.21	57	0.39	102.51	8	0.00
MI06	172.05	51	0.00	201.20	8	0.00
MI07	56.76	60	0.59	68.95	9	0.00
MI08	50.53	65	0.91	90.26	9	0.00
MI09	61.25	56	0.29	28.78	9	0.00
MI10	41.14	53	0.88	42.84	8	0.00
MI11	72.86	61	0.14	60.64	8	0.00
MI12	62.08	62	0.47	69.98	9	0.00
MI13	61.06	59	0.40	96.63	8	0.00
MI14	81.59	61	0.04	98.86	9	0.00
MI15	67.02	66	0.44	288.49	9	0.00
MI16	68.24	62	0.27	104.66	8	0.00
MI17	63.99	53	0.14	23.20	8	0.00
MI18	71.28	65	0.28	38.31	9	0.00
MI19	61.39	58	0.36	76.59	8	0.00
MI20	60.48	55	0.28	152.43	8	0.00
MI21	125.12	60	0.00	251.29	8	0.00
MI22	74.13	53	0.03	96.39	8	0.00
MI23	61.09	58	0.37	84.81	8	0.00
MI24	58.55	57	0.42	73.51	8	0.00
MI25	80.29	66	0.11	110.24	9	0.00
MI26	70.11	61	0.20	109.98	8	0.00
MI27	61.30	63	0.54	72.91	9	0.00
MI28	54.56	68	0.88	97.34	9	0.00
MI29	74.38	65	0.20	93.42	9	0.00
MI30	50.17	57	0.73	253.48	8	0.00
MI31	64.09	55	0.19	80.23	8	0.00
MI32	65.60	68	0.56	67.79	9	0.00
MI33	63.12	56	0.24	109.51	7	0.00
MI34	71.14	60	0.15	67.25	8	0.00
MI35	70.94	64	0.26	114.09	8	0.00
MI36	73.07	60	0.12	116.27	8	0.00
MI37	64.72	72	0.72	69.27	9	0.00
MI38	70.69	64	0.26	73.27	8	0.00
MI39	79.38	68	0.16	86.34	9	0.00
MI40	63.19	65	0.54	113.82	9	0.00
MI41	55.27	63	0.75	68.93	8	0.00
MI42	68.55	66	0.39	128.19	8	0.00

Table 8.4. Item Fit Statistics – Science for Spring 2014

ITEM	SX^2	df_SX^2	p_SX^2	χ^2	df	p
AS01	49.67	37	0.08	80.55	9	0.00
AS04	35.25	33	0.36	58.61	9	0.00
AS05	48.62	41	0.19	60.95	10	0.00
AS07	83.23	36	0.00	27.97	9	0.00
AS11	23.82	27	0.64	69.21	8	0.00
AS13	56.20	39	0.04	113.85	9	0.00
AS17	79.12	40	0.00	154.35	10	0.00
AS18	86.64	41	0.00	137.60	10	0.00
AS23	50.86	36	0.05	98.89	9	0.00
AS25	47.31	41	0.23	98.61	10	0.00
AS27	74.41	48	0.01	40.01	10	0.00
AS30	48.78	44	0.29	90.52	10	0.00
AS31	52.80	47	0.26	49.18	10	0.00
AS33	55.48	46	0.16	46.92	10	0.00
AS34	56.09	46	0.15	112.83	10	0.00
AS35	43.64	45	0.53	90.29	10	0.00
AS36	90.39	45	0.00	137.23	10	0.00
AS37	68.88	43	0.01	103.34	10	0.00
AS39	71.16	47	0.01	68.83	10	0.00
AS40	61.14	49	0.11	30.77	10	0.00
MI01	59.45	43	0.05	131.21	10	0.00
MI02	35.30	38	0.60	82.27	9	0.00
MI03	53.48	43	0.13	46.12	10	0.00
MI04	35.41	46	0.87	36.54	10	0.00
MI05	46.22	42	0.30	103.69	10	0.00
MI06	57.34	46	0.12	24.40	10	0.01
MI07	73.27	47	0.01	18.73	10	0.04
MI08	39.38	39	0.45	77.54	9	0.00
MI09	51.29	45	0.24	70.90	10	0.00
MI10	37.62	44	0.74	43.42	10	0.00
MI11	51.52	47	0.30	46.14	10	0.00
MI12	22.87	27	0.69	138.41	8	0.00
MI13	49.93	47	0.36	65.58	10	0.00
MI14	44.51	40	0.29	97.98	10	0.00
MI15	59.42	46	0.09	48.25	10	0.00
MI16	52.28	39	0.08	88.75	9	0.00
MI17	64.17	48	0.06	17.23	10	0.07
MI18	29.69	44	0.95	67.08	10	0.00
MI19	59.95	44	0.05	54.63	10	0.00
MI20	50.97	46	0.28	45.63	10	0.00
MI21	53.49	41	0.09	94.57	10	0.00
MI22	47.81	45	0.36	36.38	10	0.00
MI23	52.62	35	0.03	105.63	9	0.00
MI24	64.50	45	0.03	50.01	10	0.00
MI25	43.76	36	0.18	68.39	9	0.00
MI26	51.61	43	0.17	25.47	10	0.01
MI27	39.24	41	0.55	83.47	10	0.00
MI28	34.76	40	0.70	65.26	10	0.00

MI29	51.84	49	0.36	18.94	10	0.04
MI30	61.92	45	0.05	65.92	10	0.00
MI31	41.98	38	0.30	106.16	9	0.00
MI32	39.67	46	0.73	58.79	10	0.00
MI33	55.98	48	0.20	44.37	10	0.00
MI34	48.43	34	0.05	103.61	9	0.00
MI35	68.84	40	0.00	183.96	10	0.00
MI36	65.09	46	0.03	37.20	10	0.00
MI37	49.57	45	0.30	30.42	10	0.00
MI38	54.12	45	0.17	36.67	10	0.00
MI39	48.88	39	0.13	111.53	9	0.00
MI40	49.35	44	0.27	37.71	10	0.00
MI41	38.51	45	0.74	33.61	10	0.00
MI42	38.99	38	0.43	73.56	9	0.00
MI43	59.32	42	0.04	105.43	10	0.00
MI44	34.95	41	0.74	96.18	10	0.00
MI45	64.94	29	0.00	210.49	8	0.00
MI46	49.44	41	0.17	32.29	10	0.00
MI47	27.79	31	0.63	114.22	8	0.00
MI48	49.98	46	0.32	37.36	10	0.00
MI49	121.50	38	0.00	18.14	9	0.03
MI50	52.32	47	0.27	25.14	10	0.01
MI51	86.58	39	0.00	251.86	10	0.00
MI52	40.45	39	0.41	116.72	9	0.00
MI53	35.63	39	0.62	64.67	9	0.00
MI54	40.57	39	0.40	72.53	9	0.00
MI55	46.71	46	0.44	50.06	10	0.00
MI56	107.98	37	0.00	15.87	9	0.07
MI57	57.84	43	0.06	79.20	10	0.00
MI58	60.91	42	0.03	44.95	10	0.00
MI59	44.35	45	0.50	34.99	10	0.00
MI60	38.32	42	0.63	51.62	10	0.00
MI61	51.83	48	0.33	17.47	10	0.06
MI62	69.58	42	0.00	86.02	10	0.00
MI63	53.71	47	0.23	27.59	10	0.00
MI64	50.66	47	0.33	32.94	10	0.00
MI65	70.68	45	0.01	51.36	10	0.00
MI66	40.88	35	0.23	151.38	9	0.00
MI67	53.26	46	0.21	37.38	10	0.00
MI68	48.22	36	0.08	190.66	9	0.00
MI69	32.13	33	0.51	211.58	9	0.00
MI70	37.38	45	0.78	35.43	10	0.00
MI71	56.39	46	0.14	53.53	10	0.00
MI72	48.77	43	0.25	62.29	10	0.00
MI73	67.33	39	0.00	14.88	9	0.09
MI74	46.46	44	0.37	38.41	10	0.00
MI75	53.82	48	0.26	29.02	10	0.00
MI76	155.15	46	0.00	115.07	10	0.00
MI77	52.91	46	0.23	32.16	10	0.00
MI78	53.10	46	0.22	48.70	10	0.00
MI79	44.42	35	0.13	100.03	9	0.00

MI80	38.56	38	0.44	80.27	9	0.00
MI81	69.44	39	0.00	111.96	9	0.00
MI82	245.54	25	0.00	65.31	8	0.00
MI83	51.73	39	0.08	67.70	9	0.00
MI84	68.95	45	0.01	52.02	10	0.00
MI85	67.28	43	0.01	68.16	10	0.00
MI86	48.13	49	0.51	10.56	10	0.39
MI87	54.98	40	0.06	123.08	9	0.00
MI88	42.61	36	0.21	101.69	9	0.00
MI89	59.44	42	0.04	146.62	10	0.00
MI90	60.94	42	0.03	74.73	10	0.00
MI91	61.10	43	0.04	71.78	10	0.00
MI92	58.98	29	0.00	38.74	8	0.00
MI93	30.45	45	0.95	52.44	10	0.00
MI94	89.63	46	0.00	22.16	10	0.01
MI95	44.38	45	0.50	72.32	10	0.00
MI96	75.93	44	0.00	60.03	10	0.00
MI97	46.44	37	0.14	122.40	9	0.00
MI98	35.45	39	0.63	80.76	9	0.00
MI99	52.64	40	0.09	141.18	9	0.00
MI100	41.99	44	0.56	48.76	10	0.00
MI101	33.82	31	0.33	164.77	9	0.00
MI102	60.68	38	0.01	40.73	9	0.00
MI103	39.86	39	0.43	112.39	9	0.00
MI104	68.19	47	0.02	88.34	10	0.00
MI105	106.95	44	0.00	171.67	10	0.00
MI106	35.40	45	0.85	38.30	10	0.00
MI107	35.56	39	0.63	76.41	9	0.00
MI108	62.01	48	0.08	39.97	10	0.00
MI109	32.92	45	0.91	62.49	10	0.00
MI110	47.01	38	0.15	145.95	9	0.00
MI111	72.56	46	0.01	5.08	10	0.89
MI112	42.32	38	0.29	159.23	9	0.00
MI113	52.02	41	0.12	101.12	10	0.00
MI114	112.32	42	0.00	208.99	10	0.00
MI115	32.08	38	0.74	60.82	9	0.00
MI116	50.92	40	0.12	76.49	9	0.00

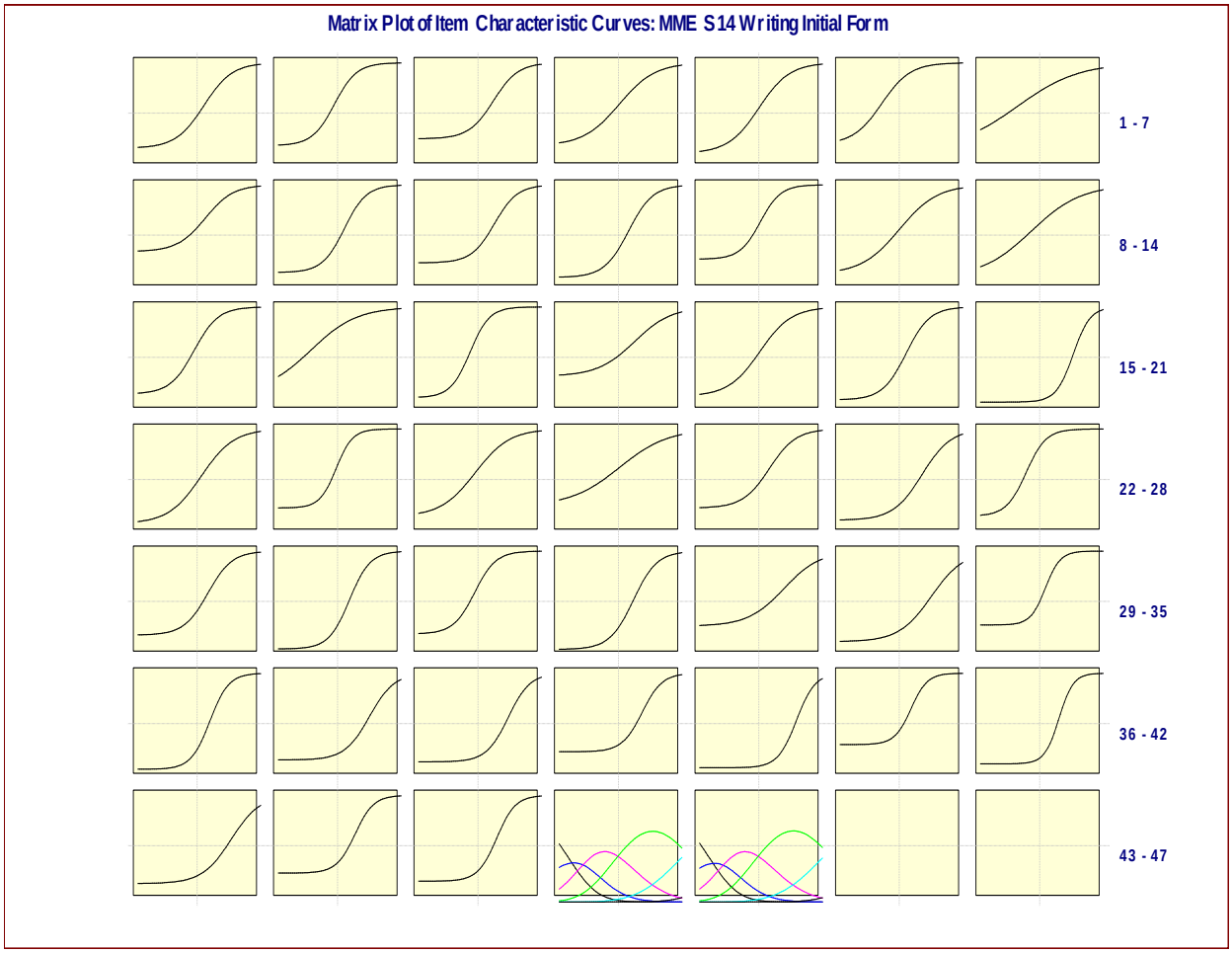


Figure 8.1. Item Characteristic Curves—Writing Spring 2014: 45 selected ACT English items plus one ACT CR item.

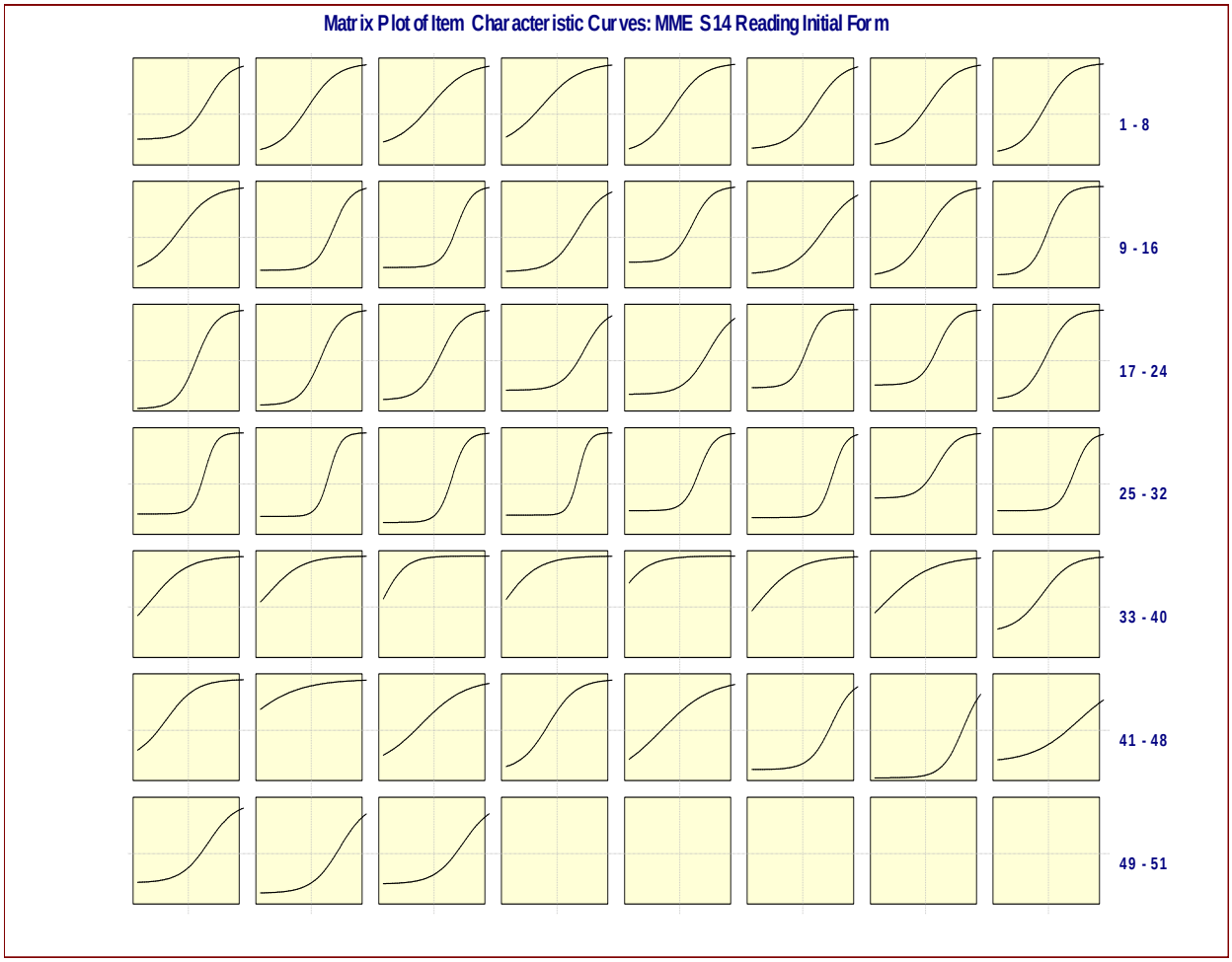


Figure 8.2. Item Characteristic Curves—Reading Spring 2014: 32 selected ACT Reading items plus 19 selected *ACT WorkKeys Reading for Information* items.

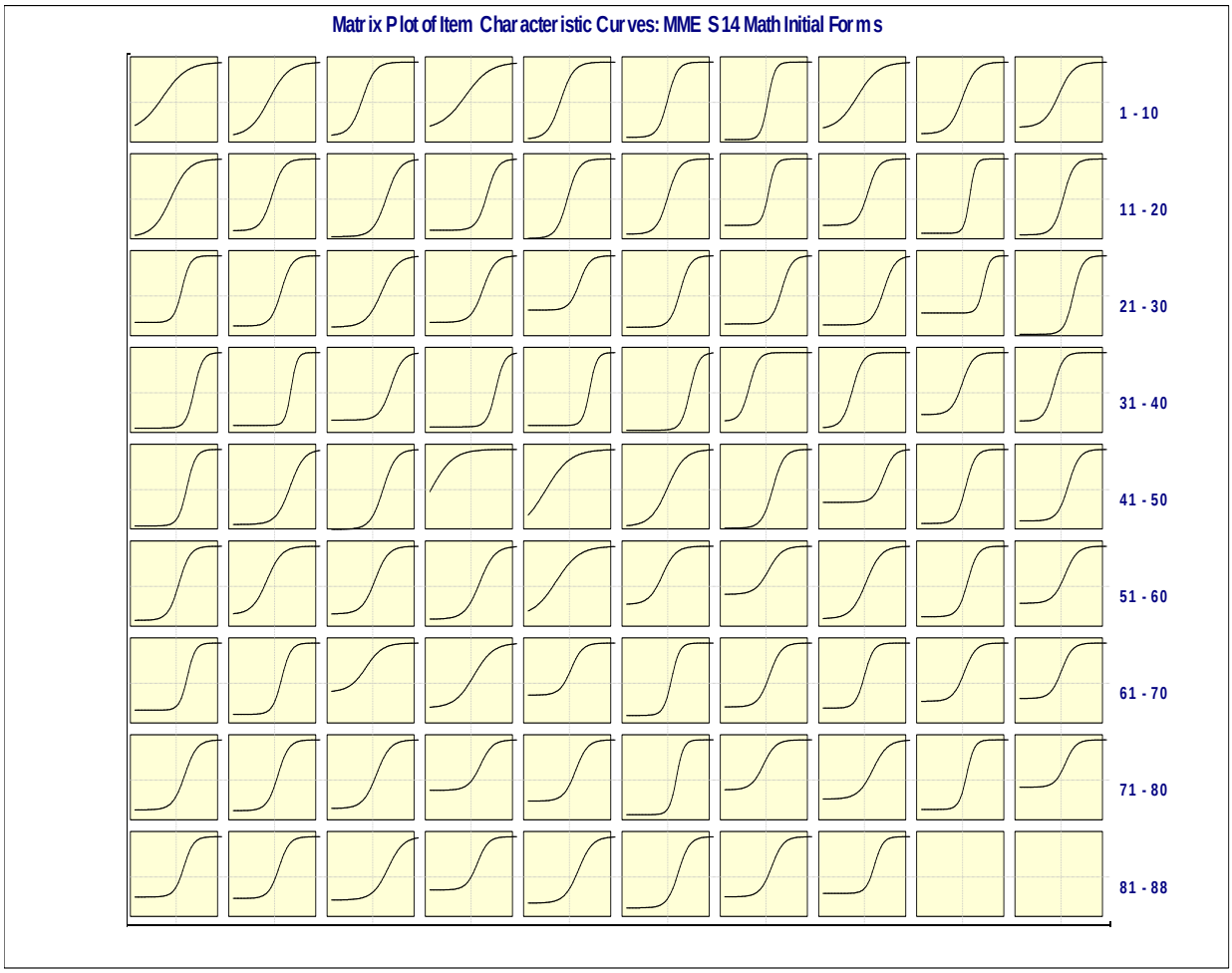
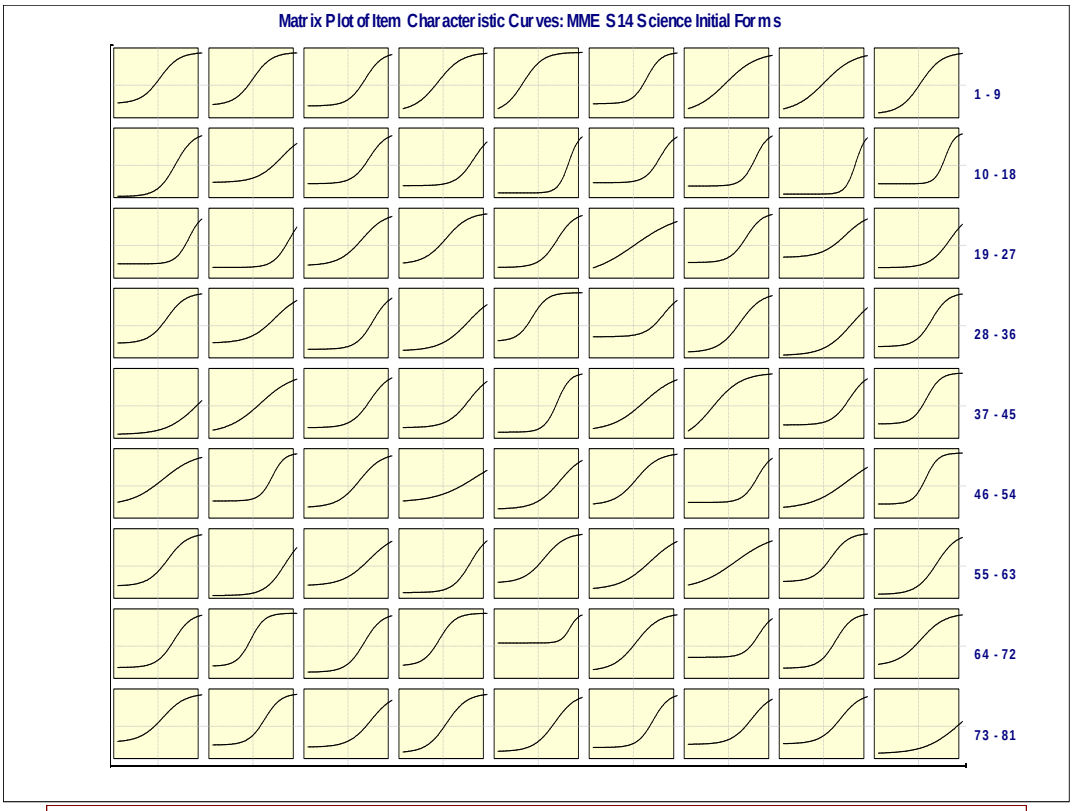


Figure 8.3. Item Characteristic Curves—Mathematics Spring 2014: 36 selected ACT Mathematics items plus 7 selected *ACT WorkKeys Applied Mathematics* items plus 3 selected *ACT WorkKeys Locating Information* items plus 42 unique Michigan-developed Mathematics items.



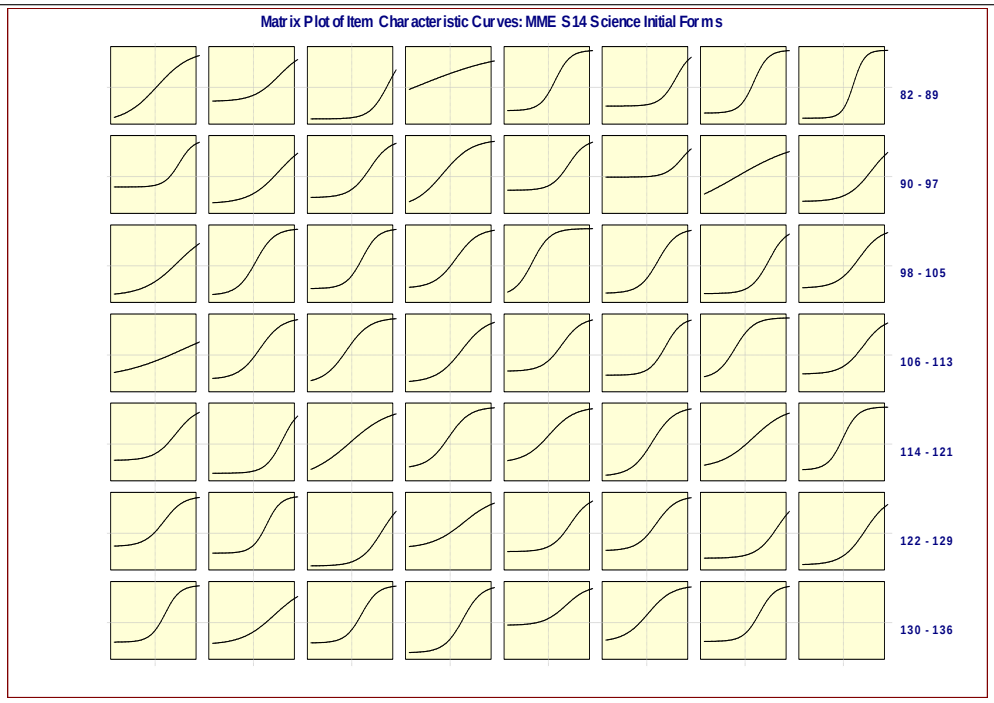


Figure 8.4. Item Characteristic Curves—Science Spring 2014: 20 selected ACT Science items plus 116 unique Michigan-developed Science items.

Table 8.5. Item Fit Statistics—Social Studies for Spring 2014

Item	INFIT MNSQ	OUTFIT MNSQ
WKLI05	1.00	1.26
WKLI14	1.03	1.33
WKLI33	1.02	1.06
WKLI34	1.24	1.55
WKLI35	1.18	1.27
WKLI36	1.06	1.21
SocS01	1.10	1.15
SocS03	0.91	0.90
SocS05	1.07	1.10
SocS08	0.85	0.80
SocS09	0.91	0.85
SocS10	0.88	0.79
SocS11	0.86	0.64
SocS13	0.73	0.66
SocS15	1.12	1.15
SocS17	1.22	1.49
SocS19	0.99	1.01
SocS20	0.96	0.93
SocS22	0.83	0.73
SocS24	0.76	0.52
SocS25	0.78	0.65
SocS27	0.86	0.76
SocS28	1.07	1.08
SocS30	0.84	0.73
SocS31	1.02	1.03
SocS32	1.02	1.06
SocS33	0.81	0.73
SocS35	1.15	1.21
SocS36	0.89	0.85
SocS38	1.18	1.29
SocS39	1.05	1.07
SocS40	0.97	0.96
SocS42	1.04	1.19
SocS43	1.11	1.22
SocS44	0.97	0.95
SocS45	0.98	1.03
SocS47	0.96	0.98
SocS48	1.01	1.00

Person-Model Fit

The *Lz* Person Fit Index

Person fit measures have been developed to assess the appropriateness of a person's item response pattern consistent with the model employed for characterizing his or her performance. *Lz* is an IRT-based person fit index proposed by Drasgow, Levine & Williams (1985). This index is based on a standardization of the person log likelihood and can be computed as follows:

$$L_z = \frac{\ln L - E(\ln L)}{\sqrt{Var(\ln L)}}$$

where *L*, *E(ln L)* and *Var(ln L)* denote, respectively, the log likelihood, the conditional expected value and conditional variance of the log likelihood for a given theta estimate under the IRT model of interest. For multiple choice and constructed response items, *E(ln L)* and *Var(ln L)* were presented in Drasgow, Levine & Williams (1985). Theoretically, *Lz* follows a standard normal distribution. For individual response patterns, an *Lz* value around 0 indicates good fit and a high negative value reflects a relatively unlikely response pattern than expected based on the model, or misfit (de Ayala, 2009). Previous studies have found that the *Lz* statistics performed as well as, and sometimes better than, other alternative person-fit indices under the 2-parameter logistic and 3-parameter logistic IRT models (Li & Olejnik, 1997, Nering & Meijer, 1998).

Data and computation programs

The MME 2014 match dataset was employed for the *Lz* person-fit analyses. If any component of a test subject is accommodated, the student was included in the accommodated group for the analyses (e.g., a student using standard testing on Day 1 and accommodated testing on Days 2 and 3 is considered "accommodated" for these analyses). Students who did not meet the MME attemptedness criteria for a test subject were excluded from the analyses for that subject. Table 8.6 presents the total N-counts for the four test subjects and a breakdown by "accommodated" versus "regular" (i.e., non-accommodated.) It was found that each test subject had approximately 8.5% of accommodated-test students.

Table 8.6. Number of Students by Subjects

test subject	total	regular	accommodated
Math	112,658	102,656	10,002
Science	113,090	103,050	10,040
Reading	113,291	103,233	10,058
Writing	113,872	104,078	9,794
Social Studies	113,071	103,248	9,823

ACT-developed programs for computing the *Lz* person fit index under the 3-parameter logistic model and the mixed-model were applied to the aforementioned datasets. Only the MME-selected items were included in the *Lz* person fit analyses. Table 8.7 exhibits numbers of MME-selected items of each test component for an MME form by test subjects.

Table 8.7. Number of Selected Items by Subjects and Test Components

test subject	ACT	*ACT WorkKeys* (WK)	Michigan
Math	36	7 WK math and 3 WK locating information	16
Science	20		35
Reading	32	19	
Writing	45 ACT English and 1 ACT writing		
Social Studies		6 WK locating information	32

Results

For each test subject and each group of students (regular and accommodated), ten subgroups (namely levels) of students were created based on the theta scores. The width of a theta interval for each level is set to be one with the exception that the last interval (level 10) includes theta scores ranging from +3.0 through +6.0. For each level, a common *Lz* critical value of -1.65 was employed for flagging aberrant response patterns. This critical value was chosen because approximately the lowest 5% region is below -1.65 under the standard normal curve. If an observed $Lz \leq -1.65$, the corresponding response pattern is considered to be aberrant/misfit. For each test subject, the following presents histograms of *Lz* for the regular and accommodated groups and a table of breakdowns of the percentages in classification categories by theta levels.

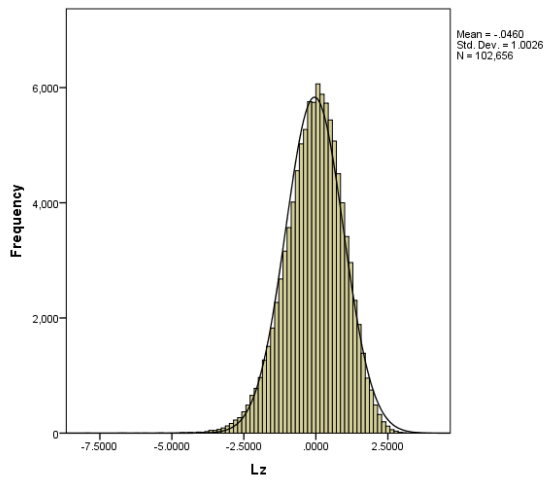


Figure 8.5a. Histogram of *Lz*—Regular Mathematics.

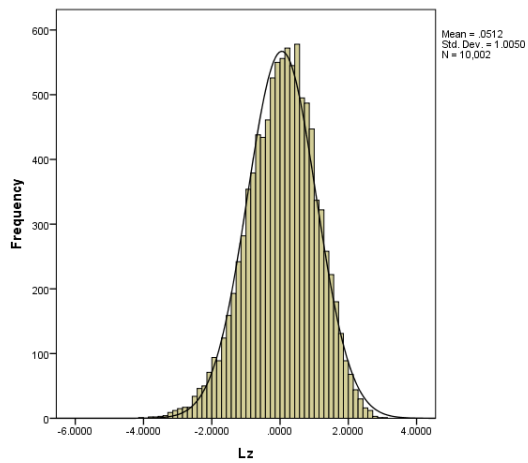


Figure 8.5b. Histogram of *Lz*—Accommodated Mathematics.

Table 8.8. Percentages in Classification Categories: Mathematics

		Regular group			Accommodated group		
Level	theta	N	%misfit	%fit	N	%misfit	%fit
1	[-6.00,-5.00)	1,165	14.9	85.1	1,202	9.6	90.4
2	[-5.00,-4.00)	14	21.4	78.6	96	12.5	87.5
3	[-4.00,-3.00)	309	4.9	95.1	91	14.3	85.7
4	[-3.00,-2.00)	2,202	5.2	94.8	876	4.6	95.4
5	[-2.00,-1.00)	12,096	4.8	95.2	3,167	3.9	96.1
6	[-1.00,0.00)	43,442	5.9	94.1	3,576	4.6	95.4
7	[0.00,1.00)	37,296	6.7	93.3	918	5.3	94.7
8	[1.00,2.00)	5,819	5.8	94.2	75	0	100
9	[2.00,3.00)	199	0	100	0		
10	[3.00,6.00]	114	0	100	1	0	100
Total		102,656	6.1	93.9	10,002	5.2	94.8

MME Science

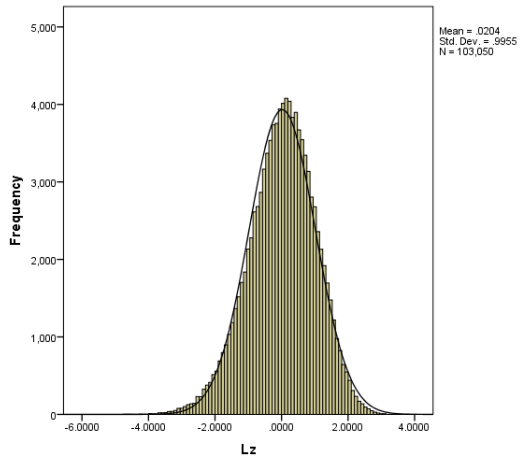


Figure 8.6a. Histogram of *Lz*—Regular Science.

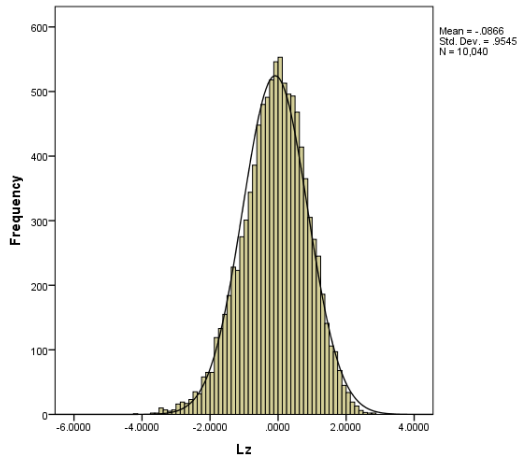


Figure 8.6b. Histogram of *Lz*—Accommodated Science.

Table 8.9. Percentages in Classification Categories: Science

		Regular group			Accommodated group		
Level	theta	N	%misfit	%fit	N	%misfit	%fit
1	[-6.00,-5.00)	2,693	6.6	93.4	739	5.7	94.3
2	[-5.00,-4.00)	217	4.6	95.4	149	7.4	92.6
3	[-4.00,-3.00)	655	7.2	92.8	366	5.2	94.8
4	[-3.00,-2.00)	2,492	4.6	95.4	977	3.6	96.4
5	[-2.00,-1.00)	9,286	3.9	96.1	2,510	4.5	95.5
6	[-1.00,0.00)	24,662	4.8	95.2	3,100	5.4	94.6
7	[0.00,1.00)	36,740	6.6	93.4	1,578	11.3	88.7
8	[1.00,2.00)	21,347	5.7	94.3	502	5.2	94.8
9	[2.00,3.00)	4,506	2	98	113	0	100
10	[3.00,6.00]	452	0	100	6	0	100
Total		103,050	5.4	94.6	10,040	5.9	94.1

MME Reading

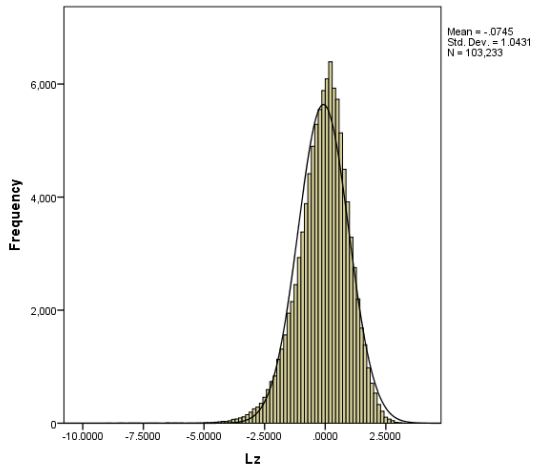


Figure 8.7a. Histogram of *Lz*—Regular Reading.

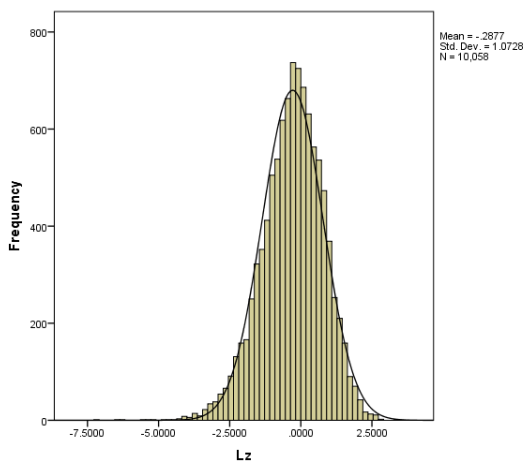


Figure 8.7b. Histogram of *Lz* —Accommodated Reading.

Table 8.10. Percentages in Classification Categories: Reading

		Regular group			Accommodated group		
Level	theta	N	%misfit	%fit	N	%misfit	%fit
1	[-6.00,-5.00)	382	22.8	77.2	294	15.3	84.7
2	[-5.00,-4.00)	322	18.9	81.1	189	12.2	87.8
3	[-4.00,-3.00)	799	13.6	86.4	587	11.4	88.6
4	[-3.00,-2.00)	2,669	11.2	88.8	1,441	8.3	91.7
5	[-2.00,-1.00)	9,016	7.2	92.8	2,247	7.9	92.1
6	[-1.00,0.00)	26,806	7.8	92.2	2,390	11.8	88.2
7	[0.00,1.00)	39,799	8.8	91.2	2,205	13.2	86.8
8	[1.00,2.00)	19,858	3.7	96.3	615	4.7	95.3
9	[2.00,3.00)	3,014	0.3	99.7	80	2.5	97.5
10	[3.00,6.00]	568	0.2	99.8	10	0	100
Total		103,233	7.3	92.7	10,058	10.3	89.7

MME Writing

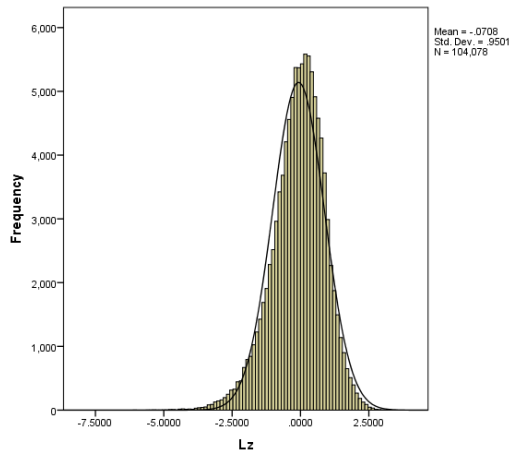


Figure 8.8a. Histogram of *Lz*—Regular Writing.

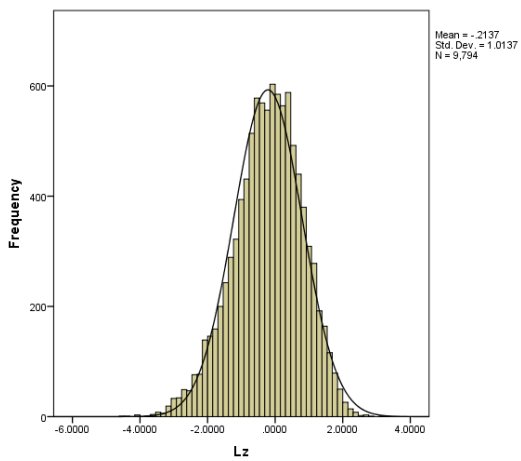


Figure 8.8b. Histogram of *Lz*—Accommodated Writing.

Table 8.11. Percentages in Classification Categories: Writing

		Regular group			Accommodated group		
Level	theta	N	%misfit	%fit	N	%misfit	%fit
1	[-6.00,-5.00)	1,634	30.2	69.8	1,288	19.3	80.7
2	[-5.00,-4.00)	217	29.5	70.5	95	8.4	91.6
3	[-4.00,-3.00)	674	21.8	78.2	231	10.8	89.2
4	[-3.00,-2.00)	2,062	8.5	91.5	762	3.3	96.7
5	[-2.00,-1.00)	7,926	5.5	94.5	2,166	4.7	95.3
6	[-1.00,0.00)	26,330	7.8	92.2	3,171	8.9	91.1
7	[0.00,1.00)	38,105	5.5	94.5	1,509	9.7	90.3
8	[1.00,2.00)	20,446	2.7	97.3	474	5.1	94.9
9	[2.00,3.00)	5,284	1.5	98.5	89	1.1	98.9
10	[3.00,6.00]	1,400	3.4	96.6	9	22.2	77.8
Total		104,078	5.9	94.1	9,794	8.8	91.2

MME Social Studies

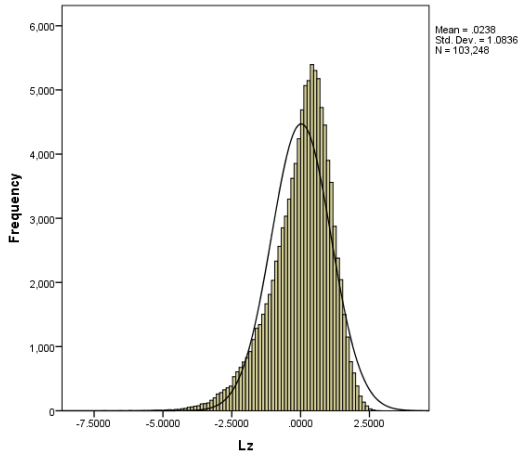


Figure 8.9a. Histogram of *Lz*—Regular Social Studies.

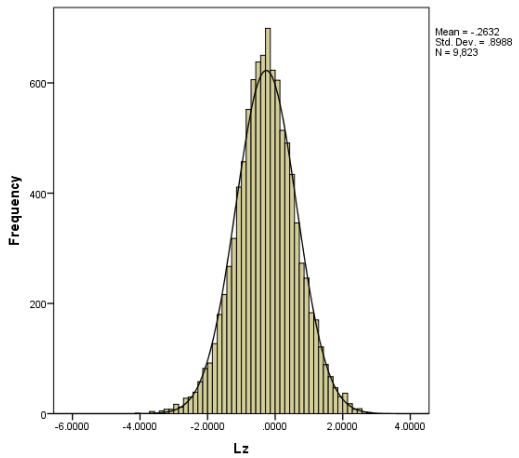


Figure 8.9b. Histogram of *Lz*—Accommodated Social Studies.

Table 8.12. Percentages in Classification Categories: Social Studies

		Regular group			Accommodated group		
Level	theta	N	%misfit	%fit	N	%misfit	%fit
1	[-6.00,-5.00)	1	0	100			
2	[-5.00,-4.00)	2	0	100			
3	[-4.00,-3.00)	5	0	100	1	0	100
4	[-3.00,-2.00)	232	16.8	83.2	19	5.3	94.7
5	[-2.00,-1.00)	5,514	26.9	73.1	1,245	0.9	99.1
6	[-1.00,0.00)	23,523	18.8	81.2	5,565	8.6	91.4
7	[0.00,1.00)	41,742	4.8	95.2	2,139	4.5	95.5
8	[1.00,2.00)	24,508	1	99	734	0	100
9	[2.00,3.00)	6,732	0.1	99.9	111	0	100
10	[3.00,6.00]	989	0	100	9	0	100
Total		103,248	7.9	92.1	9,823	6	94

For Braille-test students

Among the MME state questions given during the MME administration, question #5 of Block V was about the test booklet format students used for the ACT Plus Writing tests. The response to this item and the ACT form code were employed to identify Braille-test students. For the MME 2014 administration, eight Braille-test students were identified. Table 8.13 presents the *Lz* values for the eight Braille-test students by subjects. Based on the item responses of these students who met the MME attemptedness criteria, no one was identified as misfit.

Table 8.13. *Lz* Values for Braille-Test Students

Student	Math	Science	Reading	Writing	Social studies
1	-1.0776	-0.5611	-0.6829	1.4382	-0.7437
2	-0.4348	1.3257	0.6082	-0.7521	-1.2845
3	0.9692	-1.1229	-1.1000	0.8896	1.5030
4	-1.4893	-0.4968	1.5022	0.1452	-0.3876
5	-0.3289	-0.4454	0.4373	0.0956	0.1075
6	-1.3722	0.3100	2.4624	-0.4659	-0.1933
7	0.8161	-0.0698	-0.2637	-1.1757	-0.5636
8	-1.1031	1.0761	-1.4400	0.6331	1.4243

* indicates misfit ($Lz \leq -1.65$).

Conclusion

For each test subject, the histograms of *Lz* for the regular and accommodated groups present similar patterns. As shown in tables of percentages in classification categories, the overall percentages of misfit for each group by test are 6.1 for math regular versus 5.2 for math accommodated, 5.4 for science regular versus 5.9 for science accommodated, 7.3 for reading regular versus 10.3 reading accommodated, 5.9 for writing regular versus 8.8 writing accommodated, and 7.9 for social studies regular versus 6.0 for social studies accommodated. In summary, the overall percentages of misfit for the regular groups were lower than those for the accommodated groups for all test subjects except math and social studies. However, for both math and social studies, the overall percentages for both groups are comparable. In most cases, the percentages of misfit for the lower level groups were higher than those for the higher level groups. A plausible explanation for this could be that the test performance (e.g., guessing) of the lower level groups yielded relatively unlikely response patterns on the basis of the model. However, the breakdown of percentages in classification categories exhibit comparable patterns for the regular and accommodated groups of students.

Chapter 9: Scaling and Equating

Quality Control Protocols for MME Calibrations

The following quality control (QC) tasks were implemented for MME calibrations. For the MME test subjects of Writing, Mathematics, Reading and Science, the MME calibration runs were conducted using PARSCALE (Muraki & Bock, 1997) under the three parameter logistic model (3PLM) for dichotomously scored multiple choice (MC) items and the generalized partial credit model (GPCM) for constructed response (CR) items. For calibrating MME Social Studies, the Rasch model was employed.

A thorough review of the test maps for Michigan-developed tests and *ACT WorkKeys* was conducted including the following activities:

- Cross-checks on fields/variables regarding items (such as item code and item key) provided on the test map.
- Cross-reference of test positions for scrambled versions.
- Checks on field test items (e.g., test positions, same field test items occurring on multiple forms).

Each updated test map for Michigan-developed tests provided on the Measurement Inc./ACT ftp site was reviewed.

The linking items were also reviewed and verified. Specifically, based on the information regarding linking items from the test maps, the new and old test booklets were compared word by word to ensure that there were no differences in linking items from one form to the next.

Files containing the item parameter estimates of ACT, *ACT WorkKeys*, and Michigan linking items were prepared for review. The file naming conventions for such files were developed in advance. The values of the item parameter estimates and the test positions on the new and old forms were checked by test subject and form.

To facilitate creation of the PARSCALE and WINSTEPS control files, the 0/1 score data layout was created in advance. The positions for the 0/1 scores in the calibration data files were double-checked.

As a preliminary check on the calibration data file, SAS analyses were implemented to produce N-counts, classical item statistics, as well as frequency distributions on form codes, total raw scores, and scores for CR items. These analyses were examined for strange results, outliers, and so forth.

To review the calibration results, the following tasks were implemented:

- Check convergence for each calibration run.
- Compare classical item statistics produced by PARSCALE runs with those produced from SAS calculations, for an exact match.
- Check the discrimination parameter estimates. There should be no negative values.
- Compute correlation coefficients between p-value and b parameter estimates for reasonableness. The p-values and b parameter estimates should be negatively correlated. Examine the scatter plot of p-values versus b parameter estimates for outliers.

- Check c parameter estimates for unusually large values, with the understanding that c-parameters interact with a- and b-parameters such that there may be some well-performing items with relatively large c-parameters where the empirical ICCs match the parameterized ICC well.
- Review ICC plots produced by PARSCALE.
- Check that fixed item parameter estimates have the correct values.
- Compare p-values for ACT items with those from the history to check that they look reasonably similar.
- Compare p-values for *ACT WorkKeys* linking items with those from the history to check that they look reasonably similar.
- Compare p-values for Michigan linking items with those from the history to check that they look reasonably similar.
- For constructed response items, compare the item parameter estimates for the two raters to check that they look reasonable. Because the raters are randomly assigned, the difficulty, discrimination, and step parameters should be reasonably close across raters.

Equating for ACT

Several new forms of each of the ACT tests are developed each year. Even though each form is constructed to adhere to the same content and statistical specifications, the forms may differ slightly in difficulty. To control for these differences, subsequent forms are equated, and the scores reported to students are scale scores that have the same meaning regardless of the particular form administered to students. Thus, scale scores are comparable across test forms and test dates.

A carefully selected sample of students from one of the six national test dates each year is used as an equating sample. The students in this sample are administered a spiraled set of "n" forms—the new forms ("n – 1" of them) and one anchor form that has already been equated to previous forms. (The base form is the form used initially to establish the score scale.) The use of randomly equivalent groups is an important feature of the equating procedure and provides a basis for confidence in the continuity of scales. More than 2,000 students take each form.

Scores on the new forms are equated to the score scale using an equipercentile equating methodology. In equipercentile equating, a score on Form X of a test and a score on Form Y are considered to be equivalent if they have the same percentile rank in a given group of students. The equipercentile equating results are subsequently smoothed using an analytic method described by Kolen (1984) to establish a smooth curve, and the equivalents are rounded to integers. The conversion tables that result from this process are used to transform raw scores on the new forms to scale scores on the base form scale.

The equipercentile equating technique is applied to the raw scores of each of the four tests for each form separately. The composite score is not directly equated across forms. It is, instead, a rounded arithmetic average of the scale scores for the four equated tests. The subscores are also separately equated using the equipercentile method. Note, in particular, that the equating procedure does *not* lead to a given reported test score being equal to some prespecified arithmetic combination of subscores. As specified in the *Standards for Educational and Psychological Testing* (AERA et al., 1999), ACT conducts periodic checks on the stability of the ACT scores. The results appear reasonably stable to date.

Equating for *ACT WorkKeys*

New forms of the *ACT WorkKeys* tests are developed as needed. Though each form is constructed to adhere to the same content and statistical specifications, the forms may be slightly different in difficulty. To control for these differences, scores on all forms are equated so that when they are reported to test takers (as either Level Scores or Scale Scores), equated scores have the same meaning regardless of the particular form administered. Thus, Level Scores and Scale Scores are comparable across test forms and test dates. However, they are not comparable across tests. For example, a Level Score of 3 or a Scale Score of 73 in *Reading for Information* does not have the same meaning as a Level Score of 3 or a Scale Score of 73 on any other *ACT WorkKeys* test (e.g., *Applied Mathematics*). Two common equating designs are used with the *ACT WorkKeys* tests (Kolen & Brennan, 2004).

In a randomly equivalent groups design, new test forms are administered along with an anchor form that has already been equated to previous forms. A spiraling process is used to distribute test forms to test takers. For example, in each testing room the first person receives Form 1, the next Form 2, and the next Form 3. This pattern is repeated so that each form is given to one-third of the test takers and the forms are given to randomly equivalent groups. When this design is used, the difference in total-group performance on the new and anchor forms is considered a direct indication of the difference in difficulty between the forms. Scores on the new forms are placed to the score scale using various equating methodologies including linear and equipercentile procedures (e.g., see Kolen & Brennan, 2004). When the Level Score and Scale Score conversions are chosen for each form, the equating functions are examined, as are the resulting distributions of the scores and their means, standard deviations, skewnesses, and kurtoses.

A common item nonequivalent groups design has been used when a spiraling technique cannot be implemented in a test administration, when only a single form can be administered per test date, or when some items are changed in a revised form. In a common item nonequivalent groups design, the new form and base form have a set of items in common. These common item sets (anchors) are chosen to represent the content and statistical characteristics of the test and are usually interspersed among the other items in the new test form. The different forms are then administered to different groups of test takers. In this design, the groups are not assumed to be equivalent. Observed differences of performances between groups can result from a combination of (a) test-taker group ability differences and (b) test form difficulty differences. The common items are used to control for group differences, so that adjustments can be made for form differences. Strong statistical assumptions are required to separate these group and form differences.

The various equating methods under the common item nonequivalent groups design are distinguished in terms of their statistical assumptions (Kolen & Brennan, 2004). Observed score equating methods are typically used in equating *ACT WorkKeys* test forms. For each form, the equating functions are examined, as are the resulting distributions of scale scores and the mean, standard deviation, skewness, and kurtosis of the scale scores. The set of equating conversions chosen for each form is the one that results in scale score distributions and scale score moments that are judged to be reasonable based on the sample sizes, the magnitudes of the form differences and group differences, and the historical statistics for the test.

Equating for MME Social Studies

Social Studies is the only MME subject using the Rasch model to derive MME scale scores. The model provides a one-to-one relationship between the derived (i.e., scale) and the raw scores. The item calibration and proficiency estimates are obtained using the Rasch model and procedures implemented in WINSTEPS

version 3.63. The statistical elements of the calibration/scaling process are referred to as Rasch Calibration/Scaling as described in the WINSTEPS manual.

Starting from spring 2009, the MME Social Studies included selected *ACT WorkKeys Locating Information* items. These items were calibrated concurrently with other MME Social Studies items. The item scores for selected *ACT WorkKeys Locating Information* items and MME Social Studies items were summed to obtain a MME Social Studies raw score. The MME Social Studies raw scores were then converted to MME Social Studies scale scores.

Following calibration, operational items are "fixed" when the field test items are calibrated. Each year, new test forms are built based on the test blueprint and available statistical information obtained from previous field testing. New field test items are embedded in test forms for building and replenishing the item pool. These forms are spiraled in the administration. This procedure puts field test item parameters on the scale of the operational items.

Specific Steps for Equating of Social Studies are as follows:

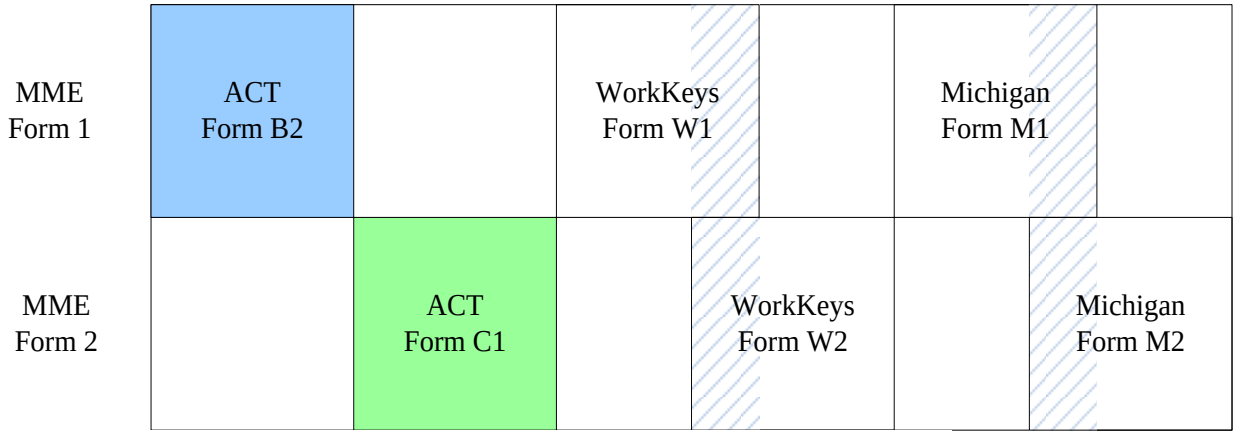
- Review test maps and obtain item parameters from the MME item pool for anchored items.
- Create data sets for item calibration and equating.
- Check the parameter stability of anchored items.
- Run operational item calibration with fixed anchored items using WINSTEPS (version 3.63).
- Review calibration results.
- Create a raw-to-scale score conversion table for scoring.
- Run field test item calibration using WINSTEPS.
- Review field test item calibration results for future form construction and linking.

Equating for MME Writing, Reading, Mathematics, Science

Depending on the MME test subject (Writing, Reading, Mathematics and Science), an MME test can consist of up to four components across three days of testing: items from the ACT tests (from Day 1), one or more of the three *ACT WorkKeys* tests (*Reading for Information*, *Applied Mathematics* or *Locating Information*, from Day 2), and Michigan-developed tests (Mathematics, Science, or Social Studies, from Day 3). To develop the MME scale, an MME base form was administered in the spring 2006 Baseline Study. A fixed-parameter calibration approach is employed for equating MME forms, and putting new form scores on the base form scale.

The MME equating plan is exhibited in Figure 9.1. The shaded areas in Figure 9.1 indicate *ACT WorkKeys* and Michigan-developed common items that link between forms (e.g., *ACT WorkKeys* forms W1 and W2). The common items have parameter estimates from previous MME administrations. These item parameter estimates are placed on the MME scale and fixed for equating new MME forms. For instance, as illustrated in Figure 9.1, for equating MME form 2, items that are fixed in MME calibration runs include, depending on the MME testing subject, *ACT WorkKeys* common items with item parameters existing from MME form 1, Michigan-developed common items with item parameters existing from MME form 1, and all ACT items on form C1 which have been placed on the MME scale. The equating for MME ACT forms is discussed in the following section.

Figure for MME Linking/Equating Plan



The shaded areas indicate common items between forms.

Figure 9.1. MME linking/equating plan.

The item parameter estimates for all ACT forms administered in MME are separately calibrated under the 3PLM using the ACT national samples discussed previously, and then placed on the MME scale using the Stocking-Lord characteristic curve method (Stocking & Lord, 1983). Figure 9.2 below exhibits the ACT linking studies. Within the same ACT linking study, the randomly equivalent groups design is employed to ensure that form groups are equivalent. For instance, in study 2 as shown in Figure 9.2, form B1 and forms A1 through A4 are administered to randomly equivalent groups. Across ACT equating studies, the Stocking-Lord transformation is employed. For example, study 1 and study 2 are linked through form B1, and forms A1 through A4 can then be placed on the study 1 scale accordingly.

ACT Linking Studies

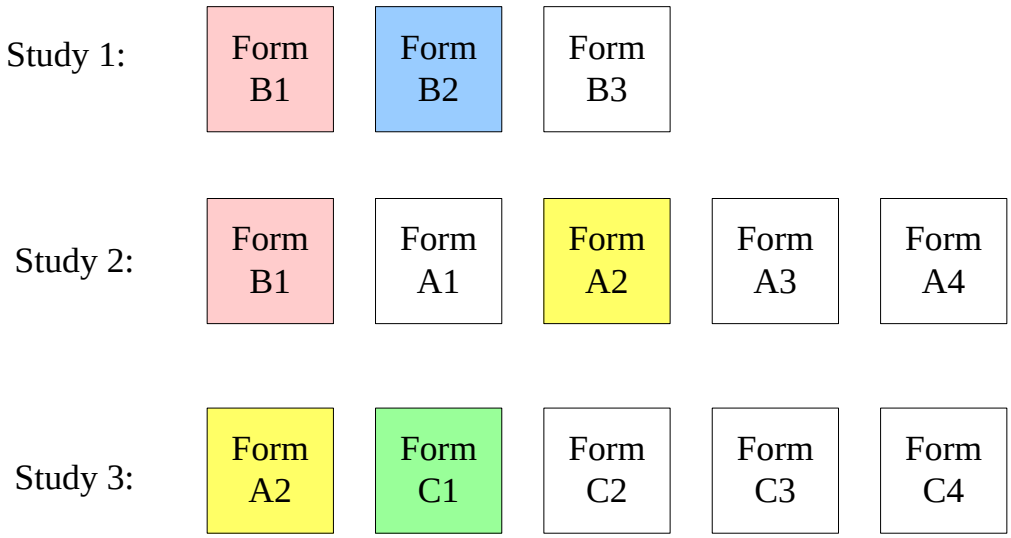


Figure 9.2. ACT linking studies.

In light of the ACT linking studies, any ACT form can be placed on the MME scale. Figure 9.3 depicts the linkage for MME ACT forms. For example, as shown in Figure 9.3, forms A3, B2 and C1 exist in the MME pool. In the ACT linking study comprising forms B1 and B2 that are administered to randomly equivalent groups, form B2 can be equated to the MME pool via the Stocking-Lord procedure. Form B1 can then be equated to the MME pool.

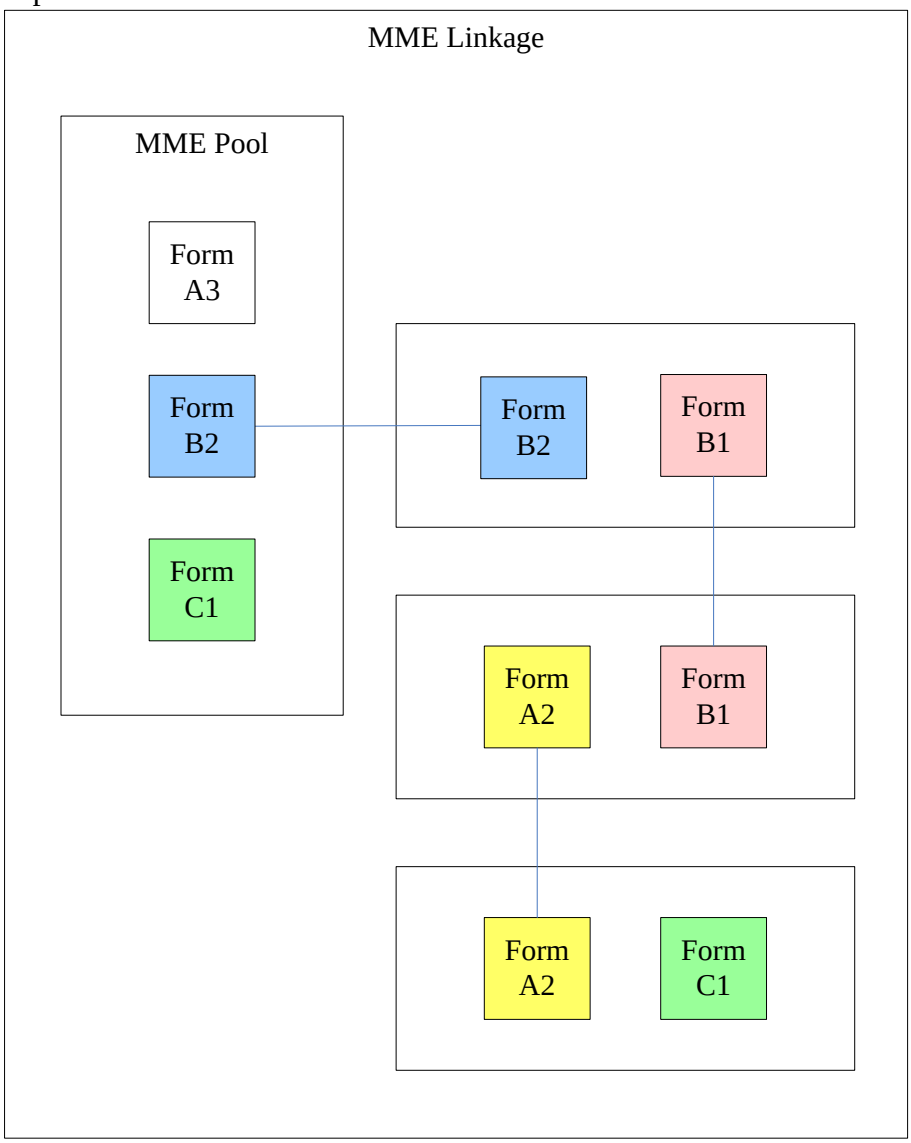


Figure 9.3. Diagram for MME linkage.

To link the *ACT WorkKeys* and Michigan-developed test forms, respectively, to the MME base form, a set of anchor items is employed and calibrated using MME sample data as shown in Figure 9.1.

For MME calibrations, the 0/1 scores of 11th grade students who meet MME attemptedness criteria were used. The MME calibration runs were conducted using PARSCALE version 4.1 (Muraki & Bock, 1997) under the GPCM for CR items and the 3PLM for dichotomous items. These models are given as follows:

Under the GPCM, the probability that an student j scores z with $z = 0, 1, \ldots, Z_i$ on item i with $Z_i + 1$ response categories is modeled by

$$P(z \mid \theta_j, \alpha_i, \beta_i, \tau_{ci}) = \frac{exp \sum_{c=0}^{z} \alpha_i \left[\theta_j - (\beta_i - \tau_{ci})\right]}{\sum_{y=0}^{Z_i} exp \sum_{c=0}^{y} \alpha_i \left[\theta_j - (\beta_i - \tau_{ci})\right]},$$

where α_i is the discrimination of item *i*, β_i denotes the difficulty of item *i*, and τ_{ci} represents the location parameter for a category on item *i*. For model identification, it needs to set $\tau_{0i} = 0$, $\sum_{c=1}^{Z_i} \tau_{ci} = 0$ and $exp \sum_{c=0}^{0} \alpha_i \left[\theta_j - (\beta_i - \tau_{ci})\right] = 1$ in the model above (Muraki, 1992, 1996).

Under the 3PLM, the probability that a student *j* scores *z* with *z* = 0 or 1 on item *i* is modeled by

$$P(z \mid \theta_j, \alpha_i, \beta_i, c_i) = c_i + (1 - c_i) \frac{1}{1 + \exp[-1.7\alpha_i(\theta_j - \beta_i)]},$$

where α_i, β_i and c_i denote the discrimination, difficulty and pseudo guessing parameter estimates, respectively.

For the MME administration, a concurrent calibration run for the various components is implemented with fixed item parameter estimates for all ACT items, fixed item parameter estimates for the *ACT WorkKeys* anchor items, and fixed item parameter estimates for the Michigan-developed anchor items; with all other items being placed on the MME scale by the calibration run. Michigan-developed operational items that were administered as field test items in previous MME administrations were recalibrated.

For scrambled versions of the Michigan-developed forms that are used in different testing situations, (i.e., initial, makeup and accommodated), the item parameter estimates for Michigan-developed anchor items are obtained from a master initial calibration run using data for the initial forms for all of the various MME components. These calibration analyses are based on the assumption that the sample size for the master initial run is the largest, and the IRT assumption that item location does not affect item parameters. Under the IRT property of group invariance, these item parameters were fixed for the calibration runs for other form combinations. Also, for calibrating Michigan-developed field test items, item parameters of ACT items, *ACT WorkKeys* items and Michigan-developed operational items were fixed. Field test items with point biserials less than .10 were excluded from the field test item calibrations as per DAS's direction.

For MME scoring, only the selected ACT items, selected *ACT WorkKeys* items and Michigan-developed items were employed.

Specific steps for equating MME Writing, Mathematics, Reading and Science are as follows:

1. Review test maps.
2. Obtain item parameter estimates from the pool for anchor items.
   - For forms with small N-counts (e.g., Braille or makeup), item parameter estimates obtained from master initial calibration runs are employed if available.
   - For forms that are a scrambled version of the initial form, item parameter estimates of the initial form are used.
3. Create data sets for calibration and equating.
4. Check anchor item parameter stability.
5. Conduct fixed-parameter calibration runs using PARSCALE without field test items.

6. Evaluate calibration results of operational items and pass item parameter estimates for MME scoring. (Only the selected ACT items, selected *ACT WorkKeys* items and Michigan-developed items are employed for MME scoring.)
7. Run PARSCALE to calibrate field test items with item parameter estimates of all operational items fixed. Field test items with point biserials less than .10 are excluded from the field test item calibrations as per DAS's direction.
8. Review calibration results of field test items for future form construction considerations and linking.

Calibration Summary Reports

Calibration summary reports that discussed N-counts, calibration convergence, and ACT's suggestions for MME scoring were presented to DAS for their review.

IRT Model Fit and Plots

Matrix plots of item characteristic curves resulting from PARSCALE calibration runs were presented to DAS for their review. The plots of SE/information curves produced by PARSCALE with the MME cut scores imposed for the testing subjects of Writing, Reading, Mathematics, and Science, respectively, were also created and presented to DAS for their review.

For MME Social Studies, the mean square fit (MNSQ) statistics obtained from WINSTEPS are used to determine whether items were functioning in a way that is congruent with the assumptions of the Rasch mathematical model. Two types of MNSQ values are presented, OUTFIT and INFIT. MNSQ OUTFIT values are sensitive to outlying observations. MNSQ INFIT values are sensitive to behaviors that affect students' performance on items near their ability estimates. According to the item analysis specification, the model is considered to be moderately misfit if the values are between 1.5 and 2.0 and highly misfit if the values are greater than 2.0.

The MME calibration runs for Writing, Mathematics, Reading, and Science are conducted using PARSCALE (Muraki & Bock, 1997) under the GPCM for CR items and the 3PLM for dichotomous items. Two model fit indices are used for the dichotomous and polytomous items. They are the Chi-square (χ^2) statistics provided in PARSCALE phase 2 output, and Orlando and Thissen's (2000) S–X^2 statistics. To compute the Chi-square index, ten ability groups are used. To test the goodness of fit for each item, a significance level (α) of .05 is used. If the observed p-value associated with a fit index for an item is lower than .05, the item is considered to be a "poorly" fitting item. The χ^2 tests of item fit are, however, extremely sensitive to sample size, which is very large for MME. The item fit statistics are reported in Tables 8.1 through 8.5.

Item Analysis

After the MME administration, the Measurement Research Department (MRD) at ACT receives matched data files. MRD computes classical item statistics as specified by DAS for the Michigan-developed operational and field test MC items and creates a SAS dataset containing these item statistics that it sends to DAS for their review.

MRD computes IRT based item statistics as specified by the DAS for the Michigan-developed operational and field test MC items and adds these statistics to the classical item statistics SAS dataset. MRD also adds the item parameters to this file. It then sends this combined item analysis file to DAS for their review.

Theta Generation

ACT developed an ACT-written program, SCOREST, to compute MME thetas (θs), and uses independent checks on the thetas. The SCOREST program is written in C++ and developed by the Computer Based Testing Research (CBTR) team in conjunction with IT. For the purpose of independent checks on MME theta scores, MRD staff developed two FORTRAN programs for estimating θs: MULTEST for multiple choice data and MIXEDEST for mixed format data. These programs produce theta estimates and standard errors of (SE) theta.

IRT Models

Two IRT models are employed in the scoring programs: the 3PLM and the GPCM. The 3PLM for dichotomous MC items with z = 0 or 1 is given as follows:

$$P(z \mid \theta_j, \alpha_i, \beta_i, c_i) = c_i + (1 - c_i)\frac{1}{1 + exp\left[-D\alpha_i\left(\theta_j - \beta_i\right)\right]},$$

where D = 1.7, α_i is the discrimination of item i, β_i denotes the difficulty of item i, and c_i is the pseudo-guessing parameter of item i. Under the GPCM, the probability that a student j scores z with z = 0, 1, …, Z_i on item i with $Z_i + 1$ response categories is modeled by the following:

$$P(z \mid \theta_j, \alpha_i, \beta_i, \tau_{ci}) = \frac{exp\sum_{c=0}^{z} D\alpha_i\left[\theta_j - (\beta_i - \tau_{ci})\right]}{\sum_{y=0}^{Z_i} exp\sum_{c=0}^{y} D\alpha_i\left[\theta_j - (\beta_i - \tau_{ci})\right]},$$

where α_i is the discrimination of item i, β_i denotes the difficulty of item i, and τ_{ci} represents the location parameter for a category on item i. For model identification, set $\tau_{0i} = 0$, $\sum_{c=1}^{Z_i} \tau_{ci} = 0$ and $exp\sum_{c=0}^{0} \alpha_i\left[\theta_j - (\beta_i - \tau_{ci})\right] = 1$. For both 3PLM and GPCM, item parameter estimates are computed using PARSCALE.

Algorithms for the Scoring Programs

The MULTEST and MIXEDEST programs use the grid search algorithm to estimate the maximum likelihood estimate (MLE) of θ values. Under the grid search algorithm, the θ space ranging from -6.0 to +6.0 is divided into grids with a width of .001, and magnitudes of the log-likelihood are computed for all grid points under the appropriate IRT model(s). The theta score with the highest log-likelihood value is selected and denoted θ^*. A finer search with a grid width of .0001 is then conducted in the neighborhood of θ^*. The MLE theta score $\hat{\theta}$ is then given by the theta score that yields the highest log-likelihood value in the finer search, and SE for $\hat{\theta}$ is computed accordingly. One advantage of the grid search algorithm is that the non-convergence for cases with irregular log-likelihood curves (e.g., flat, monotonically increasing, monotonically decreasing, or multi-modal) under the Newton-Raphson algorithm is avoided.

The algorithm employed by SCOREST for computing MLE $\hat{\theta}$ is a modified grid search, using the appropriate psychometric model(s) for each item. First, the theta score denoted θ_1 which maximizes log-likelihood over 121 equally spaced thetas between -6 and 6 (spaced by .1) is selected. Then the lower bound

is set to be $\theta_1 - .1$ and the upper bound is set to be $\theta_1 + .1$, and the theta score denoted θ_2 that yields the maximum log-likelihood over 121 theta values spaced by .01 is computed. Similarly, the lower bound is set to be $\theta_2 - .01$ and the upper bound is set to be $\theta_2 + .01$, and the theta score denoted θ_3 that yields the maximum likelihood over 121 theta values spaced by .001 is computed. This procedure is repeated until the spacing between theta values is less than .00001.

After the MLE $\hat{\theta}$ is computed, the SE for $\hat{\theta}$ is computed using the following algorithm. The test information at $\hat{\theta}$ is evaluated by summing item information functions over operational items administered. The calculation of item information depends on whether the item is a multiple choice item (and satisfies a 3PLM) or is a constructed response item (and satisfies a GPCM). The SE for $\hat{\theta}$ is then computed as the square root of the inverse of the test information.

Results of Test Runs

Comparisons between Pearson Educational Measurement (PEM or Pearson)'s ISE, PARSCALE, MULTEST (or MIXEDEST), and SCOREST results were conducted to produce some initial information on how well results from these programs match on writing, reading, mathematics and science thetas for the 2007 spring administration. For this comparison study, ISE, MULTEST, MIXEDEST and SCOREST used the 2007 spring initial form test samples from the final match file, and PARSCALE used the 2007 initial test calibration sample datasets. N-counts for these samples were over 100,000. Note that student records with missing item scores or $\hat{\theta}$ in the match file were excluded from this study. Also, student records for which PARSCALE did not produce a theta estimate (i.e., $\hat{\theta}$ = 999 reported by PARSCALE) were excluded from the analysis. The study results demonstrated that SCOREST, MULTEST and MIXEDEST yielded acceptable thetas in comparison to PARSCALE and Pearson's ISE. All the absolute differences among the methods were within .001.

Scoring Procedures for the MME Administration

Upon DAS's approval of item parameter estimates for MME forms (i.e., the initial, makeup or accommodation forms) for MME writing, mathematics, reading and science and raw-to-scale conversions for MME social studies, a score file using the matched file record layout was produced by ACT. This score file contained IDs, MME attemptedness flag, MLE theta estimates computed using SCOREST, MME scale scores and other scores reported for MME. This file was passed to ACT's Measurement Research Department (MRD) for QC checks.

Using the score file, for students who did not meet MME attemptedness criteria by MME subjects, MRD checked that no MME scores (e.g., MLE thetas and MME scale scores) were computed. For students who met MME attemptedness criteria by MME subjects, MRD independently computed MLE thetas, SE of thetas, MME scale scores and SE of MME scale scores using MULTEST or MIXEDEST, and these scores were checked against those in the score file. Other scores in the score file that were checked by MRD include MME raw scores, MME performance levels, all raw scores for all MME standards along with their percent correct and possible points. Also, the high and low MME scale score values for each student were checked. Upon all the scores passing MRD's QC checks, a file was created and passed to ACT's IT team. For the spring 2014 MME administration, all score files delivered to DAS passed MRD's QC checks.

Chapter 10: Score Precision

Reliability of a test can be regarded as a measure of consistency of the observed test scores. Since consistency entails repeated realization of an entity, reliability of a test is hard to estimate, particularly with a single administration of a test. If observed test scores are not consistent, or unreliable, the inconsistency is due to measurement error, more specifically, random error of measurement. Statistically, reliability is thus defined as the ratio of the true score (i.e., score without random error) variance to the observed score variance. Several methods of estimating reliability coefficients have been presented. Among them, coefficient alpha is popular because it is based on internal consistency from a single administration. When the measurement is used for classification decisions, classification consistency may function as a reliability measure.

Internal Consistency Reliability

For the spring 2014 administration, over 40,000 examinees of the initial test samples were included in the reliability analysis dataset, depending on the content area. Table 10.1 exhibits the alpha coefficients (Cronbach's alpha) for the 2014 spring MME administration.

Table 10.1. Cronbach's alpha for Spring 2014

Assessment	Cronbach's alpha
Writing	0.91
Reading	0.87
Mathematics	0.92
Science	0.87
Social Studies	0.84

Table 10.2 presents the percentage of agreement between two raters on the constructed response items.

Table 10.2. Rater Validity Percent of Agreement for Spring 2014

Absolute Score Difference Between Two Raters	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	81744	71.79	81744	71.79
1	31366	27.55	113110	99.33
2	724	0.64	113834	99.97
3	38	0.03	113872	100
4	0	0.00	113872	100

Further Evidence of Reliability on ACT Writing

Data from a special study (ACT, 2009b) was used to estimate alternate forms reliability of the ACT writing test, where approximately 6,000 high school students took two forms of the essay. Counter-balancing was used so that each form was administered in both the morning/first session and the afternoon/second session. Approximately 30 different essay forms were used in this study and essays were assigned randomly to both

students and a pool of raters. A “test-retest” correlation was computed for each pair of essays by comparing the scores an examinee received on each of his/her two prompts, and the average of these reliability coefficients yielded the value of 0.67. This value includes variability due to different essay forms and different essay raters.

Reliability analyses were also conducted using data from a field test study in which new prompts were administered to students prior to operational use, to examine how well they worked. DAS requested that ACT provide additional reliability analyses for constructed response items, so ACT conducted the following study to comply with that request. Each examinee responded to two prompts on successive days. The prompts were spiraled to control for sampling error, and administered in counterbalanced order to control for order effects. To carry out these reliability analyses, several prompts were scored in a students × prompts × raters facet model, utilizing a completely crossed design. There were six prompts, each administered to 20 examinees, and scored by two raters on a 1–6 scale. The prompts and examinees were chosen randomly from those in the field test study. Generalizability Theory analyses produced G-coefficients (internal consistency indices of score consistency) for each prompt pair. The median G-coefficient for the writing test was .70 over the six prompt pairs. Prompts and raters contributed negligible amounts to the total variance, which means the level of student achievement, not the particular prompt asked or the particular raters doing the scoring, is what most strongly determines the scores. Lastly, it was found that the median inter-rater reliability was .94 over the 12 prompts in the Generalizability study.

Empirical IRT Reliability

For the IRT methods, the conditional standard error of measurement (CSEM) is computed as part of the item parameter estimation process, via the test information function. Once the mean squared CSEM over examinees is computed, the equation below can be used to compute the reliability given in Table 10.3. In reference to this equation, $\bar{\sigma}^2(E)$ is the mean squared CSEM and $\sigma^2(S)$ is the observed variance of scale scores for the test taken over examinees.

$$rel = 1 - \frac{\bar{\sigma}^2(E)}{\sigma^2(S)}$$

Table 10.3. Empirical IRT reliability for Spring 2014

Assessment	Empirical IRT reliability
Writing	0.90
Reading	0.88
Mathematics	0.90
Science	0.83
Social Studies	0.84

MME Scale Score Reliability

Because the MME scale is a linear function of theta, MME scale score reliabilities are the same as the theta reliabilities. Therefore, the reliabilities in Table 10.3 are also the reliabilities of the MME scale scores.

SEM/Information Curves with Cut Scores (Imposed)

Appendix B exhibits the plots of SEM/information curves produced by PARSCALE with the MME cut scores imposed for the testing subjects of Writing, Reading, Mathematics and Science respectively. The SEM/information curve for MME Social Studies based on the Rasch model is also exhibited in appendix B. note that all the SEM/information curves are based on MME selected items. The vertical lines represent the performance level cut scores. For MME, the four performance levels are Not Proficient, Partially Proficient, Proficient, and Advanced.

Classification Consistency and Classification Accuracy

Classification consistency indices quantify the reliability of categorizing examinees into mastery or achievement levels, with respect to specific standards. Several model-based approaches have been developed for estimating classification consistency for a single test administration because repeated testing data are seldom available. An IRT model-based approach (Lee, Hanson, & Brennan, 2002) is used in this technical report to calculate the agreement index, *P*.

Assuming the two raw score random variables X_1 and X_2 from two administrations of a test are independent and identically distributed, the conditional joint distribution of X_1 and X_2 is given by $f(x_1, x_2 \mid \theta) = f(x_1 \mid \theta) f(x_2 \mid \theta)$, where θ denotes true examinee ability. Then, the marginal joint distribution of X_1 and X_2 can be obtained by integrating the conditional probabilities over the distribution of θ as

$$f(x_1, x_2) = \int f(x_1, x_2 \mid \theta) g(\theta) d\theta .$$

A consistent classification is made if both x_1 and x_2 for an examinee belong to the same category I_h (h=1, 2, …, H). The conditional probability of falling in the same category on the two testing occasions is

$$Pr(X_1 \in I_h, X_2 \in I_h \mid \theta) = \left[\sum_{x_1 = c_{(h-1)}}^{c_h - 1} f(x_1 \mid \theta) \right]^2 ,$$

where c_1, c_2, …, $c_{(H-1)}$ are raw cutoff scores, c_0 is the lowest raw score, and c_H is a perfect test score. Then, the agreement index *P* conditional on θ is obtained by

$$P(\theta) = \sum_{h=1}^{H} Pr(X_1 \in I_h, X_2 \in I_h \mid \theta),$$

and the marginal values of agreement index can be computed by

$$P = \int P(\theta) g(\theta) d\theta .$$

For each MME assessment, there are three cutoff score points and four categories at the scale-score level. Since there are four categories, examinees are classified into one of the four mutually exclusive categories based on their scale scores and the cutoff points on the MME assessment. To estimate classification consistency, however, 4 × 4 contingency tables for the MME assessment are created using the psychometric model, with the columns and rows showing the four classification categories. The elements of the 4 × 4 tables indicate the joint probabilities of students being classified in the pairs of the column and row categories; for example, being classified in the Basic level on one occasion (column) and in the Proficient Standards level on the other (row). The sums of the diagonal elements of the 4 × 4 tables are the indices of classification consistency.

Data used to compute classification consistency reported in Table 10.4 were obtained from the MME tests administered in spring 2014. The three parameter logistic model, the generalized partial credit model and the Rasch model are used to estimate the classification index. The basic role of these IRT models is to estimate the theta distribution and predict the observed score distribution. Once these distributions are estimated, 4 × 4 contingency tables can be created, which, in turn, are used as a basis for computing the classification index. Table 10.4 shows the 4 × 4 contingency tables and indices of classification consistency for the MME assessments.

Table 10.4. The 4 × 4 contingency table and classification consistency for the MME assessments for Spring 2014

MME Writing

	Not Proficient	Partially Proficient	Proficient	Advanced
Not Proficient	0.02139	0.02412	0.00001	0.00000
Partially Proficient	0.02412	0.32674	0.05714	0.00000
Proficient	0.00001	0.05714	0.40281	0.02284
Advanced	0.00000	0.00000	0.02284	0.04086

MME Reading

	Not Proficient	Partially Proficient	Proficient	Advanced
Not Proficient	0.05944	0.04217	0.00394	0.00000
Partially Proficient	0.04217	0.13755	0.06850	0.00009
Proficient	0.00394	0.06850	0.33932	0.04553
Advanced	0.00000	0.00009	0.04553	0.14321

MME Mathematics

	Not Proficient	Partially Proficient	Proficient	Advanced
Not Proficient	0.24663	0.05906	0.00016	0.00000
Partially Proficient	0.05906	0.26218	0.04487	0.00003
Proficient	0.00016	0.04487	0.18220	0.01951
Advanced	0.00000	0.00003	0.01951	0.06176

MME Science

	Not Proficient	Partially Proficient	Proficient	Advanced
Not Proficient	0.32480	0.07044	0.00186	0.00001
Partially Proficient	0.07044	0.18934	0.05112	0.00230
Proficient	0.00186	0.05112	0.09523	0.02859
Advanced	0.00001	0.00230	0.02859	0.08198

MME Social Studies

	Not Proficient	Partially Proficient	Proficient	Advanced
Not Proficient	0.15604	0.04150	0.00031	0.00000
Partially Proficient	0.04150	0.20587	0.05222	0.00030
Proficient	0.00031	0.05222	0.20827	0.04106
Advanced	0.00000	0.00030	0.04106	0.15904

Table 10.5 provides classification accuracy indices for the MME scales using an index based on estimated thetas and conditional standard errors. Classification accuracy evaluates the degree of accuracy of classifying examinees into score categories based upon observed scores. An expected classification accuracy index (Martineau, 2007) using measurement error is employed in this report. Let κ denote the vector of H+1 cut scores that divide the theta score scale into H categories, or $\kappa = [\kappa_1, \kappa_2, ..., \kappa_{H+1}]$ where $\kappa_1 < \kappa_2 < ... < \kappa_{H+1}$ and $\kappa_1 = -\infty, k_{H+1} = \infty$. For an examinee *i* with observed theta score $\hat{\theta}_i$ and standard error $SE_{\hat{\theta}_i}$, an expected probability that the student falling into the h_i performance level under the assumption of conditional normality of measurement error is defined as the area from κ_h to κ_{h+1} under the normal curve with mean $\hat{\theta}_i$ and standard deviation $SE_{\hat{\theta}_i}$. Let $\hat{p}_{ih_i} = \phi(\kappa_{h_i}, \kappa_{h_i+1}, \hat{\theta}_i, SE_{\hat{\theta}_i})$ represent this expected probability. Then, the expected classification accuracy index, based on measurement error, is equal to $\tau = \sum_{i=1}^{N} \phi(\kappa_{h_i}, \kappa_{h_i+1}, \hat{\theta}_i, SE_{\hat{\theta}_i}) / N$ where *N* is the number of examinees. This index ranges from 0 to 1, with 0 indicating no accuracy in examinee classifications, with 0.5 indicating random accuracy, and 1 indicating perfect expected accuracy in examinee classification.

Table 10.5. Classification accuracy for the MME assessments using four classification categories Spring 2014

Assessment	Index Value
Writing	0.87
Reading	0.79
Mathematics	0.84
Science	0.76
Social Studies	0.75

Chapter 11: Validity

Validity refers to the extent to which scores reflect what the test is intended to measure. As stated in the *Standards for Educational and Psychological Testing* (AERA, et al.,1999), validity refers to the "degree to which evidence and theory support the interpretations of test scores entailed by the proposed uses of tests." This statement shows that validation is an ongoing process, which begins the moment that work on a test begins and continues throughout the life of the test. Validation is the process of continually accumulating and reviewing evidence from various sources to refine the utility of a test for making recommended interpretations consistent with the intended uses of the test scores.

Construct Validity Evidence from Content and Curricular Validity

Content validity involves the systematic examination of test content to determine whether it covers the curricular standards to be measured. As stated in Chapter 3, the MME augmentation is used to measure content which Michigan educators believe all students should know and be able to achieve in the content areas that are not measured by the ACT and *ACT WorkKeys* assessments. Assessment results quantify how Michigan students and schools perform when compared with standards established by the State Board of Education. The MME is based on an extensive definition of the content the test is intended to assess and its match to the content standards. Therefore, the MME assessments are content-based and aligned directly to the statewide content standards.

Relation to Statewide Content Standards

Prior to the development and implementation of the MME, a committee of educators, item development experts, assessment experts, and DAS staff met annually to review new and field tested items for use on the MEAP (the old high school assessment). These stakeholders now meet to review new and field tested items for use in augmenting the MME. DAS has established a sequential review process, as illustrated in Figure 11.1. This process continues to provide many opportunities for these professionals to offer suggestions for improving or eliminating items and to offer insights into the interpretation of the statewide content standards. These review committees participate in this process to ensure test content validity.

In addition to providing information on the difficulty, appropriateness, and fairness of these items, committee members provide a necessary check on the alignment between the items and the content standards they are intended to measure. When items are judged to be relevant (i.e., representative of the content defined by the standards), this provides evidence to support the validity of inferences made with MME results regarding knowledge of this content. When items are judged to be inappropriate for any reason, the committee can either suggest revisions (e.g., reclassification or rewording) or elect to eliminate the item from the field test item pool. Items that are approved by the content review committee are later embedded in live MME forms to allow for the collection of performance data. In essence, these committees review and verify the alignment of the test items with the objectives and measurement specifications to ensure that the items measure appropriate content. The nature and specificity of these review procedures provide strong evidence for the content validity of the MME.

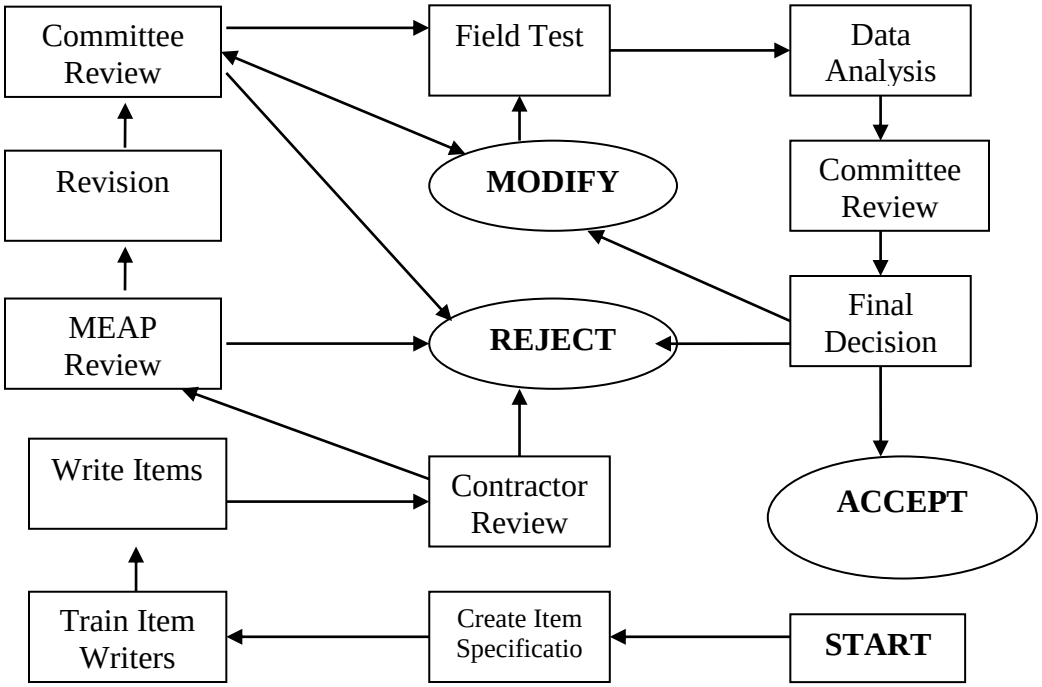


Figure 11.1. **Item development/review cycle**.

MME Alignment Studies

As detailed in Chapter 5, "Test Development Analyses," two alignment studies have been performed for the MME, documenting alignment of the overall set of items from the ACT, *ACT WorkKeys*, and Michigan-developed augmentation to Michigan's content standards. These independent alignment studies provide validity evidence which is complementary to the input provided during content reviews. Along with the reliability analyses and other technical analyses, these alignment studies provide strong evidence of the validity of MME. Additional alignment studies will be performed in future years.

Educator Input

Michigan educators provide valued input on the MME content and the match between the items and the statewide content standards. In addition, many current and former Michigan educators and some educators from other states work as independent contractors to write items specifically to measure the objectives and specifications of the content standards for the MME. Using a varied supply of item writers provides a system of checks and balances for item development and review that reduces single source bias. Because many people with various backgrounds write the items, it is less likely that items will suffer from a bias that might occur if items were written by a single author. This direct input from educators, many of whom serve on the aforementioned committees, offers evidence regarding the content validity of the MME.

Construct-related Validity Evidence from Criterion Validity Analyses

Criterion validity refers to the degree to which a test correlates with other external outcome criteria. Criterion validity addresses how accurately criterion performance can be predicted from test scores. The key to criterion-related evidence is the degree of relationship between the assessment and the outcome criterion. The criterion should be relevant to the assessment and reliable. As the ACT and *ACT WorkKeys* are administered intact as a part of the MME, and there is substantial evidence concerning their reliability and validity, there is a built in relevance of these criteria to the MME.

There is a large body of evidence that the ACT successfully predicts success in college, and that *ACT WorkKeys* successfully predicts workplace success. As a criterion, a strong correlation of MME with *ACT WorkKeys* and the ACT would indicate that the MME also can be used to predict college and workplace success.

The correlations among the old high school MEAP, the MME, the ACT, and *ACT WorkKeys* from the Spring 2006 pilot are presented in Table 11.1. The cells reported in bold are the correlations between the ACT and the MME scores and the *ACT WorkKeys* and MME scores. These correlations are very high, and indicate that the MME should be approximately as effective in predicting workplace and college success as the ACT and *ACT WorkKeys* assessments.

In addition, the correlations among the MME and old high school MEAP are strong, indicating that as expected, the assessments measure similar constructs.

For the MME Spring 2014 administration, the correlations among the MME and the ACT and *ACT WorkKeys* scale scores were as follows. The sample sizes employed for computing these correlations were over 100,000.

- MME Writing and ACT English: .87.
- MME Reading and ACT Reading: .86.
- MME Reading and *ACT WorkKeys Reading for Information*: .82.
- MME Mathematics and ACT Mathematics: .78.
- MME Mathematics and *ACT WorkKeys Applied Mathematics*: .78.
- MME Science and ACT Science: .76.

Table 11.1. Correlations between MME and other related measures for the Spring 2006 pilot.

Correlations (based on 3306 students who had valid scores on all MME subjects)																			
			ELA								Mathematics				Science			Social Studies	
			English	Writing			Reading												
Subject			ACT	MME	ACT	MEAP	MME	ACT	WK	MEAP	MME	ACT	WK	MEAP	MME	ACT	MEAP	MME	MEAP
ELA	English	ACT	1.00	**0.96**	0.47	0.51	0.76	0.75	0.62	0.60	0.72	0.72	0.59	0.68	0.75	0.71	0.67	0.67	0.67
	Writing	MME	0.96	1.00	0.59	0.57	0.78	0.74	0.63	0.62	0.73	0.71	0.59	0.69	0.75	0.71	0.67	0.67	0.67
		ACT	0.47	0.59	1.00	0.52	0.44	0.42	0.34	0.39	0.40	0.39	0.29	0.38	0.39	0.41	0.34	0.35	0.35
		MEAP	0.51	0.57	0.52	1.00	0.47	0.44	0.38	0.46	0.43	0.40	0.34	0.44	0.43	0.41	0.40	0.41	0.41
	Reading	MME	0.76	0.78	0.44	0.47	1.00	**0.89**	**0.82**	0.60	0.69	0.64	0.60	0.62	0.74	0.68	0.66	0.68	0.68
		ACT	0.75	0.74	0.42	0.44	0.89	1.00	0.59	0.56	0.61	0.61	0.51	0.57	0.69	0.65	0.62	0.64	0.64
		WK	0.62	0.63	0.34	0.38	0.82	0.59	1.00	0.51	0.63	0.57	0.58	0.57	0.65	0.59	0.58	0.58	0.58
		MEAP	0.60	0.62	0.39	0.46	0.60	0.56	0.51	1.00	0.52	0.49	0.43	0.52	0.58	0.51	0.56	0.59	0.59
Mathematics		MME	0.72	0.73	0.40	0.43	0.69	0.61	0.63	0.52	1.00	**0.90**	**0.88**	0.84	0.81	0.77	0.71	0.66	0.66
		ACT	0.72	0.71	0.39	0.40	0.64	0.61	0.57	0.49	0.90	1.00	0.74	0.82	0.77	0.74	0.69	0.63	0.63
		WK	0.59	0.59	0.29	0.34	0.60	0.51	0.58	0.43	0.88	0.74	1.00	0.72	0.70	0.65	0.63	0.58	0.58
		MEAP	0.68	0.69	0.38	0.44	0.62	0.57	0.57	0.52	0.84	0.82	0.72	1.00	0.76	0.70	0.72	0.66	0.66
Science		MME	0.75	0.75	0.39	0.43	0.74	0.69	0.65	0.58	0.81	0.77	0.70	0.76	1.00	**0.89**	0.88	0.76	0.76
		ACT	0.71	0.71	0.41	0.41	0.68	0.65	0.59	0.51	0.77	0.74	0.65	0.70	0.89	1.00	0.67	0.65	0.65
		MEAP	0.67	0.67	0.34	0.40	0.66	0.62	0.58	0.56	0.71	0.69	0.63	0.72	0.88	0.67	1.00	0.73	0.73
Social Studies		MME	0.67	0.67	0.35	0.41	0.68	0.64	0.58	0.59	0.66	0.63	0.58	0.66	0.76	0.65	0.73	1.00	1.00
		MEAP	0.67	0.67	0.35	0.41	0.68	0.64	0.58	0.59	0.66	0.63	0.58	0.66	0.76	0.65	0.73	1.00	1.00

Criterion-related Validity Evidence for MME Science

Science standards underwent significant revisions prior to the 2009 MME administration. In order to compile additional evidence for criterion-related validity of the MME science scale scores, additional analyses were conducted. These analyses examine the criterion related validity of MME science scale scores. Using spring 2009 data, three external criterion variables were selected: 1) science course grades, 2) number of semesters students have taken science courses, and 3) whether students have taken advanced science courses.

Average MME science scale scores, grouped by each of the criterion variables are presented in Table 11.2, 11.3, and 11.4 respectively. As shown, the average MME science score increases as the course grade increases for the subjects of General Science, Biology, Chemistry and Physics. Students tend to have higher MME scores if they have taken science courses for a longer period of time, and students who have taken advanced science courses score higher than students who haven't. The criterion related validity of MME science is supported by this evidence.

Table 11.2. Average MME Science Scale Scores, by Course Grade of Science Courses

General Science	MME	Biology	MME	Chemistry	MME	Physics	MME
F	1070	F	1071	F	1079	F	1082
D	1077	D	1080	D	1088	D	1087
C	1085	C	1089	C	1098	C	1096
B	1098	B	1103	B	1112	B	1113
A	1118	A	1122	A	1128	A	1130

Table 11.3. Average MME Science Scale Scores, by Semesters of Science

Number of Semesters of Science	Mean MME Science Score
1	1061
2	1073
3	1079
4	1090
5	1090
6	1101
7	1101
8	1119

Table 11.4. Average MME Science Scale Scores by Students with or without Advanced Courses in Natural Sciences

AP, Accelerated, or Honors Courses in Natural Sciences	Mean MME Science Score
Yes	1118
No	1110

DIF Analyses of the Spring 2014 MME

For the DIF analyses, only the item responses of students who took all three days of the MME in the same administration mode—all initial, all makeup, or all accommodated—were considered. Of those students, only those who had valid flags of "Y" in the match file for a subject area (i.e., students who met attemptedness in the subject area, did not have nonstandard accommodations, did not have prohibited behavior, and were not involved in a misadministration) were included in data sets on which the DIF analyses were conducted. Even with these restrictions on these data, at least 95% of all students were included in the DIF analyses in each subject area.

Two focal/reference group comparisons were conducted for each item: females compared with males, and African Americans (Blacks) compared with Whites. For each multiple-choice item and each comparison, several statistics were computed: the Mantel-Haenszel delta statistic (MH-D), the value of the associated chi-square statistic (MH-CHISQ), the probability (P) of this chi-square value under the null hypothesis of no DIF, and the ETS A, B, or C category for the item based on the values of MH-D and P. Table 11.5 presents the criteria for the A, B, and C categories. For a further description of these statistics and the categories see, for example, Holland and Wainer (1993). A positive MH-D denotes an item that favors the focal group, while a negative value indicates an item that favors the reference group.

Table 11.5. Criteria for the A, B, and C DIF Categories

Category	Description	Criterion
A	Negligible DIF	Nonsignificant MH-CHISQ ($P > 0.05$) or $\lvert MH\text{-}D\rvert < 1.0$
B	Moderate DIF	Significant MH-CHISQ ($P \leq 0.05$) and $1.0 \leq \lvert MH\text{-}D\rvert < 1.5$
C	Large DIF	Significant MH-CHISQ ($P \leq 0.05$) and $\lvert MH\text{-}D\rvert \geq 1.5$

For the polytomously-scored ACT Writing Test, in place of the MH-D statistic, the standardized mean difference (SMD) index, the standard deviation in Writing Test scores (SD) for the focal and reference groups combined, and the resulting effect size (ES = |SMD/SD|) are computed, as are the AA, BB, and CC classifications resulting from the values of ES and P. Table 11.6 presents the criterion for those classifications. For a further description of these statistics and the AA, BB, and CC categories see, for example, Dorans and Schmitt, (1991). A positive SMD index denotes an item that favors the focal group, while a negative value indicates an item that favors the reference group.

Table 11.6. Criteria for the AA, BB, and CC DIF Categories

Category	Description	Criterion
AA	Negligible DIF	Nonsignificant MH-CHISQ ($P > 0.05$) or Significant MH-CHISQ ($P \leq 0.05$) and $ES \leq 0.17$
BB	Moderate DIF	Significant MH-CHISQ ($P \leq 0.05$) and $0.17 < ES \leq 0.25$
CC	Large DIF	Significant MH-CHISQ ($P \leq 0.05$) and $ES > 0.25$

Matching Criteria

The matching criterion for each comparison was the raw score over all items that counted toward students' MME scores in the subject area to which the item belonged. (See Chapter 5 for a description of how items from Days 1 and 2 were selected to be MME-scored.) These raw scores are described below:

1. Writing: This was the sum of the raw score on the 45 MME-scored items from the ACT English Test and the ACT Writing Test score. This sum ranged from 2 to 57.

2. Reading: This was the sum of the raw scores on the 32 MME-scored items from the ACT Reading Test and the 19 MME-scored items from the *ACT WorkKeys Reading for Information* Test. This sum ranged from 0 to 51.

3. Math: This was the sum of the raw scores on the 36 MME-scored items from the ACT Mathematics Test, the 7 MME-scored items from the *ACT WorkKeys Applied Mathematics* Test, and the 3 MME-scored items from the *ACT WorkKeys Locating Information* Test, along with the Day 3 Mathematics Test raw score (operational items only). This sum ranged from 0 to 62.

4. Science: This was the sum of the raw score on the 20 MME-scored items from the ACT Science Test and the Day 3 Science Test raw score (operational items only). This sum ranged from 0 to 55.

5. Social Studies: This was the sum of the Day 3 Social Studies Test raw score (operational items only) and the raw score on the 6 MME-scored items from the *ACT WorkKeys Locating Information* Test. This sum ranged from 0 to 38.

For the *ACT WorkKeys Locating Information* items not selected to count either toward MME Math scores or MME Social Studies scores, the matching criterion for each comparison was the *ACT WorkKeys Locating Information* raw score, which ranged from 0 to 32.

For Days 1 and 2, there was just one operational initial form of each test. All students who took the initial ACT form, for example, responded to the same operational items. For Day 3, there were 6 versions of each initial form: Forms 1401-1406. For both the Day 3 Mathematics and Science forms, the set of operational items varied from one version to the next, with some items appearing in more than one version. (The

operational items for Social Studies were the same across all 6 versions; the versions differed only in field-test items. The Mathematics and Science forms differed in field-test items as well.) Because of this, a Mathematics or Science raw score attained on any version of the Day 3 initial form is not directly comparable to one attained on any other version, and therefore the matching criteria described in (3) and (4) above are not comparable across the 6 versions. It was therefore necessary to perform a separate DIF analysis on the item responses of students who took each of the 6 Day 3 Mathematics initial forms, and on those of students who took each of the 6 Day 3 Science initial forms. The total numbers of Mathematics and Science items appearing in Table 11.7, below, reflect this; while each student took 109 operational Mathematics items and 72 operational Science items, 6 times as many DIF analyses were required for each comparison because of the multiple versions of the Day 3 initial forms.

Tables 11.7 through 11.9 present the number of "A", "B," and "C" operational items, by subject area, for the initial, makeup and accommodated testing. Tables 11.10 through 11.12 break down the "B" and "C" items by the favored group (i.e., males or females, blacks or whites) for the initial, makeup and accommodated testing. Table 11.13 gives the SMD results for the ACT Writing Test.

Table 11.7. Summary of Mantel-Haenszel Results by Focal/Reference Groups and Subject, Operational Items Only, Initial Testing

	Number of items in Category			
	A	B	C	Total
Females/Males				
Writing	73	2	0	75
Reading	69	1	0	70
Mathematics	575	62	17	654
Science	418	31	1	450
Social Studies	33	5	0	38
Locating Information	21	2	0	23
Total	1189	103	18	1310
Blacks/Whites				
Writing	74	1	0	75
Reading	67	3	0	70
Mathematics	619	23	12	654
Science	445	5	0	450
Social Studies	36	1	1	38
Locating Information	23	0	0	23
Total	1264	33	13	1310

Table 11.8. Summary of Mantel-Haenszel Results by Focal/Reference Groups and Subject, Operational Items Only, Makeup Testing

	Number of items in Category			
	A	B	C	Total
Females/Males				
Writing	72	3	0	75
Reading	69	1	0	70
Mathematics	94	12	3	109
Science	69	5	1	75
Social Studies	33	5	0	38
Locating Information	21	2	0	23
Total	358	28	4	390
Blacks/Whites				
Writing	69	6	0	75
Reading	62	6	2	70
Mathematics	95	9	5	109
Science	69	5	1	75
Social Studies	37	1	0	38
Locating Information	21	2	0	23
Total	353	29	8	390

Table 11.9. Summary of Mantel-Haenszel Results by Focal/Reference Groups and Subject, Operational Items Only, Accommodated Testing

	Number of items in Category			
	A	B	C	Total
Females/Males				
Writing	74	1	0	75
Reading	68	2	0	70
Mathematics	97	11	1	109
Science	69	5	1	75
Social Studies	38	0	0	38
Locating Information	22	2	1	25
Total	368	21	3	392
Blacks/Whites				
Writing	74	0	1	75
Reading	68	2	0	70
Mathematics	95	9	5	109
Science	73	2	0	75
Social Studies	38	0	0	38
Locating Information	24	1	0	25
Total	372	14	6	392

Table 11.10. Numbers of Category "B" and "C" items, by favored group, Initial testing

	B		C		
	Females	Males	Females	Males	Total
Writing	0	2	0	0	2
Reading	0	1	0	0	1
Mathematics	11	51	1	16	79
Science	12	19	0	1	32
Social Studies	3	2	0	0	5
Locating Information	1	1	0	1	2
Total	27	76	1	17	121
	Blacks	Whites	Blacks	Whites	Total
Writing	0	1	0	0	1
Reading	0	3	0	0	3
Mathematics	6	17	0	12	35
Science	1	4	0	0	5
Social Studies	1	0	0	1	2
Locating Information	0	0	0	0	0
Total	8	25	0	13	46

Table 11.11. Numbers of Category "B" and "C" items, by favored group, Makeup testing

	B		C		
	Females	Males	Females	Males	Total
Writing	1	2	0	0	3
Reading	7	1	2	0	10
Mathematics	3	9	2	1	15
Science	3	2	1	0	6
Social Studies	1	1	1	0	3
Locating Information	0	0	0	0	0
Total	15	15	6	1	37
	Blacks	Whites	Blacks	Whites	Total
Writing	0	6	0	0	6
Reading	3	3	2	0	8
Mathematics	1	8	0	5	14
Science	2	3	0	1	6
Social Studies	1	0	0	0	1
Locating Information	0	1	1	0	2
Total	7	21	3	6	37

Table 11.12. Numbers of Category "B" and "C" items, by favored group, Accommodated testing

	B		C		
	Females	Males	Females	Males	Total
Writing	0	1	0	0	1
Reading	1	1	0	0	2
Mathematics	3	8	0	1	12
Science	0	1	0	0	1
Social Studies	0	0	0	0	0
Locating Information	2	0	0	1	3
Total	6	11	0	2	19
	Blacks	Whites	Blacks	Whites	Total
Writing	0	0	0	1	1
Reading	0	2	0	0	23
Mathematics	0	9	0	5	14
Science	1	1	0	0	2
Social Studies	0	0	0	0	0
Locating Information	0	1	0	0	1
Total	1	13	0	6	20

Table 11.13. Summary of SMD results, by focal/reference groups, all testings

	Females/Males		Blacks/Whites	
Testing	Category	Group Favored	Category	Group Favored
Initial	BB	Females	AA	
Makeup	BB	Females	AA	
Accommodated	BB	Females	AA	

Validity Evidence for the Day 1 Stand Alone Component: ACT Assessment

Validity is often categorized into several types such as content validity, construct validity, and criterion-related validity. More fundamentally, validity can be defined as "the appropriateness, meaningfulness, and usefulness of the specific inferences made from test scores" (AERA et al., 1999, p. 9). Since ACT scores can be used for diverse purposes, ACT scores have been thoroughly studied for common interpretations and uses, such as measuring educational achievement, making admissions decisions, making course placement decisions, evaluating the effectiveness of high school college-preparatory programs, and evaluating students' probable success in the first year of college and beyond (ACT, 2007). The following is a brief summary of the validity evidence of the ACT for its various uses. For the technical details such as descriptive and inferential statistics, see *The ACT Technical Manual* (ACT, 2007).

Measuring Educational Achievement

Among the validity types, content validity is particularly important for the use of ACT to measure educational achievement. The ACT tests are designed to measure students' problem-solving skills and knowledge in particular subject domains and are closely reviewed to ensure that the test content represents current high school and university curricula. This content validation process is standardized so that the ACT test scores can have the same meaning for all students, test forms, and test dates. Statistical analyses were also conducted. For example, ACT test results were compared with high school grades, and a strong relationship was found between them. Also, longitudinal growth was investigated using ACT, PLAN, and EXPLORE: the three testing programs of ACT's Educational Planning and Assessment System (EPAS). The large inter test correlations and the increases in the average scores indicate EPAS is measuring educational achievement as students progress through the grades.

Making Admissions Decisions

Appropriate admissions decisions are important for students, parents, and postsecondary institutions alike. For this use of ACT tests, validity can be measured in relationship with first-year college grades and GPAs. Validity of ACT test scores and high school grades are also important since they can serve as multiple measures for making college admission decisions. Research studies conclude that the ACT Composite scores provide greater differentiation across levels of academic achievement during the first year of college than do high school GPAs, in terms of probable success during the first year of college.

Course Placement Decisions

The ACT tests were also designed to facilitate placement of first-year college students to appropriate-level courses such as "standard," "remedial," or "advanced." Helping with placement decisions is accomplished by the close connection of the ACT test battery with subject matter content. The content specifications of the ACT tests are based on the recommendations of nationally representative panels of secondary and postsecondary educators. Statistical relationships of ACT scores with course grades and high school GPAs have also been investigated by subjects and for subgroups. It was found that a typical institution using the ACT optimal cutoff score from their data could expect that at least 64% of the placement decisions would be correct decisions.

Indicators of Educational Effectiveness

The ACT tests can be used to evaluate college-preparatory programs since they have been developed to measure academic skills and knowledge that are obtained in high school and are necessary for academic success in the first year of college. However, a content review should be conducted to determine the extent to which the tests represent important outcomes the college-preparatory programs wish to measure.

Evaluating Probable College Success

The use of the ACT tests to evaluate probable college success is closely connected with the other uses of the ACT. According to recent studies, the ACT College Readiness Benchmarks show that students who are college-ready are more likely to immediately enroll in college, and once they enroll, tend to be more successful during their first year. Also, the ACT College Readiness Benchmarks can assist in determining who will succeed in college, even into the second year.

Validity Evidence for the Day 2 Stand Alone Component: the *ACT WorkKeys* Assessments

ACT WorkKeys assessments are designed for use in both business and educational settings. To support these uses, ACT has adopted a multi-faceted approach to validation of *ACT WorkKeys* Assessments: *Reading for Information* (RFI), *Applied Mathematics* (AM), and *Locating Information* (LI). Three types of validity evidence have been collected to justify the use of *ACT WorkKeys* assessment scores, including content-related evidence, criterion-related evidence, and construct related evidence. To accumulate such evidence, ACT has conducted validity studies or worked with organizations to collect data on students and employees. The results are reported in *ACT WorkKeys* Assessment Technical Manuals (ACT, 2008a, 2008b, and 2008c).

Content-Related Evidence

To support the content-related validity of the three test scores, ACT uses two job analysis procedures—*ACT WorkKeys* Job Profiling and the SkillMap Job Inventory—to link the *Reading for Information*, *Applied Mathematics*, and *Locating Information* Skill Levels, to relevant job behaviors. *ACT WorkKeys* Job Profiling and SkillMap are both designed to meet federal standards and other industry guidelines for content validation of employment tests used for high-stakes decisions such as hiring and promotion. Both procedures can be used to define critical job tasks, determine which *ACT WorkKeys* skills are relevant to performing the tasks, and identify the level of skill required for performing them.

Criterion-Related Evidence

To support the criterion-related validity of the three test scores, ACT has gathered data from various organizations on the correlation between the test scores used to select job applicants and their subsequent job performance ratings. While sample sizes and correlations vary from study to study, all of the correlations have been positive, ranging from 0.12 to 0.86, which compares favorably with the correlations typically found in the general research literature on criterion-related validity of employment tests. ACT has also conducted classification consistency studies, comparing the employees' job performance classification to their classification by *ACT WorkKeys* Assessment Skill Levels. In these studies, the percentage of employees classified the same way by both measures ranged from 30 percent to 100 percent depending on sample size, skill level, and participants.

Construct-Related Evidence

To support the construct-related validity of the three test scores, ACT examined the relationship between *ACT WorkKeys* assessments and other tests measuring somewhat similar skills and found a moderate correlation between the test scores. In addition, ACT examined the relationship among the three fundamental skill assessments. Initial results suggest that (1) each assessment measures unique job-related skills as well as some general skills, and (2) each assessment has a strong unidimensional structure.

Gender and Race/Ethnicity Analyses

Because *ACT WorkKeys* assessments can be used for high-stakes employment decisions, ACT has analyzed Skill Level scores for evidence of adverse impact by gender and racial/ethnic groups. Evidence of adverse impact has been found to be consistent with existing research on the validity of employment test scores used for high-stakes selection decisions. In this context, such findings reinforce the need to clearly link use of *ACT WorkKeys* test scores to the critical tasks and skills required for the job.

Fairness Review

Fairness Review for the ACT

According to the *Code of Fair Testing Practices in Education* (Joint Committee on Testing Practices, 2004), test developers should provide "tests that are fair to all test takers regardless of age, gender, disability, race, ethnicity, national origin, religion, sexual orientation, linguistic background, or other personal characteristics" (p. 1). As a testing organization, ACT endorses the *Code* and makes every effort to see that all ACT tests are fair to the populations for which the tests are intended. The work of ensuring test fairness takes place during every stage of the test development process, including item (test question) writing and review, item pretesting, forms construction, and forms review. ACT is committed to ensuring that each of its testing programs upholds the *Code*'s standards for appropriate test development practice.

Item Writing, Review, and Pretesting

Most of the individuals who write items for ACT's tests are actively engaged in teaching at the high school or the university level. ACT makes every attempt to include item writers who represent the diversity of the population of the United States with respect to ethnic background, gender, and geographic location. Item writers work closely with ACT test development associates in producing items and passages of high quality that are designed to meet the test specifications, represent diversity, and be fair to all examinees. Item writers are provided with detailed guidelines to assist them in developing test materials, including specific information on fairness concerns. Among these is the way in which various groups of the population are portrayed, and the degree to which representatives of various groups are depicted in active versus passive circumstances, as exhibiting stereotypic mental or physical characteristics or tendencies, or as engaged in particular occupations or roles. In addition, the construction of fair test items requires sensitivity to the changing circumstances of our society: increased variation in family structures; the multiethnic composition of the population; and a wide range of socioeconomic and urban, suburban, and rural lifestyles.

Every new test item and passage is comprehensively reviewed for fairness, interest, and appropriateness to the grade level for which the test is designed; adherence to specifications; soundness and defensibility;

grammatical accuracy; and sound measurement characteristics. The items are first reviewed by ACT's test development associates and editorial staff. Any problems found in this review are corrected immediately. The items are then sent to two groups of external reviewers: content experts (including classroom teachers, college faculty, and curriculum specialists, representing diversity as to geographic region, ethnicity, and gender), who focus on content accuracy, item classifications, skill levels, and grade-level appropriateness; and fairness reviewers, who are of diverse ethnicity, gender, and geographic background and are sensitive to issues of test and item fairness. The fairness reviewers carefully examine all items and stimulus materials to make sure that they do not contain any language, roles, situations, or contexts that could be considered offensive or demeaning to any population group.

ACT selects fairness reviewers from among African American, Asian American, Latino, American Indian, and female consultants. ACT communicated with prominent, nationally recognized advocacy groups to obtain nominees who could review the ACT test materials. (See the ACT publication, *Fairness Report for the ACT Tests 2009–2010*, for a list of these organizations.) From the recommendations of these groups, ACT selects fairness reviewers who have a history of active participation in promoting the concerns of the group within educational settings and beyond.

Items that pass the content and fairness reviews are pretested on a representative sample of the ACT examinee population in a national administration of the ACT. The purpose of pretesting items is to determine whether the items are technically sound and at the appropriate level of difficulty for the ACT examinee population. Statistical indices of item difficulty and discrimination, among other statistics, are compiled on the basis of pretest results. Items are evaluated according to their performance in the pretest. Those that perform acceptably on all criteria are included in the item pool from which preliminary forms of the ACT tests are constructed.

Operational Forms Construction

Preliminary forms of the ACT tests are constructed using the items that survive the pretest. Items are selected to match the requirements of both the content and statistical specifications for the tests. The distributions of the items in each test form are also examined for fairness, variety, diversity, and balance. Each test form is balanced with regard to multicultural and gender representation. While it is impossible, given the constraint of the limited amount of material in each test form, to represent every group in every form, a good-faith effort to represent diversity should be discernible in every final form. Two strategies ACT uses to attain this diversity are ensuring the inclusion of culturally diverse passages within each form and ensuring that all passages depict universal themes applicable to all groups.

Preliminary versions of ACT test forms are subjected to the same comprehensive reviews for content and fairness issues that items undergo. ACT's test development associates, editorial staff, and measurement staff conduct the initial forms reviews. The forms are then sent to external content experts and fairness reviewers (not the same individuals who conducted the reviews prior to pretest). The comments made by all reviewers are collated, and the items/passages identified as problematic are replaced as necessary. ACT's test development associates work with the fairness and content reviewers to prepare the final forms of the test for printing. In all, at least sixteen independent reviews are made of each test item before its appearance on a national form of the ACT, primarily to ensure that each student's level of achievement is accurately and fairly evaluated.

Differential Item Functioning (DIF)

Fairness in the content of the items does not necessarily prevent items from functioning statistically in different ways for different population subgroups. Differential item functioning (DIF) can be described as a statistical difference between the probability of a specific population group (the "focal" group) getting the

item right and a comparison population group (the "base" group) getting the item right *given that both groups have the same level of expertise* with respect to the content being tested.

To detect the existence of differential item functioning (DIF) for items in each test form, ACT analyzes response data from actual national and state administrations of each of the forms. After each national or state administration of a test form, large random samples representing the student groups of interest are selected from the total number of students taking the test. The groups compared are African Americans/Caucasians, Mexican Americans/Caucasians, Hispanics (other than Mexican origin)/Caucasians, Asian Americans or Pacific Islanders/ Caucasians, American Indians or Alaska Natives/Caucasians, and females/males. The statistics ACT uses for detecting DIF are the standardized difference in proportion-correct (STD) and the Mantel-Haenszel common odds-ratio (MH). The samples of students' responses to each item are analyzed using the STD and MH procedures. All items with MH and/or STD values exceeding a pre-established statistical tolerance level are flagged for further review. The flagged items are reviewed by ACT's test development associates for possible explanations of the unusual STD or MH results. In the event that a problem is found with an item, actions are taken as necessary to eliminate or minimize the influence of the problem.

Fairness review for *ACT WorkKeys*

Fairness review is an important step in developing and pretesting news items for the three *ACT WorkKeys* assessments. Participants in fairness review include ACT test development staff and external business and education experts from diverse cultural and ethnic backgrounds. Fairness reviewers representing gender, cultural, and ethnic/racial subgroups work to ensure that no item was unfair to any minority group members. ACT gives the reviewers written guidelines and requires them to write an evaluation of each item. ACT reviews the evaluations and responds to any concerns the reviewers raise. Any item rejected by the reviewers is removed from the operational pool. Items that pass reviews and meet specifications are left intact to preserve the accuracy of pretest item data. Such items constitute the pool from which subsequent operational forms are drawn. Please see more details in *ACT WorkKeys* Assessment Technical Manuals (ACT, 2008a, 2008b, and 2008c).

Conclusion

The evidence from the methods used for item development, item review, augmentation, alignment, and correlation with related measures provide validity-related evidences for the interpretation of MME scores. Given the desired interpretation of scores as described in this chapter, the validity-related evidence strongly support the interpretability of the MME scores.

Chapter 12: Item Analysis

Post Field Test Item Review

After field test administration, item analyses were conducted to prepare data for two more rounds of reviews: bias/sensitivity review and content review. For the 2014 MME, the Rasch model was used for item analysis for the social studies portion of the exam. The three parameter logistic item response theory model was used for all other subjects on the exam. This section describes data based on Rasch model analysis for these two post field test reviews. A section on item field testing is also in Chapter 3, and the reader may refer to that section for a presentation that is complementary to this one. Readers can also refer to Appendix E: Guidelines for Content and Bias Review of Field Test Item Data for Day 3 item review information.

Data

All field test items were embedded in the live test forms for each test. After the calibration of live test forms, field test items were calibrated and put onto the same scale as the live operational items. Appendix C lists all the statistics created for the field tested items. The statistics for each field test item can be summarized into nine categories:

1. General test information: test name, subject, grade, level;
2. Administration related information: year cycle, administration year, released position;
3. Specific item information: item ID, CID, item type, answer key, maximal score, maturity, item function, character code, number of forms the item appears on, form numbers, test position, n-count (total, male, female, white, and black students), percent for each comment code, percent for each condition code;
4. Content-related information: strand, benchmark, grade level expectation, depth of knowledge, domain, scenario;
5. Option analysis: percent for each option and each score point (total, male, female, white, and black students), p-value or item mean (total, male, female, white, and black students), adjusted p-value, difficulty flag, item standard deviation, item-total correlation, biserial/polyserial correlation, corrected point-serial correlation, item-total correlation flag, option point-biserial correlation, flag for potential miskeying;
6. DIF analysis: Mantel Chi-square, Mantel-Haenszel Delta and its standard error, signed and unsigned SMD, SMD signed effect size, DIF category, and favored group for male versus female comparison and white versus black comparison;
7. IRT parameters: b-parameter and its SE, step parameters and their respective SE, item information at cut points;
8. Fit statistics: mean-square infit, mean-square outfit, mean-square fit flag, misfit level;
9. Data for creating plots: conditional item mean for decile 1 to 10 for each student group (total, male, female, white, and black students) for creating conditional mean plots, 5th, 25th, 50th, 75th, 95th percentile for creating Box & Whisker plot for each student group (total, male, female, white, and black students) for each option and each score point.

These statistics were reviewed by the DAS and some of these statistics were used for the bias/sensitivity review and content review.

Statistics and Graphs Prepared for Review Committees

Statistics from item analyses for field test items were used to create item labels for the post field test reviews. MME Day 3 field test review was conducted through DAS IBS. Table 12.1 displays all the statistics prepared for MC items for the review committee. These include six categories:

1. General administration information: test name, grade, subject, and administration time;
2. Item general information: ItemID, maturity, forms and positions;
3. Item specific information: item type, key, p-value, n-count, estimated IRT parameters, difficulty flag, point-biserial correlation, point-biserial correlation flag, fit flag, option quality flag;
4. Breakout group descriptives and optional analysis: percent of students selecting each option and omit, option point-biserial correlations, and n-count for all and subgroups: male, female, white, and black students;
5. Differential Item Functioning: flag, and favored group for male versus female and white versus black;
6. Review decision.

All statistics prepared for the review committee are explained in Appendix C. When the p-value for an MC item, or Rasch/IRT difficulty (i.e., b parameter) was out of the desired range, a difficulty flag was shown. When a point-biserial correlation for an MC item was out of range, the appropriate flag was shown. If the mean square infit or outfit was out of desired range, an infit or outfit flag was presented. Similarly, if DIF or improperly functioning options (distracters) were detected, the corresponding flag was activated for the item. The criteria used for flagging an MC item are presented in Table 12.2.

For further psychometric reference, conditional mean plots and box & whisker plot for two student group comparison, male versus female and white versus black were prepared for the flagged items for the two post field test reviews. See Figure 12.1for conditional mean plots and Figure 12.2 for box & whisker plots.

Members of the bias review and content review committees were given specific training in analyzing item quality. Some of the supporting materials for the training sessions are provided in Appendix E (for both content and bias review).

Table 12.1. Item Label for an MC Item

Item Details | Attributes | History | Committee Review | Field Review | Statistics | Preview

Item Information

Item ID	: 1036	Program	: MME	Maturity	: Ready for Operational
Version	: 14.00	Content Area	: Mathematics	Is this a Migrated Item ?	: No
Context	: N/A	Grade Level/ Span	: 11	Item Type	: Multiple Choice

Test Statistics details

Field Test

Data Review Statistics

BSC Committee

Content Expectation: L2.3.1

Cycle: Spring 2013

Administration Type	Group	NCOUNT	Adjusted p -value	DIF Flag		Performance Statistics					
						Opt A	Opt B*	Opt C	Opt D	Omit	Mult
Make-up	All	3,170	0.28	NA	Option Percent	33.41	28.49	8.30	29.72	0.06	0.03
					Correlation	-0.24	0.27	-0.21	0.11	-0.02	NA
	Female	1,689	0.30	A	Option Percent	32.62	30.14	7.99	29.25	0.00	0.00
	Male	1,481	0.27		Option Percent	34.30	26.60	8.64	30.25	0.14	0.07
	Black	612	0.23	A	Option Percent	37.91	22.71	14.87	24.51	0.00	0.00
	White	2,237	0.31		Option Percent	32.10	30.80	6.08	30.89	0.09	0.04

CAC Committee

Content Expectation: L2.3.1

Cycle: Spring 2013

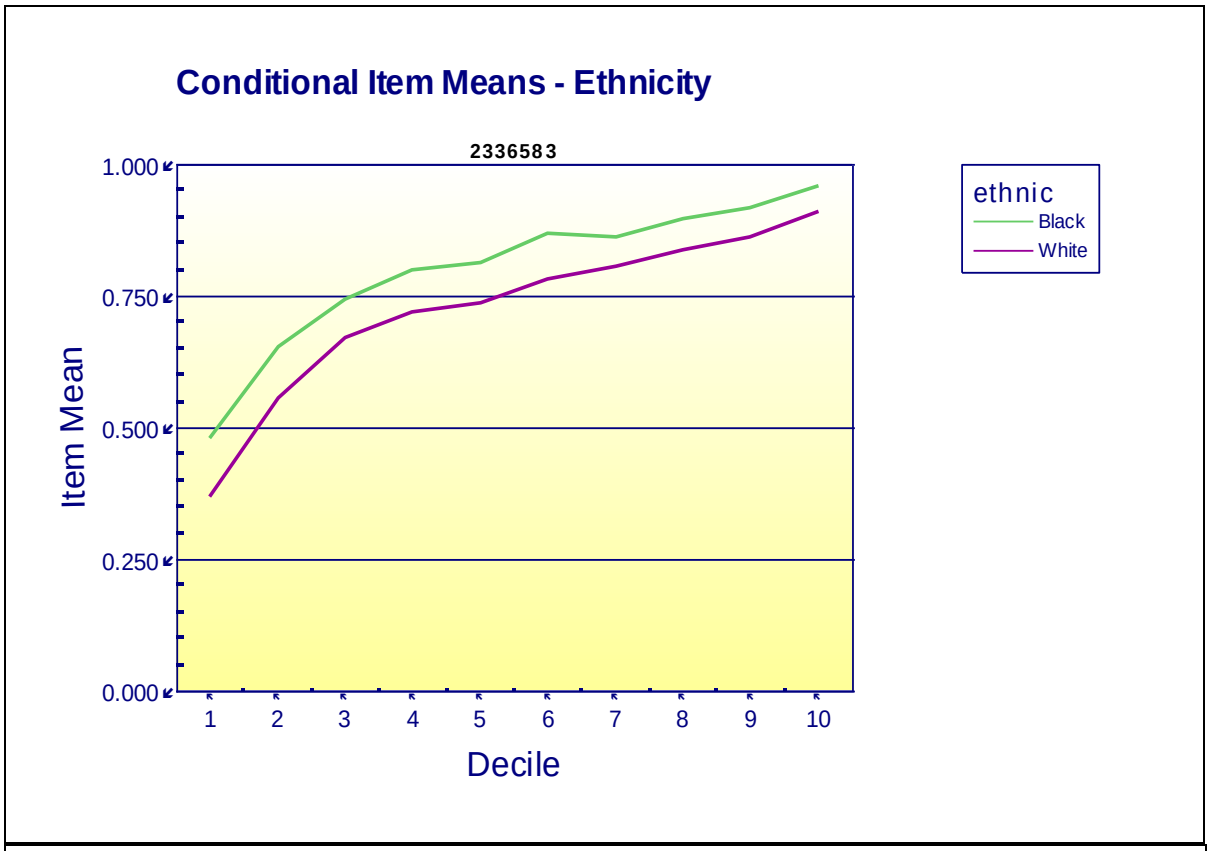
Administration Type	NCOUNT	Adjusted p-value	Difficulty Flag	Item-Total Correlation	ITOT Flag	Miskey Flag		Performance Statistics					
								Opt A	Opt B*	Opt C	Opt D	Omit	Mult
Make-up	3,170	0.28	PL	0.27		F	Option Percent	33.41	28.49	8.30	29.72	0.06	0.03
							Correlation	-0.24	0.27	-0.21	0.11	-0.02	NA

Table 12.2. Flagging Criteria

Statistic	Flag	Flag Definition	Flag Field
PVAL PVAL ADJPVAL	PL PH BL BH	For MC 4 options, if p-value LT .3 (PL) or GT .9 (PH) For CR items, if adj. p-value LT .10 (PL) or GT .9 (PH)	DIFFICFL
BPAR		If b-parameter LT -2.5 (BL) or GT 2.5 (BH)	
ITOT	CL	If item-total correlation or point biserial correlation LT 0.25 (CL)	ITOTFL
MSQIN MSQOUT	MH MM TP	If msqin or msqout GT 2 (MH) If msqin 1.5 through 2 and msqout LE 2 (MM) If msqout 1.5 through 2 and msqin LE 2 (MM) If msqin LT 0.5 and msqout LT 1.5 (TP) If msqout LT 0.5 and msqin LT 1.5 (TP)	MSQINFL MSQOUTFL
DIF_MF DIF_WB	A B C AA BB CC	For MC items: A: If either |MH Delta| is not significantly GT 0 ($p < 0.05$, using either MH-Chi-Square or standard error of MH Delta) or if the |MH Delta| is LT 1 B: If |MH Delta| is significantly GT 0 and is either GE 1 and LE 1.5 or is GE 1 but not significantly GT 1 ($p < 0.05$, using standard error of MH Delta) C: If |MH Delta| is both GT 1.5 and significantly GT 1 ($p < 0.05$, using standard error of MH Delta) For CR items: AA: If the Mantel Chi-Square is not significant ($p > 0.05$) or the |Effect Size| (ES) of SMD LE 0.17 BB: If the Mantel Chi-Square is significant ($p < 0.05$) and the |ES| is GT 0.17 but LE 0.25 CC: If the Mantel Chi-Square is significant ($p < 0.05$) and the |ES| is GT 0.25	DIF_MF DIF_WB Categories A and AA are not displayed in flag field
A, B, C, D M, S5, S6, O APB BPB CPB DPB OPB	H L P O N B	For MC items: If the keyed option is not the highest percentage (H) If any option LE 2% (L) If any non-keyed option pb-corr GT 0 (P), or if omit pb-corr GT 0.03 (O) If the keyed option pb-corr LT 0 (N) For CR items: For CR, if omit pb-corr GT 0.03 (O) For CR, if any score point LT 0.5% (L) For CR, if omit GT 20% (B)	MISKFL

Meaning of Flags:

- **PL … p-value low**
- **PH … p-value high**
- **BL … b-parameter low**
- **BH … b-parameter high**
- **CL … correlation low between item and total**
- **MH … misfit high**
- **MM … misfit moderate**
- **TP … too predictable**
- **A or AA … no or negligible DIF**
- **B or BB … moderate DIF**
- **C or CC … substantial DIF**
- **H … highest percentage is not a keyed option**
- **L … low percentage of any option**
- **P … positive pb-correlation for any non-keyed option**
- **N … negative pb-correlation for the keyed option**
- **O … omit has a positive pb-correlation**
- **B … blanks are over 20%**



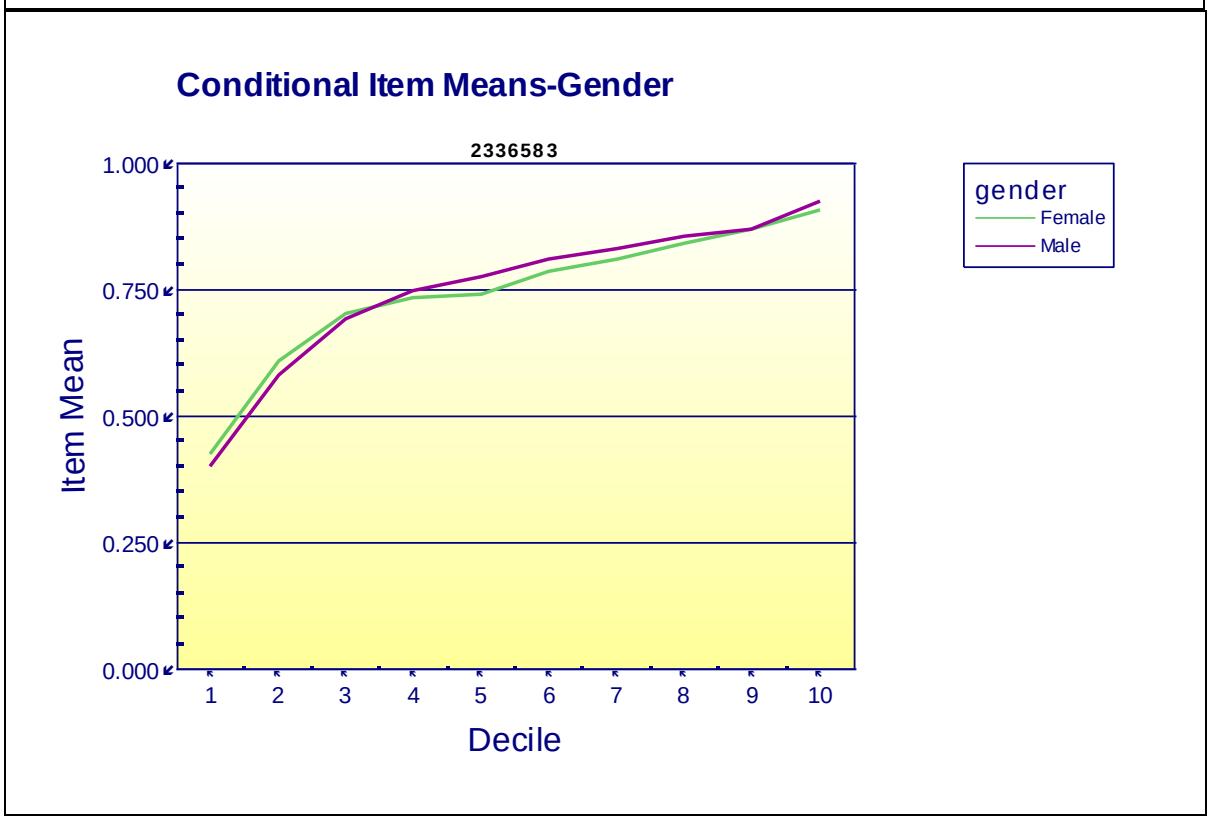


Figure 12.1. Conditional item mean plots for ethnicity and gender for MC items.

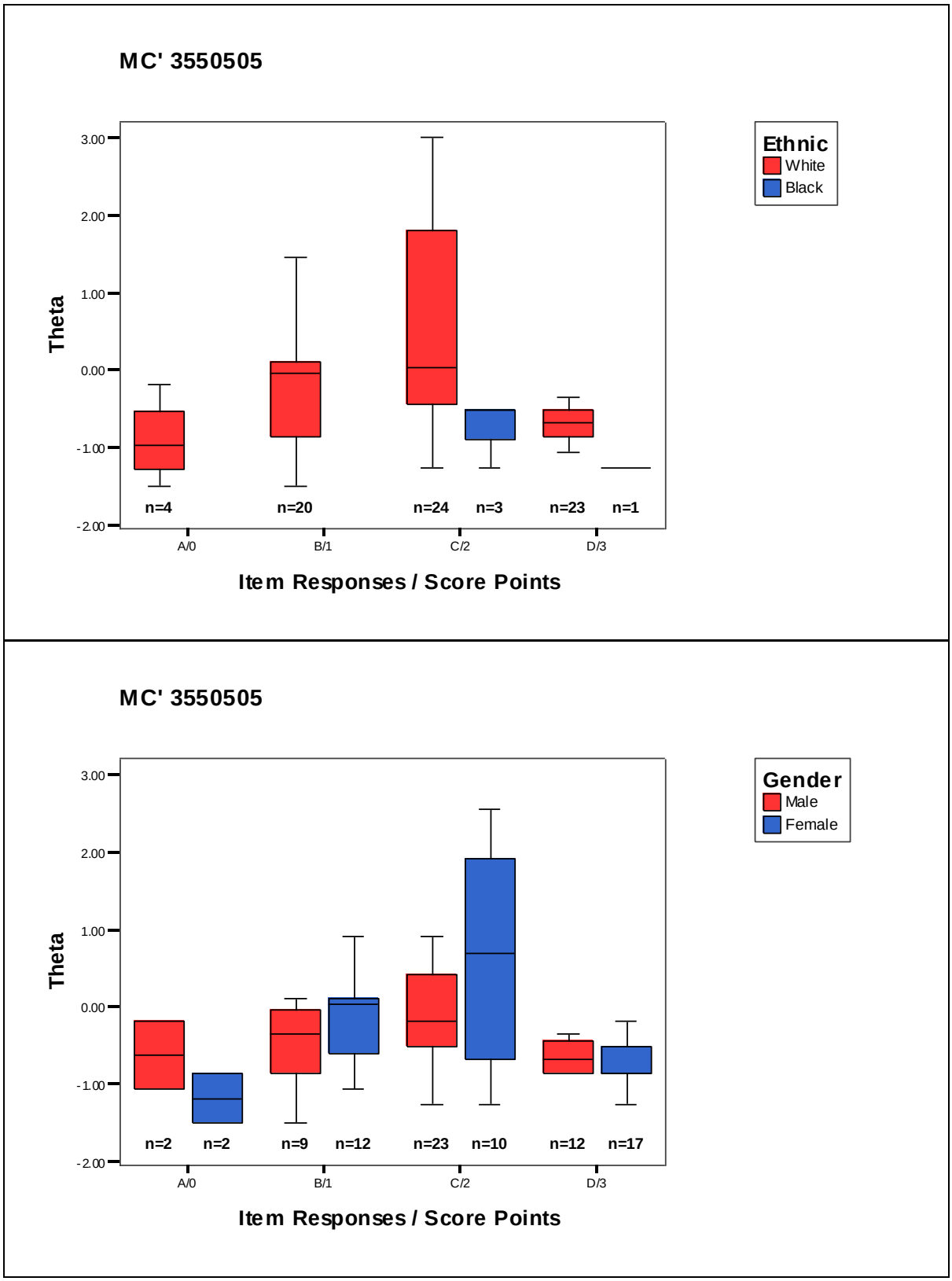


Figure 12.2. Box & whisker plots for ethnicity and gender for MC items.

Chapter 13: MME Proficiency Level Cut Scores

This chapter presents the MME proficiency level cut scores and their development. The MME proficiency level cut scores were originally determined through a standard setting in 2006. A new set of MME proficiency level cut scores was derived from a special study in 2011 and has been applied to the MME administrations since 2012.

The MME Proficiency Level Cut Scores from the 2006 Standard Setting

Standard setting is a complex and detailed procedure that requires extensive documentation, particularly given the high-stakes nature of standard setting for state-administered assessments. In order to provide the most complete information possible regarding standard setting, those interested in learning more about the standard setting process are asked to reference the complete standard setting document in the *Michigan Department of Education Memorandums*, October 2006 and November 2006 regarding the MME Standard Setting, and in the *Standard Setting Report* (Assessment and Examination Service, 2006). Below is a brief overview of the main activities involved in standard setting for the MME. Standard setting was conducted for the MME in 2006 using the procedures outlined below.

The plan for establishing cut scores for the performance levels is contained in the *Standard Setting Plan* (Assessment and Examination Service, 2006). This document describes the data collection, methodology (the Bookmark or Item Mapping method) and agenda for conducting the standard setting studies for the MME.

The results of a modified item mapping procedure are described in the *Standard Setting Report* (Assessment and Examination Service, 2006). The following modified item mapping method was used: "In the ordered item booklet, three items were flagged as reference items, one for each performance standard (Partially Proficient, Proficient, Advanced). If selected, these items would produce cut-scores such that the percentage of students in each of the four categories would be the same as the results of the Spring 2006 Grade 11 assessments." These data for the MME standard setting were obtained from a group of panelists who reviewed items ordered with respect to a 2006 field test of the Michigan Merit Examination in Reading, Writing, Mathematics, and Science. The *Standard Setting Report* recommended three cut scores to delineate the four performance levels: Not Proficient, Partially Proficient, Proficient, or Advanced. The MME cut scores are reported in Table 13.1. These cut scores were placed on the MME scale.

A *Michigan Department of Education Memorandum* in October 2006 described four possible sets of cut scores for the performance levels, and recommended one. A second *Michigan Department of Education Memorandum* (November 2006) revised the recommendation to a different set of cut scores, and provided a justification based on a change in content specifications. The revised recommendation was to adopt MME cut scores based on a linkage to the MEAP.

The formal adoption of MME cut scores is detailed on page 5 of the minutes of the November 2006 State Board of Education meeting (*Minutes of the State Board of Education* November 14, 2006).

Table 13.1. **Proficiency level cut scores by subject**.

	Performance Standard Cut Score		
	Not Proficient/ Partially Proficient	Partially Proficient/ **Proficient**	Proficient/ **Advanced**
Writing	1051	1100	1146
Mathematics	1089	1100	1128
Reading	1078	1100	1158
Science	1087	1100	1143
Social Studies	1086	1100	1129

Revised MME Proficiency Level Cut Scores

In 2011, a special study was conducted to identify new cut scores on the Michigan Merit Examination (MME), where proficient is defined as being on track to succeed in a postsecondary educational experience. Grade 11 MME scores were linked to freshman college grades to identify cut scores on the MME. The work was accomplished by the Michigan Department of Education (MDE) and ACT, Inc. New cut scores were set in Mathematics, Reading, Science, and Social Studies. Writing was not included in the study because the MME writing cut score is already similar to the ACT writing college readiness benchmark.

The first step in setting new cut scores was to set college readiness cutoff scores on the 11th grade MME. This was accomplished by relating course grades from first-year college students enrolled in Michigan public postsecondary institutions (two- and four-year) to MME scores.

All Michigan postsecondary institutions were asked to provide a list of first-year credit-bearing courses that they felt would be appropriate. The final list was reviewed and approved by Michigan Department of Education (MDE) staff. Each course was assigned to a subject area (mathematics, reading, science, or social studies). Some courses were used for both reading and social studies. Using the final list, grades for courses were pulled by ACT from the Center for Educational Performance and Information (CEPI) grade file provided by MDE. The final file included 13 four-year and 26 two-year public institutions.

Students with first college enrollment dates of Fall 2009 and Fall 2010 were used in the study. These were the first cohorts that had both 11th grade MME scores and college course grades. After matching and cleaning, the final sample size was 104,691 records.

For each subject area, Signal Detection Theory (SDT) was used to generate a distribution of consistency classifications across MME test score by institution. The median consistency at each score was calculated across institutions and a logistic regression function was fit to this distribution to smooth the results. The MME scores with the highest median consistency were selected as the 11th grade MME college readiness cutoff scores. A score that gives the highest classification consistency also has a probability of success of 0.50—meaning that students with this score have a 50% chance of receiving a B or higher course grade in the subject area. Partially proficient and advanced cutoff scores were selected as the scores at which students had a 33% and 67% chance of success.

Table 13.2 exhibits the revised MME proficiency level cut scores by subject.

Table 13.2. **The Revised MME Proficiency Level Cut Scores by Subject**.

	Performance Standard Cut Score		
	Not Proficient/ Partially Proficient	Partially Proficient/ **Proficient**	Proficient/ **Advanced**
Writing	1051	1100	1146
Mathematics	1093	1116	1138
Reading	1081	1108	1141
Science	1106	1126	1144
Social Studies	1097	1129	1158

For more information about this special study on the new cut scores, please visit MDE's website (http://www.michigan.gov/documents/mde/Cut_Scores_Board_Item_362615_7.pdf).

Chapter 14: Michigan School Accountability Scorecards and Education YES

The major policy-based uses of assessment data from the MME, MEAP, MEAP-Access and MI-Access are for public reporting and school accountability decisions.

Legislative Grounding

- Throughout 2011-2012, the Michigan Department of Education (MDE) worked with local education stakeholders across the state, as well as with the United States Department of Education (USED) to develop a request for flexibility from certain requirements of the Elementary and Secondary Education Act (ESEA), also known as "No Child Left Behind." The flexibility requested includes waivers of 11 specific provisions of this federal law, including the requirement that all schools meet the 100% student proficiency targets by 2014. Michigan's work in implementing career- and college-ready expectations for all students; developing differentiated recognition, accountability, and support for districts and schools; and supporting effective instruction and leadership will create the context in which this flexibility may be successfully implemented for the benefit of Michigan's students and education community.

  On July 19, 2012, the MDE received notification from USED that Michigan's ESEA Flexibility Request was approved.

- Michigan statute (section 1280 of the Revised School Code) requires the State Board of Education to accredit public elementary and secondary schools. The State Board approved *Education YES— A Yardstick for Excellent Schools!* in 2002, and accepted the report of the Accreditation Advisory Committee in 2003.

The Michigan School Accountability Scorecards combine student assessment data with graduation or attendance rates as well as information on compliance with state and federal laws. The Scorecard is a diagnostic tool that gives schools, districts, parents, and the public an easy way to see a school's or district's strengths and weaknesses.

The Michigan School Accountability Scorecards are a replacement to the Michigan School Report Cards that were required under the No Child Left Behind (NCLB) Act to report Adequate Yearly Progress (AYP). Michigan received an Elementary and Secondary Education Act (ESEA) Flexibility Waiver from the U.S. Department of Education in July 2012 that allows the use of the Scorecards in place of the former AYP Report Cards.

Education YES! uses several components that are interlinked to present a complete picture of performance at the school level. *Education YES!* is a broad set of measures that looks at school performance and student achievement in multiple ways. Measures of student achievement in Michigan's school accreditation system include:

- <u>Achievement status</u> to measure how well a school is doing in educating its students.

- Achievement change to measure whether student achievement is improving or declining.

In addition, the Indicators of School Performance measure investments that schools are making in improved student achievement, based on indicators that come from research and best practice.

Procedures for Using Assessment Data for Accountability

Targets for participation, proficiency, and graduation or attendance must be met for the school or district as a whole and for any valid subgroup. There are 12 potential subgroups for a school and 13 potential subgroups for a district. The minimum size for a subgroup is almost always 30 students. The one exception to the minimum size is for the Bottom 30% subgroup. The minimum size required for the Bottom 30% subgroup is 9 students. The "All Students" group will display even if the entire school or district has fewer than 30 students. The subgroups include:

- Major Racial/Ethnic Groups
  - Black or African American
  - American Indian or Alaska Native
  - Asian American
  - Native Hawaiian or other Pacific Islander
  - Hispanic or Latino
  - White
  - Multiracial
- Students with Disabilities
- English Learner
- Economically Disadvantaged
- Bottom 30% (achievement only)
- Shared Educational Entity (SEE) subgroups for district use only

Michigan's minimum subgroup size is 30 students. For a district or school that enrolls more than 3,000 students, the minimum subgroup size will be 1% of enrollment, up to 200 students. An accountability determination will be made for all subgroups of 200 or more students.

It is the policy of the Michigan State Board of Education that all students participate in the state assessment program. The student's status, in terms of enrollment for a full academic year, is not relevant to whether the student should be assessed. The federal No Child Left Behind Act requires that at least 95% of enrolled

students be assessed. The number of students to be assessed is determined from the Michigan Student Data System (MSDS—formerly the SRSD), collected by the Center for Educational Performance and Information (CEPI). This is taken from the Fall (October) collection for grades 3–9 and from the Spring (February) collection for high schools.

Proficiency targets are unique to each school and district. Targets are set at the school and district level in each content area. This means that any subgroup present in the school or district must meet the school or district's proficiency target. All schools and districts are expected to reach 85% proficiency in all content areas by the end of the 2021–22 school year.

Proficiency targets are based on the school or district's full academic year percent proficient in 2011–12. Proficient students are those who attain a Performance Level 1 or 2 on the MEAP, MME, MEAP-Access, or MI-Access. This initial proficiency rate is called the base year percent proficient. The targets for each successive year are incremented equally over ten years by taking the difference between 85% and the base year percent proficient. Targets are calculated for each subject assessed in a school or district.

Individual school and district proficiency targets can be found at:

http://www.michigan.gov/documents/mde/Michigan_Proficiency_Targets_413516_7.xls.

Because the decisions made based upon accountability classifications are such high-stakes decisions for individual schools, it is important to account for error in order to be accurate in classifying schools as meeting or not meeting their accountability targets. Uncertainty in scores has an impact on classifying students as proficient, and uncertainty in classifying students as proficient has an impact on calculating accountability. For this reason, measurement error needs to be taken into account in calculating accountability. Measurement error can cause two types of errors in calculating accountability: false positives (mistakenly identifying schools as meeting targets) and false negatives (mistakenly identifying schools as not meeting targets).

Students with scale scores within two conditional standard errors of measurement of the proficient cut score are considered provisionally proficient for accountability.

In addition, the Indicators of School Performance measure investments that schools are making in improved student achievement, based on indicators that come from research and best practice.
Scores on all three components of *Education YES!* have been converted to a common 100 point scale where: 90–100 A; 80–89 B; 70–79 C; 60–69 D; and 50–59 F. Grades of D and F are not used for the school's composite grade, where the labels D/Alert and Unaccredited are used.

Achievement Status

Achievement status is measured in reading and mathematics at the elementary level. It includes science and social studies at the middle school and high school levels. Achievement Status uses up to three years of comparable data from the Michigan Educational Assessment Program, the Michigan Merit Examination, or the MI-Access Assessments.

The method of computing achievement status uses students' scale scores on the Michigan assessments, as weighted by the performance level or category (1, 2, 3, or 4) assigned to each student's score. Scale score values at the chance level are substituted for values below the chance level because values below that point do not have valid information about the student's performance. A template is provided so that a school can paste in their assessment data to see how the values are derived. The weighted index is computed by following these steps:

1. Multiply each student's scale score by the performance level (e.g.., 1100*2);
2. Sum of the resulting values resulting in the sum of the index values;
3. Sum of the performance levels or weights;
4. Divide the sum of the index values by the sum of the weights.

The intent of the weighted index is to encourage schools to place priority on improving the achievement of students that attain the lowest scores on the Michigan assessments.

Cut scores for the score ranges in achievement status were set by representative panels that assigned grades to selected schools. The cut scores were reviewed by the Accreditation Advisory Committee and approved by the State Board of Education. The Accreditation Advisory Committee, a group of five national experts, was appointed by the State Board of Education to advise the Board on the implementation of the *Education YES!* school accreditation.

Achievement Change

Achievement change uses up to five years of comparable assessment data to determine if student achievement in a school is improving at a rate fast enough to attain the goal of 85% proficiency in school year 2021–22, as required by the ESEA Flexibility Waiver. The change grade is derived from the average of up to three calculations of improvement rates (slopes) using the school's assessment data. Scores from assessments that are not comparable will not be placed on the same trend line. Achievement Change is based on the goal of 85% percent proficient in 2021–22, as set in Michigan's approved ESEA Flexibility Waiver. Achievement Change is computed by dividing the computed slope by the target slope, determining the percent of the target that the school has attained.

The linear regression methodology previously used to calculate Achievement Change was not used in 2006–07 for the elementary and middle school levels because scores from assessments that are not comparable cannot be placed on the same slope line. Multiple linear regression was used to predict each school's 2012–13 score based on the school's scores from 2010, 2011, and 2012. A prediction was made for each content area and grade level that was tested in previous years. The prediction was compared to the school's actual 2012–13 percent proficient. The Difference is computed as the residual (Actual–Predicted). The school's status score for each content area and grade range is adjusted as follows:

- Schools where the actual score exceeds the prediction plus 1.5 times the standard error of the estimate had a 15 point adjustment added to the achievement score for that content area;

- Schools where the actual score exceeds the prediction plus the standard error of the estimate had a 10 point adjustment added to the achievement score for that content area;
- Schools where the actual score is less than the prediction minus 1.5 times the standard error of the estimate had a 15 point deduction applied to the achievement score for that content area; and
- Schools where the actual score is less than the prediction minus the standard error of the estimate had a 10 point deduction applied to the achievement score for that content area.

The Achievement Change adjustment is calculated only if there are at least 10 students tested each year (2010, 2011, 2012, 2013, and 2014) in the content area and grade level.

Scores and grades are calculated for each content area for each school. The content areas remain the same, using only reading and mathematics at the elementary level, and adding science and social studies at the middle school and high school levels. The score and grade for each content area is based on the score for achievement status, as adjusted by averaging it with the score for achievement change.

The composite school grade is derived from the school scores and letter grades and the school's Accountability Scorecard status. The weighting of the components of *Education YES!* in the composite grade has been as follows:

Table 14.1. Education YES! Composite Score Weighting

Component	Point Value
School Performance Indicators	33
Achievement Status	34
Achievement Change	33
Total	100

The scores for each content area are averaged to calculate an achievement score and grade for each school. An achievement score for each content area has been computed by averaging the Status and Change (or adjusted Change) scores for a content area. A preliminary aggregate achievement score is derived by averaging the scores from each content area. The preliminary aggregate achievement score is weighted 67% and the School Self-Assessment (Indicator score) is weighted 33% in calculating the preliminary score and grade for a school.

In 2004–05, the State Board of Education approved a change to the *Education YES!* policy so that the school's indicator score cannot improve the school's composite score and grade by more than one letter grade more than the school's achievement grade. This means that a school that receives an "F" for achievement can receive a composite grade no higher than "D/Alert."

After the computation of a school's composite grade for achievement described above, a final "filter" will be applied, consisting of the question of whether or not a school or district met or did not meet its accountability targets. The answer to this question is an additional determining factor for a school's final composite grade on the report card. A school that does not make its accountability targets shall not be given a grade of "A." A school that makes its accountability targets shall not be listed as unaccredited. A school's composite school grade will be used to prioritize assistance to underperforming schools and to prioritize interventions to improve student achievement.

Table 14.2. Unified Accountability for Michigan Schools

Education Yes! Composite Score	School Categories	
90–100	B (iv)	A
80–89	B (iv)	B (iv)
70–79	C (iii)	C (iii)
60–69	D/Alert (ii)	C (iii)
50–59	Unaccredited (i)	D/Alert (ii)
	Did Not Make Accountability Targets	***Makes Accountability Targets***

Schools that are labeled "A", "B", "C", or "D / Alert" will be accredited. Schools that receive an "A" will be summary accredited. Schools that receive a "B", "C", or "D/Alert" will be in interim status. Unaccredited schools will also be labeled as such. Summary accreditation, interim status, and unaccredited are labels from Section 1280 of the Revised School Code.

Results of accountability analyses for 2013-14 (as compares with 2012-13 and 2011–12) are summarized below.

District Accountability Scorecards Summary

Number of Districts Receiving Accountability Scorecards

- 893, 2013-14 district accountability scorecards
- 873, 2012-13 district accountability scorecards
- 543, 2011-12 district report cards

Percent of Districts Not Meeting Accountability Targets

- 18% (159/893), 2013-14 districts did not meet accountability targets (red)
- 21% (181/873), 2012-13 districts did not meet accountability targets (red)
- 48% (259/543), 2011-12 districts did not make AYP

Percent of Districts Meeting Accountability Targets

- 82% (734/893), 2013-14 districts met accountability targets (orange or higher)
- 79% (692/873), 2012-13 districts met accountability targets (orange or higher)

— 52% (284/543), 2011-12 districts made AYP

School Accountability Scorecards Summary

Number of Schools Receiving Accountability Scorecards

— 3361, 2013-14 school accountability scorecards

— 3397, 2012-13 school accountability scorecards

— 3411, 2011-12 school report cards

Percent of Schools Not Meeting Accountability Targets

— 14% (481/3361), 2013-14 schools did not meet accountability targets (red)

— 15% (511/3397), 2012-13 schools did not meet accountability targets (red)

— 18% (602/3411), 2011-12 schools did not make AYP.

Percent of Schools Meeting Accountability Targets

— 86% (2880/3361), 2013-14 schools met accountability targets (orange or higher)

— 85% (2886/3397), 2012-13 schools met accountability targets (orange or higher)

— 80% (2726/3411), 2011-12 schools made AYP

Chapter 15: State Summary Data

The summary data for the spring 2014 administration are presented in Table 15.1. For each content area, Table 15.1 presents the average score and the percentages of students falling into each of the four performance levels. The new MME proficiency level cut scores by subjects in Table 13.2 were employed for computations. Frequency distributions for the MME scale scores are presented in Figures 15.1 through 15.5, and in Tables 15.2 through 15.6. Tables 15.7 through 15.11 present the summary statistics for the item parameter estimates for the items employed for MME scoring. The summation of some percentages in the tables presented does not equal 100 due to rounding errors.

Table 15.1. Spring 2014 Michigan State Average Scores and Percentages in each Performance Level—All Students

			Percentages within Performance Levels			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	113,264	1110	15%	26%	44%	14%
Writing	113,872	1096	8%	42%	44%	6%
Mathematics	112,585	1098	36%	36%	22%	7%
Science	113,023	1103	45%	27%	17%	11%
Social Studies	113,029	1123	17%	40%	34%	10%

Note: All students (both public and nonpublic) who met the attemptedness criterion and obtained a valid scale score on the relevant subject of MME Spring 2014 administration were included in the analysis for this table.

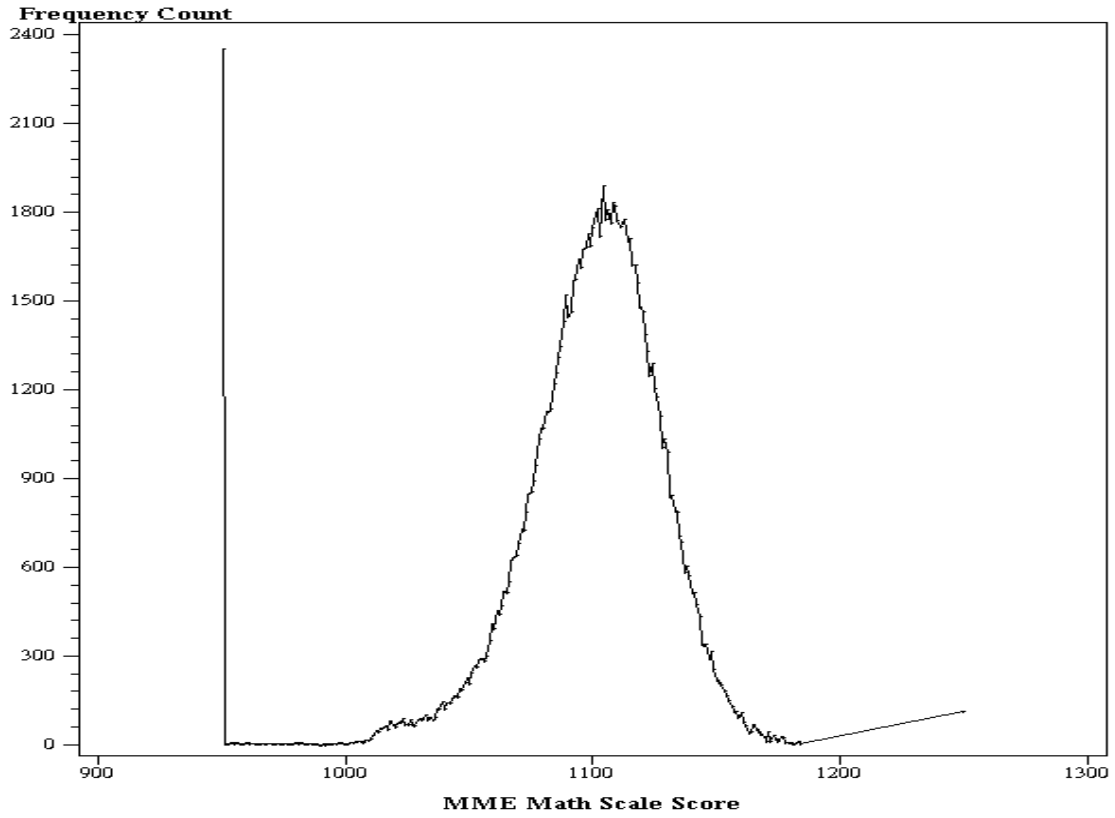


Figure 15.1. **Frequency plot for MME Spring 2014 Mathematics scale score total group—All forms included**.

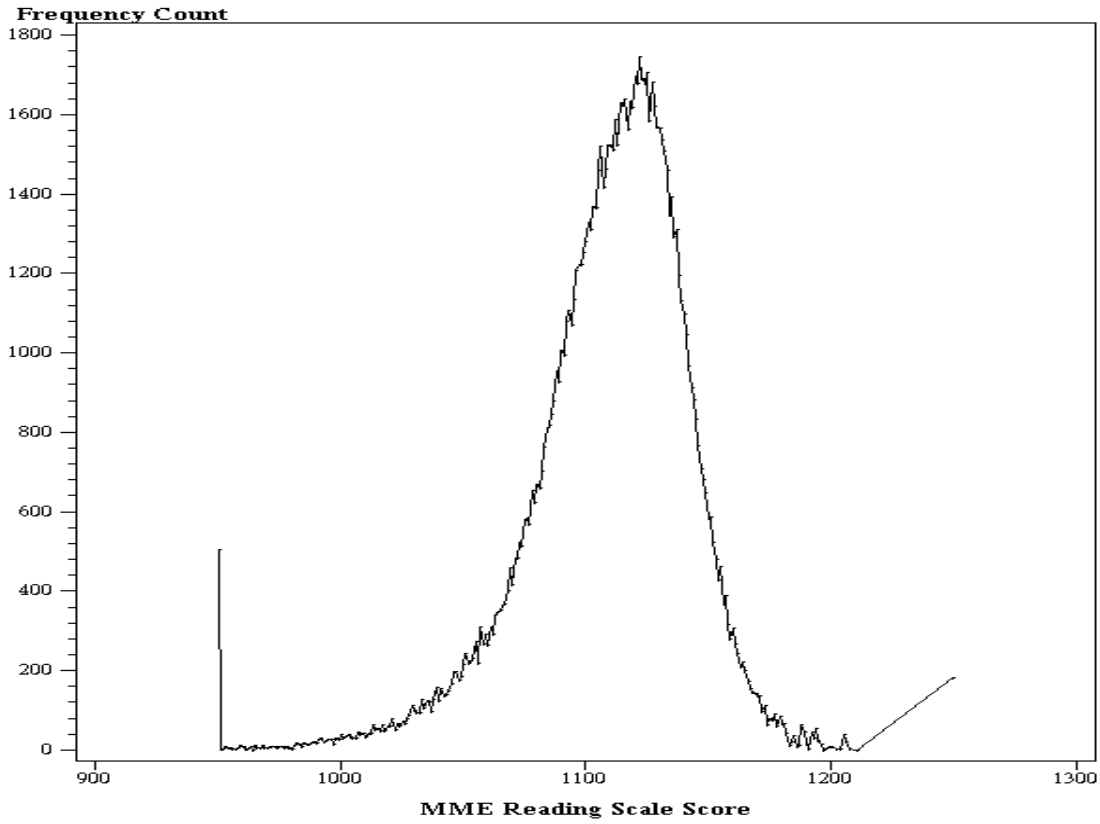


Figure 15.2. Frequency plot for MME Spring 2014 Reading scale score total group—All forms included.

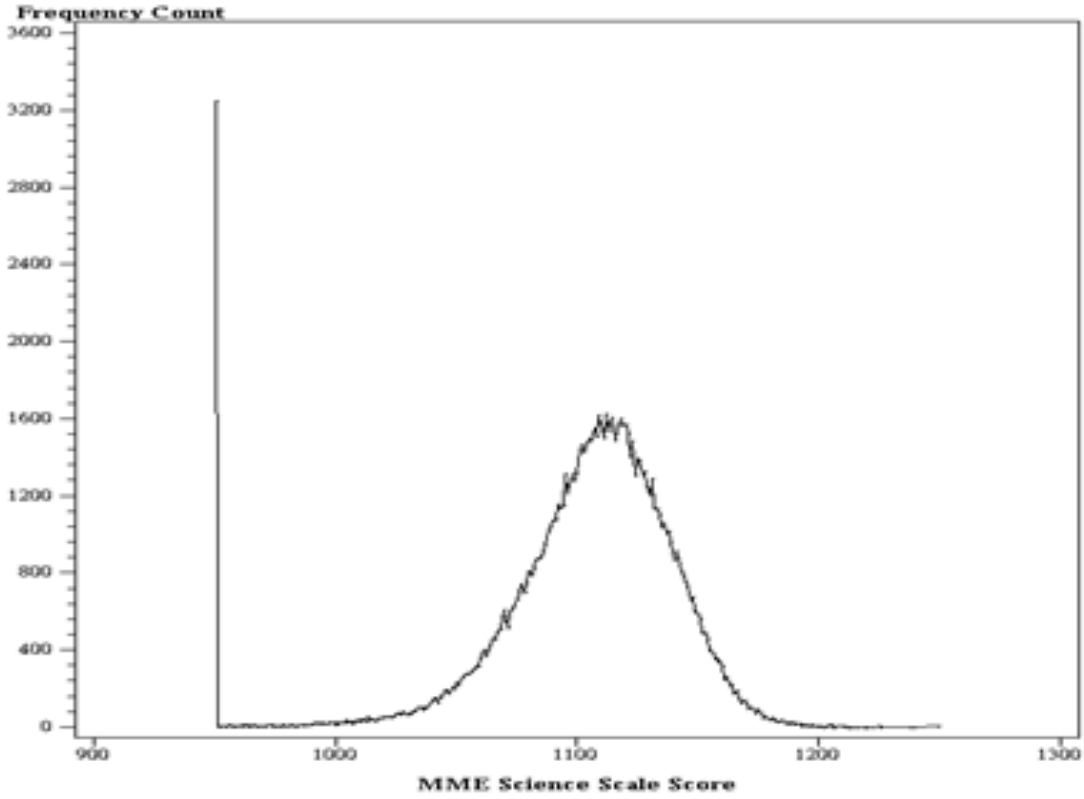


Figure 15.3. Frequency plot for MME Spring 2014 Science scale score total group—All forms included.

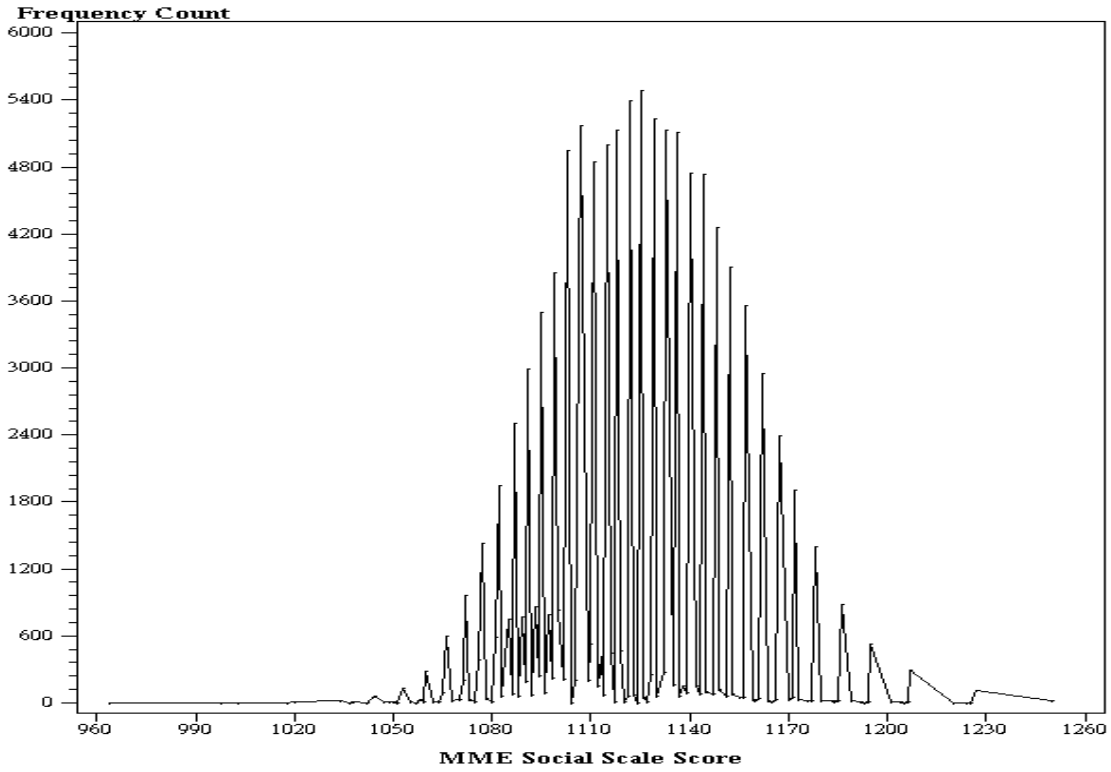


Figure 15.4. Frequency plot for MME Spring 2014 Social Studies scale score total group—All forms included.

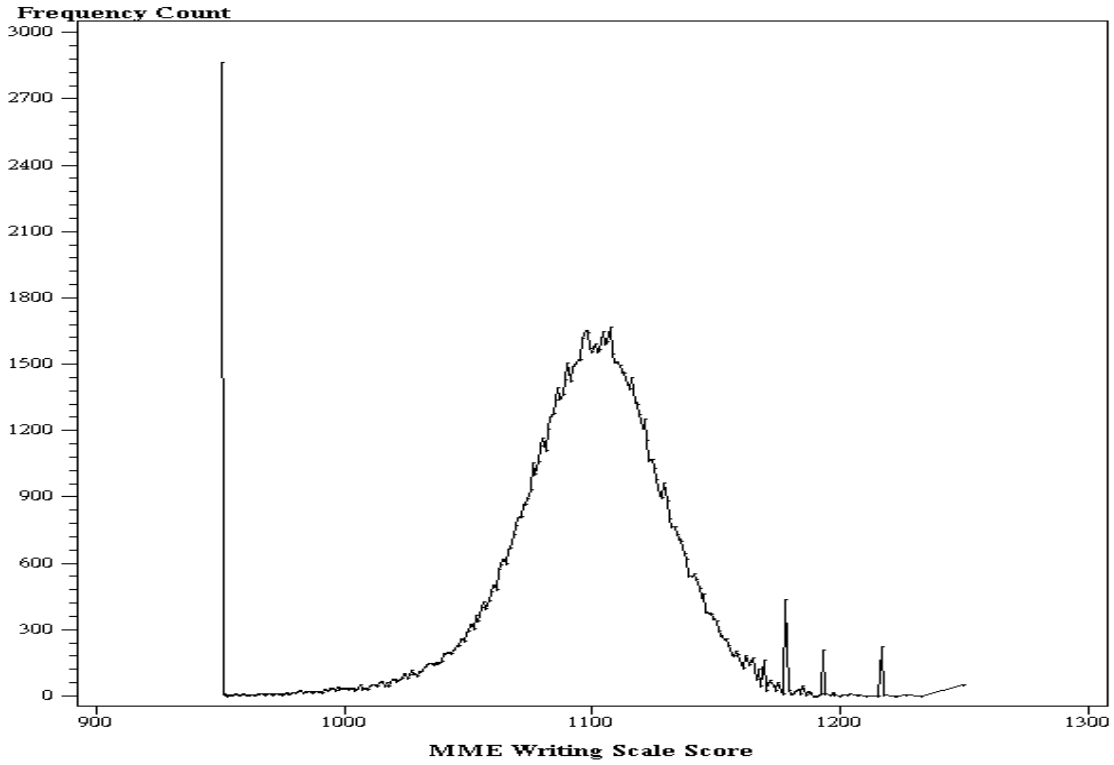


Figure 15.5. Frequency plot for MME Spring 2014 Writing scale score total group—All forms included.

Table 15.2. MME Spring 2014 Mathematics Scale Score Frequencies for Total Group—All Forms Included

Scale Score	Frequency	Percent
950	2353	2.09
951	3	0.00
952	3	0.00
953	3	0.00
954	9	0.01
955	3	0.00
956	6	0.01
957	2	0.00
958	5	0.00
959	4	0.00
960	6	0.01
961	3	0.00
963	3	0.00
964	2	0.00
965	2	0.00
966	2	0.00
967	5	0.00
968	3	0.00
970	3	0.00
971	2	0.00
972	3	0.00
973	5	0.00
974	3	0.00
975	2	0.00
976	2	0.00
977	3	0.00
978	5	0.00
979	5	0.00
980	6	0.01
981	2	0.00
982	7	0.01
983	2	0.00
984	5	0.00
985	5	0.00
986	2	0.00
987	5	0.00
988	3	0.00
989	1	0.00
990	1	0.00
991	5	0.00
992	1	0.00
993	3	0.00
994	3	0.00
995	3	0.00
996	4	0.00
997	7	0.01
998	6	0.01
999	5	0.00
1000	3	0.00
1001	4	0.00
1002	6	0.01
1003	9	0.01
1004	10	0.01
1005	12	0.01
1006	11	0.01
1007	9	0.01
1008	15	0.01
1009	16	0.01
1010	19	0.02
1011	33	0.03
1012	50	0.04
1013	44	0.04
1014	56	0.05
1015	55	0.05
1016	63	0.06
1017	54	0.05
1018	80	0.07
1019	68	0.06
1020	62	0.06
1021	71	0.06
1022	76	0.07
1023	87	0.08
1024	69	0.06
1025	70	0.06
1026	83	0.07
1027	69	0.06
1028	64	0.06
1029	85	0.08
1030	88	0.08
1031	84	0.07
1032	101	0.09
1033	84	0.07
1034	91	0.08
1035	84	0.07
1036	92	0.08
1037	121	0.11
1038	120	0.11
1039	146	0.13

1040	120	0.11
1041	142	0.13
1042	140	0.12
1043	156	0.14
1044	166	0.15
1045	161	0.14
1046	190	0.17
1047	188	0.17
1048	209	0.19
1049	228	0.20
1050	206	0.18
1051	241	0.21
1052	267	0.24
1053	265	0.24
1054	287	0.25
1055	290	0.26
1056	282	0.25
1057	298	0.26
1058	351	0.31
1059	408	0.36
1060	394	0.35
1061	453	0.40
1062	442	0.39
1063	470	0.42
1064	518	0.46
1065	513	0.46
1066	550	0.49
1067	626	0.56
1068	638	0.57
1069	642	0.57
1070	681	0.60
1071	730	0.65
1072	726	0.64
1073	787	0.70
1074	848	0.75
1075	856	0.76
1076	892	0.79
1077	944	0.84
1078	1034	0.92
1079	1069	0.95
1080	1070	0.95
1081	1127	1.00
1082	1126	1.00
1083	1135	1.01
1084	1220	1.08
1085	1256	1.12
1086	1311	1.16
1087	1347	1.20

1088	1430	1.27
1089	1522	1.35
1090	1449	1.29
1091	1465	1.30
1092	1568	1.39
1093	1573	1.40
1094	1642	1.46
1095	1612	1.43
1096	1675	1.49
1097	1681	1.49
1098	1726	1.53
1099	1685	1.50
1100	1748	1.55
1101	1794	1.59
1102	1812	1.61
1103	1719	1.53
1104	1888	1.68
1105	1776	1.58
1106	1808	1.61
1107	1765	1.57
1108	1831	1.63
1109	1819	1.62
1110	1771	1.57
1111	1750	1.55
1112	1769	1.57
1113	1778	1.58
1114	1702	1.51
1115	1711	1.52
1116	1623	1.44
1117	1623	1.44
1118	1562	1.39
1119	1479	1.31
1120	1465	1.30
1121	1387	1.23
1122	1330	1.18
1123	1250	1.11
1124	1289	1.14
1125	1203	1.07
1126	1176	1.04
1127	1109	0.99
1128	1005	0.89
1129	1034	0.92
1130	989	0.88
1131	841	0.75
1132	845	0.75
1133	789	0.70
1134	787	0.70
1135	704	0.63

1136	686	0.61
1137	583	0.52
1138	602	0.53
1139	572	0.51
1140	515	0.46
1141	513	0.46
1142	476	0.42
1143	433	0.38
1144	342	0.30
1145	336	0.30
1146	339	0.30
1147	293	0.26
1148	315	0.28
1149	257	0.23
1150	219	0.19
1151	210	0.19
1152	203	0.18
1153	184	0.16
1154	166	0.15
1155	151	0.13
1156	128	0.11
1157	112	0.10
1158	115	0.10
1159	94	0.08
1160	107	0.10
1161	78	0.07
1162	64	0.06
1163	42	0.04
1164	46	0.04
1165	70	0.06
1166	51	0.05
1167	43	0.04
1168	35	0.03
1169	26	0.02
1170	10	0.01
1171	43	0.04
1172	11	0.01
1173	31	0.03
1174	21	0.02
1175	10	0.01
1176	29	0.03
1177	23	0.02
1178	8	0.01
1179	6	0.01
1180	6	0.01
1181	2	0.00
1182	3	0.00
1183	10	0.01
1184	2	0.00
1250	115	0.10

Table 15.3. MME Spring 2014 Reading Scale Score Frequencies for Total Group—All Forms Included

Scale Score	Frequency	Percent
950	504	0.44
951	2	0.00
952	2	0.00
953	9	0.01
954	6	0.01
955	7	0.01
956	3	0.00
957	4	0.00
958	5	0.00
959	11	0.01
960	8	0.01
961	4	0.00
962	3	0.00
963	10	0.01
964	1	0.00
965	11	0.01
966	7	0.01
967	5	0.00
968	11	0.01
969	7	0.01
970	6	0.01
971	9	0.01
972	9	0.01
973	10	0.01
974	7	0.01
975	9	0.01
976	10	0.01
977	7	0.01
978	9	0.01
979	6	0.01
980	3	0.00
981	13	0.01
982	18	0.02
983	14	0.01
984	8	0.01
985	17	0.02
986	15	0.01
987	14	0.01
988	18	0.02
989	22	0.02
990	18	0.02
991	27	0.02
992	29	0.03
993	22	0.02
994	25	0.02
995	27	0.02
996	27	0.02
997	16	0.01
998	30	0.03
999	26	0.02
1000	39	0.03
1001	29	0.03
1002	33	0.03
1003	40	0.04
1004	33	0.03
1005	31	0.03
1006	30	0.03
1007	44	0.04
1008	38	0.03
1009	42	0.04
1010	32	0.03
1011	38	0.03
1012	41	0.04
1013	62	0.05
1014	51	0.05
1015	54	0.05
1016	49	0.04
1017	65	0.06
1018	47	0.04
1019	59	0.05
1020	59	0.05
1021	79	0.07
1022	51	0.05
1023	67	0.06
1024	60	0.05
1025	73	0.06
1026	66	0.06
1027	78	0.07
1028	88	0.08
1029	111	0.10
1030	100	0.09
1031	95	0.08
1032	94	0.08
1033	128	0.11

1034	107	0.09
1035	125	0.11
1036	121	0.11
1037	97	0.09
1038	127	0.11
1039	158	0.14
1040	125	0.11
1041	156	0.14
1042	137	0.12
1043	141	0.12
1044	148	0.13
1045	168	0.15
1046	197	0.17
1047	197	0.17
1048	177	0.16
1049	185	0.16
1050	215	0.19
1051	242	0.21
1052	218	0.19
1053	226	0.20
1054	230	0.20
1055	272	0.24
1056	218	0.19
1057	310	0.27
1058	267	0.24
1059	292	0.26
1060	265	0.23
1061	311	0.27
1062	292	0.26
1063	340	0.30
1064	346	0.31
1065	353	0.31
1066	365	0.32
1067	367	0.32
1068	402	0.35
1069	458	0.40
1070	415	0.37
1071	484	0.43
1072	482	0.43
1073	523	0.46
1074	514	0.45
1075	581	0.51
1076	584	0.52
1077	569	0.50
1078	654	0.58
1079	624	0.55
1080	669	0.59
1081	660	0.58

1082	702	0.62
1083	763	0.67
1084	813	0.72
1085	819	0.72
1086	846	0.75
1087	880	0.78
1088	954	0.84
1089	926	0.82
1090	1008	0.89
1091	993	0.88
1092	1079	0.95
1093	1106	0.98
1094	1070	0.94
1095	1133	1.00
1096	1207	1.07
1097	1221	1.08
1098	1222	1.08
1099	1254	1.11
1100	1280	1.13
1101	1330	1.17
1102	1310	1.16
1103	1369	1.21
1104	1364	1.20
1105	1460	1.29
1106	1522	1.34
1107	1416	1.25
1108	1462	1.29
1109	1523	1.34
1110	1523	1.34
1111	1510	1.33
1112	1588	1.40
1113	1523	1.34
1114	1629	1.44
1115	1623	1.43
1116	1639	1.45
1117	1564	1.38
1118	1634	1.44
1119	1618	1.43
1120	1698	1.50
1121	1679	1.48
1122	1746	1.54
1123	1690	1.49
1124	1678	1.48
1125	1707	1.51
1126	1584	1.40
1127	1681	1.48
1128	1622	1.43
1129	1568	1.38

1130	1565	1.38
1131	1537	1.36
1132	1508	1.33
1133	1460	1.29
1134	1346	1.19
1135	1394	1.23
1136	1292	1.14
1137	1311	1.16
1138	1194	1.05
1139	1131	1.00
1140	1098	0.97
1141	1045	0.92
1142	966	0.85
1143	911	0.80
1144	881	0.78
1145	832	0.73
1146	766	0.68
1147	708	0.63
1148	680	0.60
1149	647	0.57
1150	583	0.51
1151	588	0.52
1152	522	0.46
1153	479	0.42
1154	429	0.38
1155	462	0.41
1156	367	0.32
1157	390	0.34
1158	315	0.28
1159	279	0.25
1160	307	0.27
1161	266	0.23
1162	242	0.21
1163	208	0.18
1164	221	0.20
1165	199	0.18
1166	174	0.15
1167	156	0.14
1168	146	0.13
1169	144	0.13

1170	138	0.12
1171	137	0.12
1172	96	0.08
1173	113	0.10
1174	65	0.06
1175	79	0.07
1176	75	0.07
1177	91	0.08
1178	59	0.05
1179	84	0.07
1180	67	0.06
1181	66	0.06
1182	41	0.04
1183	13	0.01
1184	21	0.02
1185	36	0.03
1186	10	0.01
1187	11	0.01
1188	63	0.06
1189	44	0.04
1190	14	0.01
1191	4	0.00
1192	44	0.04
1193	31	0.03
1194	55	0.05
1195	24	0.02
1196	16	0.01
1197	1	0.00
1198	2	0.00
1199	8	0.01
1200	8	0.01
1202	4	0.00
1204	3	0.00
1205	40	0.04
1206	21	0.02
1208	2	0.00
1211	1	0.00
1250	181	0.16

Table 15.4. MME Spring 2014 Science Scale Score Frequencies for Total Group—All Forms Included

Scale Score	Frequency	Percent
950	3248	2.87
951	8	0.01
952	5	0.00
953	6	0.01
954	5	0.00
955	7	0.01
956	9	0.01
957	8	0.01
958	6	0.01
959	8	0.01
960	7	0.01
961	10	0.01
962	3	0.00
963	12	0.01
964	3	0.00
965	8	0.01
966	13	0.01
967	8	0.01
968	3	0.00
969	4	0.00
970	7	0.01
971	4	0.00
972	11	0.01
973	12	0.01
974	6	0.01
975	6	0.01
976	7	0.01
977	4	0.00
978	11	0.01
979	8	0.01
980	8	0.01
981	13	0.01
982	13	0.01
983	8	0.01
984	5	0.00
985	14	0.01
986	11	0.01
987	14	0.01
988	12	0.01
989	12	0.01
990	17	0.02
991	18	0.02
992	23	0.02
993	20	0.02
994	21	0.02
995	20	0.02
996	16	0.01
997	21	0.02
998	26	0.02
999	23	0.02
1000	12	0.01
1001	22	0.02
1002	22	0.02
1003	22	0.02
1004	33	0.03
1005	22	0.02
1006	27	0.02
1007	18	0.02
1008	28	0.02
1009	34	0.03
1010	31	0.03
1011	40	0.04
1012	28	0.02
1013	56	0.05
1014	37	0.03
1015	41	0.04
1016	36	0.03
1017	34	0.03
1018	45	0.04
1019	46	0.04
1020	51	0.05
1021	53	0.05
1022	51	0.05
1023	56	0.05
1024	56	0.05
1025	72	0.06
1026	75	0.07
1027	66	0.06
1028	76	0.07
1029	66	0.06
1030	70	0.06
1031	68	0.06
1032	87	0.08
1033	84	0.07
1034	103	0.09
1035	103	0.09
1036	88	0.08
1037	102	0.09

1038	105	0.09
1039	130	0.12
1040	140	0.12
1041	154	0.14
1042	130	0.12
1043	160	0.14
1044	157	0.14
1045	192	0.17
1046	182	0.16
1047	175	0.15
1048	206	0.18
1049	200	0.18
1050	233	0.21
1051	220	0.19
1052	255	0.23
1053	264	0.23
1054	271	0.24
1055	282	0.25
1056	285	0.25
1057	300	0.27
1058	314	0.28
1059	318	0.28
1060	358	0.32
1061	402	0.36
1062	372	0.33
1063	392	0.35
1064	416	0.37
1065	460	0.41
1066	453	0.40
1067	495	0.44
1068	513	0.45
1069	571	0.51
1070	607	0.54
1071	516	0.46
1072	604	0.53
1073	612	0.54
1074	623	0.55
1075	661	0.58
1076	696	0.62
1077	741	0.66
1078	700	0.62
1079	750	0.66
1080	807	0.71
1081	788	0.70
1082	828	0.73
1083	867	0.77
1084	876	0.78
1085	889	0.79

1086	910	0.81
1087	950	0.84
1088	1023	0.91
1089	1041	0.92
1090	1070	0.95
1091	1079	0.95
1092	1153	1.02
1093	1136	1.01
1094	1151	1.02
1095	1315	1.16
1096	1216	1.08
1097	1283	1.14
1098	1311	1.16
1099	1285	1.14
1100	1319	1.17
1101	1435	1.27
1102	1466	1.30
1103	1428	1.26
1104	1475	1.31
1105	1493	1.32
1106	1487	1.32
1107	1549	1.37
1108	1506	1.33
1109	1616	1.43
1110	1578	1.40
1111	1503	1.33
1112	1624	1.44
1113	1541	1.36
1114	1603	1.42
1115	1559	1.38
1116	1490	1.32
1117	1571	1.39
1118	1600	1.42
1119	1568	1.39
1120	1569	1.39
1121	1521	1.35
1122	1403	1.24
1123	1484	1.31
1124	1306	1.16
1125	1395	1.23
1126	1379	1.22
1127	1315	1.16
1128	1327	1.17
1129	1245	1.10
1130	1204	1.07
1131	1292	1.14
1132	1137	1.01
1133	1132	1.00

1134	1102	0.98
1135	1039	0.92
1136	1055	0.93
1137	1010	0.89
1138	1013	0.90
1139	956	0.85
1140	869	0.77
1141	910	0.81
1142	878	0.78
1143	803	0.71
1144	786	0.70
1145	752	0.67
1146	731	0.65
1147	664	0.59
1148	676	0.60
1149	600	0.53
1150	582	0.51
1151	559	0.49
1152	495	0.44
1153	487	0.43
1154	456	0.40
1155	402	0.36
1156	380	0.34
1157	361	0.32
1158	352	0.31
1159	338	0.30
1160	316	0.28
1161	251	0.22
1162	262	0.23
1163	226	0.20
1164	210	0.19
1165	177	0.16
1166	189	0.17
1167	144	0.13
1168	124	0.11
1169	142	0.13
1170	119	0.11
1171	96	0.08
1172	101	0.09
1173	88	0.08
1174	74	0.07
1175	92	0.08
1176	71	0.06
1177	50	0.04
1178	55	0.05
1179	40	0.04
1180	42	0.04
1181	50	0.04

1182	33	0.03
1183	28	0.02
1184	30	0.03
1185	38	0.03
1186	23	0.02
1187	25	0.02
1188	15	0.01
1189	24	0.02
1190	19	0.02
1191	18	0.02
1192	18	0.02
1193	4	0.00
1194	11	0.01
1195	13	0.01
1196	8	0.01
1197	14	0.01
1198	5	0.00
1199	7	0.01
1200	4	0.00
1201	7	0.01
1202	1	0.00
1203	3	0.00
1204	4	0.00
1205	9	0.01
1206	1	0.00
1207	2	0.00
1208	3	0.00
1210	5	0.00
1211	3	0.00
1212	1	0.00
1213	2	0.00
1214	1	0.00
1215	1	0.00
1217	1	0.00
1219	2	0.00
1220	1	0.00
1221	1	0.00
1223	1	0.00
1225	5	0.00
1226	1	0.00
1238	1	0.00
1240	1	0.00
1250	8	0.01

Table 15.5. MME Spring 2014 Social Studies Scale Score Frequencies for Total Group—All Forms Included

Scale Score	Frequency	Percent
964	1	0.00
998	1	0.00
1003	1	0.00
1018	1	0.00
1020	5	0.00
1034	14	0.01
1037	2	0.00
1038	8	0.01
1042	2	0.00
1044	62	0.05
1047	4	0.00
1049	4	0.00
1050	13	0.01
1051	3	0.00
1053	128	0.11
1055	7	0.01
1057	3	0.00
1058	34	0.03
1059	9	0.01
1060	286	0.25
1062	13	0.01
1064	9	0.01
1065	90	0.08
1066	597	0.53
1068	15	0.01
1070	26	0.02
1071	201	0.18
1072	966	0.85
1073	33	0.03
1075	7	0.01
1076	384	0.34
1077	1432	1.27
1078	44	0.04
1080	8	0.01
1081	590	0.52
1082	1948	1.72
1083	58	0.05
1085	750	0.66
1086	83	0.07
1087	2499	2.21
1088	57	0.05
1089	767	0.68
1090	196	0.17
1091	2991	2.65
1092	66	0.06
1093	862	0.76
1094	237	0.21
1095	3500	3.10
1096	93	0.08
1097	794	0.70
1098	223	0.20
1099	3856	3.41
1100	832	0.74
1102	214	0.19
1103	4945	4.37
1104	1	0.00
1105	206	0.18
1107	5172	4.58
1109	200	0.18
1110	525	0.46
1111	4847	4.29
1112	155	0.14
1113	412	0.36
1114	65	0.06
1115	4998	4.42
1116	446	0.39
1117	5	0.00
1118	5127	4.54
1119	470	0.42
1120	5	0.00
1121	58	0.05
1122	5395	4.77
1123	71	0.06
1124	1	0.00
1125	5482	4.85
1126	54	0.05
1127	7	0.01
1128	249	0.22
1129	5231	4.63
1130	57	0.05
1132	271	0.24
1133	5132	4.54
1135	158	0.14
1136	5113	4.52
1137	60	0.05
1138	151	0.13

1139	89	0.08
1140	4742	4.20
1142	155	0.14
1143	83	0.07
1144	4734	4.19
1145	103	0.09
1147	77	0.07
1148	4257	3.77
1149	116	0.10
1151	55	0.05
1152	3904	3.45
1153	83	0.07
1155	45	0.04
1156	54	0.05
1157	3555	3.15
1159	33	0.03
1160	21	0.02
1161	36	0.03
1162	2948	2.61
1164	24	0.02
1165	11	0.01
1166	25	0.02
1167	2388	2.11
1170	25	0.02
1171	46	0.04
1172	1901	1.68
1173	29	0.03
1176	16	0.01
1177	22	0.02
1178	1394	1.23
1180	24	0.02
1183	15	0.01
1184	5	0.00
1185	17	0.02
1186	884	0.78
1189	17	0.02
1192	8	0.01
1193	2	0.00
1194	10	0.01
1195	529	0.47
1201	6	0.01
1204	8	0.01
1205	2	0.00
1206	4	0.00
1207	288	0.25
1220	3	0.00
1224	2	0.00
1225	3	0.00

1227	109	0.10
1250	24	0.02

Table 15.6. MME Spring 2014 Writing Scale Score Frequencies for Total Group—All Forms Included

Scale Score	Frequency	Percent
950	2863	2.51
951	7	0.01
952	5	0.00
953	1	0.00
954	5	0.00
955	5	0.00
956	7	0.01
957	4	0.00
958	2	0.00
959	7	0.01
960	4	0.00
961	4	0.00
962	5	0.00
963	6	0.01
964	5	0.00
965	9	0.01
966	7	0.01
967	8	0.01
968	6	0.01
969	9	0.01
970	10	0.01
971	5	0.00
972	7	0.01
973	10	0.01
974	7	0.01
975	3	0.00
976	15	0.01
977	8	0.01
978	11	0.01
979	13	0.01
980	16	0.01
981	18	0.02
982	23	0.02
983	14	0.01
984	20	0.02
985	18	0.02
986	18	0.02
987	17	0.01
988	21	0.02
989	18	0.02
990	19	0.02
991	16	0.01
992	28	0.02
993	24	0.02
994	37	0.03
995	34	0.03
996	25	0.02
997	41	0.04
998	29	0.03
999	35	0.03
1000	35	0.03
1001	36	0.03
1002	31	0.03
1003	33	0.03
1004	23	0.02
1005	31	0.03
1006	48	0.04
1007	31	0.03
1008	37	0.03
1009	29	0.03
1010	47	0.04
1011	48	0.04
1012	48	0.04
1013	46	0.04
1014	58	0.05
1015	65	0.06
1016	44	0.04
1017	60	0.05
1018	45	0.04
1019	77	0.07
1020	75	0.07
1021	64	0.06
1022	75	0.07
1023	80	0.07
1024	100	0.09
1025	82	0.07
1026	97	0.09
1027	114	0.10
1028	100	0.09
1029	93	0.08
1030	110	0.10
1031	110	0.10
1032	131	0.12
1033	142	0.12
1034	147	0.13
1035	147	0.13
1036	139	0.12
1037	153	0.13

1038	147	0.13
1039	159	0.14
1040	190	0.17
1041	190	0.17
1042	195	0.17
1043	193	0.17
1044	206	0.18
1045	227	0.20
1046	227	0.20
1047	258	0.23
1048	248	0.22
1049	290	0.25
1050	293	0.26
1051	325	0.29
1052	303	0.27
1053	363	0.32
1054	339	0.30
1055	398	0.35
1056	423	0.37
1057	396	0.35
1058	432	0.38
1059	472	0.41
1060	500	0.44
1061	481	0.42
1062	574	0.50
1063	590	0.52
1064	616	0.54
1065	600	0.53
1066	664	0.58
1067	671	0.59
1068	730	0.64
1069	769	0.68
1070	808	0.71
1071	810	0.71
1072	864	0.76
1073	866	0.76
1074	893	0.78
1075	932	0.82
1076	1053	0.92
1077	1002	0.88
1078	1059	0.93
1079	1131	0.99
1080	1164	1.02
1081	1111	0.98
1082	1206	1.06
1083	1260	1.11
1084	1279	1.12
1085	1338	1.18

1086	1393	1.22
1087	1342	1.18
1088	1365	1.20
1089	1428	1.25
1090	1503	1.32
1091	1422	1.25
1092	1490	1.31
1093	1498	1.32
1094	1518	1.33
1095	1522	1.34
1096	1615	1.42
1097	1650	1.45
1098	1642	1.44
1099	1572	1.38
1100	1556	1.37
1101	1593	1.40
1102	1556	1.37
1103	1565	1.37
1104	1649	1.45
1105	1593	1.40
1106	1600	1.41
1107	1665	1.46
1108	1546	1.36
1109	1511	1.33
1110	1510	1.33
1111	1493	1.31
1112	1465	1.29
1113	1461	1.28
1114	1410	1.24
1115	1390	1.22
1116	1437	1.26
1117	1326	1.16
1118	1320	1.16
1119	1274	1.12
1120	1212	1.06
1121	1251	1.10
1122	1155	1.01
1123	1064	0.93
1124	1070	0.94
1125	1027	0.90
1126	979	0.86
1127	907	0.80
1128	899	0.79
1129	963	0.85
1130	882	0.77
1131	799	0.70
1132	767	0.67
1133	766	0.67

1134	730	0.64
1135	707	0.62
1136	699	0.61
1137	641	0.56
1138	616	0.54
1139	544	0.48
1140	543	0.48
1141	554	0.49
1142	526	0.46
1143	487	0.43
1144	443	0.39
1145	461	0.40
1146	381	0.33
1147	375	0.33
1148	368	0.32
1149	348	0.31
1150	337	0.30
1151	293	0.26
1152	275	0.24
1153	258	0.23
1154	260	0.23
1155	226	0.20
1156	185	0.16
1157	182	0.16
1158	202	0.18
1159	189	0.17
1160	143	0.13
1161	124	0.11
1162	181	0.16
1163	140	0.12
1164	161	0.14
1165	171	0.15
1166	75	0.07
1167	123	0.11
1168	47	0.04
1169	160	0.14
1170	25	0.02
1171	58	0.05
1172	72	0.06
1173	47	0.04

1174	23	0.02
1175	58	0.05
1176	22	0.02
1177	12	0.01
1178	437	0.38
1179	25	0.02
1180	9	0.01
1181	12	0.01
1182	20	0.02
1183	32	0.03
1184	7	0.01
1185	44	0.04
1186	6	0.01
1187	18	0.02
1188	17	0.01
1189	1	0.00
1190	1	0.00
1191	1	0.00
1192	8	0.01
1193	205	0.18
1194	12	0.01
1196	3	0.00
1197	15	0.01
1198	2	0.00
1200	1	0.00
1201	2	0.00
1203	2	0.00
1204	9	0.01
1207	4	0.00
1208	2	0.00
1211	1	0.00
1215	1	0.00
1217	222	0.19
1218	2	0.00
1222	1	0.00
1223	1	0.00
1227	2	0.00
1233	1	0.00
1250	48	0.04

Table 15.7. Mean and SD of Item Parameter Estimates for Mathematics

	2014 Spring Mathematics		
	a	b	c
	Initial Form 1		
mean	1.545	0.094	0.181
SD	0.515	0.821	0.079
	Initial Form 2		
mean	1.550	0.076	0.189
SD	0.524	0.824	0.088
	Initial Form 3		
mean	1.564	0.086	0.185
SD	0.509	0.821	0.082
	Initial Form 4		
mean	1.564	0.098	0.188
SD	0.521	0.824	0.089
	Initial Form 5		
mean	1.571	0.128	0.190
SD	0.518	0.821	0.088
	Initial Form 6		
mean	1.562	0.116	0.187
SD	0.512	0.825	0.085
	Makeup Form		
mean	1.554	0.201	0.178
SD	0.606	0.856	0.074
	Accommodated Form		
mean	1.609	0.181	0.175
SD	0.512	0.634	0.054

Table 15.8. Mean and SD of Item Parameter Estimates for Reading

	2014 Spring Reading		
	a	b	c
	Initial Form		
mean	0.906	-0.090	0.199
SD	0.378	1.556	0.075
	Makeup Form		
mean	1.031	0.114	0.178
SD	0.386	1.350	0.055
	Accommodated Form		
mean	0.950	0.161	0.211
SD	0.348	1.393	0.056

Table 15.9. Mean and SD of Item Parameter Estimates for Science

	2014 Spring Science		
	a	b	c
	Initial Form 1		
mean	0.879	1.023	0.227
SD	0.304	0.930	0.073
	Initial Form 2		
mean	0.910	1.044	0.230
SD	0.315	0.952	0.087
	Initial Form 3		
mean	0.893	1.054	0.220
SD	0.313	1.044	0.076
	Initial Form 4		
mean	0.891	1.016	0.222
SD	0.308	1.005	0.088
	Initial Form 5		
mean	0.872	0.929	0.222
SD	0.305	0.987	0.072
	Initial Form 6		
mean	0.909	1.063	0.233
SD	0.298	0.892	0.083
	Makeup Form		
mean	0.878	0.826	0.217
SD	0.264	0.962	0.074
	Accommodated Form		
mean	0.889	0.813	0.215
SD	0.357	0.861	0.086

Table 15.10. Mean and SD of Item Parameter Estimates for Writing

	2014 Spring Writing MC Items		
	a	b	c
	Initial Form		
mean	0.989	0.315	0.202
SD	0.303	0.732	0.073
	Makeup Form		
mean	1.002	0.314	0.199
SD	0.344	0.904	0.078
	Accommodated Form		
mean	0.942	0.411	0.204
SD	0.305	0.707	0.076

	2014 Spring Writing CR Items						
	a	b	Step1	Step2	Step3	Step4	Step5
	Initial Form						
mean	0.494	0.927	3.292	2.772	1.065	-2.311	-4.819
SD	0.001	0.009	0.014	0.016	0.012	0.017	0.003
	Makeup Form						
mean	0.495	0.554	3.236	2.311	0.386	-1.936	-3.996
SD	0.006	0.006	0.010	0.037	0.004	0.002	0.053
	Accommodated Form						
mean	0.319	1.587	3.861	2.983	1.117	-3.037	-4.924
SD	0.000	0.067	0.103	0.080	0.012	0.243	0.439

Table 15.11. Mean and SD of Item Parameter Estimates for Social Studies

	2014 Spring Social Studies
	b
	Initial Form
mean	0.217
SD	1.269
	Makeup Form
mean	0.272
SD	1.013
	Accommodated Form
mean	0.318
SD	0.666

Chapter 16: MME Scale Score History

The first MME assessment was administered statewide in spring 2007. For each content area, Tables 16.1 to 16.8 present the average scores and the percentages of students in each of the four performance levels. The summation of some percentages do not equal to 100 due to rounding errors. For the 2007 through 2011 MME administrations, the original MME proficiency level cut scores by subjects are reported in Table 13.1. For 2012 and the years after, the revised MME proficiency level cut scores by subjects are employed and presented in Table 13.2. Yearly samples from a state may vary, and changes to a testing program (such as the inclusion of a new measurement instrument like *Locating Information* in 2009) contribute to annual scale score means. Therefore, changes in means across years need to be considered in context. DAS encourages those interested in using MME scale scores to reference the informational materials contained in this technical report, as well as information posted on the MME website (www.michigan.gov/mme). Additionally, the Guide to Reports should be used when using or referencing assessment data (see http://www.michigan.gov/documents/mde/2014_MME_Guide_to_Reports_Final_459354_7.pdf.

Please note that the analyses in Tables 16.1 through 16.8 included all (both public and nonpublic) students who met the attemptedness criterion and obtained a valid scale score on the relevant subject of MME Spring administrations. It is also worth mentioning that beginning from Spring 2010 administration, total ELA was not reported and only separate MME Reading and MME Writing scale scores were reported, thus leaving five subjects in the "Content Area" column in the tables below for 2010 and the years after as compared with six subjects for the previous years.

Table 16.1. Spring 2007 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels			
Content Area	**N**	**Average**	**Apprentice**	**Basic**	**Met Standards**	**Exceeded Standards**
Reading	113,956	1104	17%	24%	58%	2%
Writing	111,479	1090	10%	50%	38%	2%
ELA	111,000	1098	12%	37%	49%	2%
Mathematics	113,839	1093	38%	16%	37%	10%
Science	113,630	1098	28%	16%	50%	6%
Social Studies	113,718	1124	7%	9%	42%	41%

Table 16.2. Spring 2008 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	130,226	1106	17%	21%	60%	3%
Writing	129,400	1090	11%	48%	39%	3%
ELA	128,818	1099	13%	34%	50%	2%
Mathematics	129,803	1093	38%	16%	36%	10%
Science	129,691	1099	27%	16%	51%	6%
Social Studies	130,957	1123	7%	13%	39%	41%

Table 16.3. Spring 2009 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	124,385	1106	16%	23%	58%	3%
Writing	125,579	1091	10%	45%	40%	4%
ELA	124,099	1099	12%	35%	50%	3%
Mathematics	123,284	1095	35%	15%	37%	13%
Science	123,873	1099	29%	15%	48%	8%
Social Studies	123,969	1127	8%	11%	39%	43%

Table 16.4. Spring 2010 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	120,488	1108	14%	21%	62%	3%
Writing	121,181	1093	8%	47%	41%	4%
Mathematics	119,672	1094	33%	16%	39%	12%
Science	120,084	1101	27%	15%	49%	9%
Social Studies	120,233	1123	7%	14%	42%	38%

Table 16.5. Spring 2011 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	112,918	1108	14%	22%	61%	3%
Writing	113,615	1095	8%	44%	43%	5%
Mathematics	112,250	1095	32%	15%	40%	13%
Science	112,618	1104	24%	15%	52%	9%
Social Studies	112,714	1123	8%	14%	36%	42%

Table 16.6. Spring 2012 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels Based on New Cut Scores in Table 13.2			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	114,635	1108	16%	28%	42%	14%
Writing	115,405	1095	8%	43%	44%	5%
Mathematics	113,637	1098	35%	36%	23%	6%
Science	114,075	1103	47%	27%	17%	9%
Social Studies	114,100	1123	20%	39%	29%	11%

Table 16.7. Spring 2013 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels Based on New Cut Scores in Table 13.2			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	114,002	1107	17%	30%	39%	14%
Writing	114,564	1095	8%	43%	43%	6%
Mathematics	113,232	1096	34%	38%	23%	6%
Science	113,694	1103	46%	28%	17%	9%
Social Studies	113,677	1124	13%	49%	28%	10%

Table 16.8. Spring 2014 Michigan State Average Scores and Percentages in each Performance Level

			Percentages within Performance Levels Based on New Cut Scores in Table 13.2			
Content Area	**N**	**Average**	**Not Proficient**	**Partially Proficient**	**Proficient**	**Advanced**
Reading	113,264	1110	15%	26%	44%	14%
Writing	113,872	1096	8%	42%	44%	6%
Mathematics	112,585	1098	36%	36%	22%	7%
Science	113,023	1103	45%	27%	17%	11%
Social Studies	113,029	1123	17%	40%	34%	10%

References

ACT. (2009a). *ACT National Curriculum Survey 2009*. Iowa City, IA: Author.

ACT. (2009b). *ACT Writing Test Technical Report*. Iowa City, IA: Author.

ACT. (2007b). *The ACT technical manual*. Iowa City, IA: Author.

ACT. (2008a). *WorkKeys Applied Mathematics technical manual*. Iowa City, IA: Author.

ACT. (2008b). *WorkKeys Locating Information technical manual*. Iowa City, IA: Author.

ACT. (2008c). *WorkKeys Reading for Information technical manual*. Iowa City, IA: Author.

ACT (2010). *2009–2010 Fairness Report for the ACT Tests*. Iowa City, IA: Author

American Educational Research Association (AERA), American Psychological Association (APA), National Council on Measurement in Education (NCME), & Joint Committee on Standards for Educational and Psychological Testing (U.S.). (1999). *Standards for educational and psychological testing*. Washington, DC: American Educational Research Association.

Anastasi, A. (1982). *Psychological testing (5th ed.)*. New York: Macmillan.

Assessment and Examination Service. (2006). *Standard Setting Plan.*

Assessment and Examination Service. (2006). *Standard Setting Report*.

Crocker, L. & Algina, J. (1986). *Introduction to classical and modern test theory*. Holt, Rinehart and Winston, Inc.

de Ayala, R. J. (2009). *The theory and practice of item response theory*. NY: Guilford Press.

Dorans, N. J., & Schmitt, A. P. (1991). Constructed response and differential item functioning: A pragmatic approach (Research Rep. No. 91-47). Princeton, NJ: Educational Testing Service.

Dossey, J. A. (2005). *Comparison of the ACT and WorkKeys assessments with the Mathematics and Science Content Expectations in the Michigan Curriculum Framework.*

Drasgow, F., Levine, M. V., & Williams, E. A. (1985). Appropriateness measurement with polytomous item response models and standardized indices. *British Journal of Mathematical and Statistical Psychology*, 38, 67–68.

Hambleton, R. K., Merenda, P. F., & Spielberger, C. D. (2005). Adapting educational and psychological tests for cross-cultural assessments. Mahwah, NJ: Lawrence Erlbaum Associates, Inc.

Hambleton, R. K., & Swaminathan, H. (1985). *Item response theory: Principles and Applications*. Boston: Kluwer.

Holland, P. W., & Wainer, H. (1993). *Differential item functioning*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Joint Committee on Testing Practices. (2004). *Code of fair testing practices in education*. Washington, DC: Author.

Kolen, M. J. (1984). Effectiveness of analytic smoothing in equipercentile equating. *Journal of Educational Statistics*, 9, 25–44.

Kolen, M. J., & Brennan, R. L. (2004). *Test equating, scaling, and linking: Methods and practices*, New York: Springer.

Lee, W. C., Hanson, B. A., & Brennan, R. L. (2002). Estimating consistency and accuracy indices for multiple classifications. *Applied Psychological Measurement, 26*(4), 412–432.

Li, M. F., & Olejnik, S. (1997). The power of Rasch person-fit statistics in detecting unusual response patterns. *Applied Psychological Measurement*, 21, 215–231.

Martineau, J. A. (2007). An extension and practical evaluation of expected classification accuracy. *Applied Psychological Measurement 31*(3), 181–194.

Michigan Department of Education. (2006). *Michigan Department of Education Memorandum*.

Michigan Department of Education. (2006). *Minutes of the State Board of Education*.

Michigan Department of Education Web Site. (2007). http://www.michigan.gov/mde/.

Millman, J., & Greene, U. (1989). *The specification and development of tests of achievement and ability*. In R.L. Linn (Ed.) Educational Measurement (3rd edition, pp. 335–-366). New York: American Council on Education and Macmillan.

Muraki, E. (1992). A generalized partial credit model: Application of an EM algorithm. *Applied Psychological Measurement*, *16*, 159–176.

Muraki, E. (1996). A generalized partial credit model. In Van der Linden, W.J. & Hambleton, R.K. (Eds). *Handbook of modern item response theory* (pp. 153–168). New York: Springer.

Muraki, E. , & Bock, R. D. (1997). PARSCALE: IRT item analysis and test scoring for rating-scale data. Chicago, IL: Scientific Software International.

Nering, M. L., & Meijer, M. D. (1998). A comparison of the person response function and the lz person fit statistic. *Applied Psychological Measurement*, 22, 53–69.

Office of Educational Assessment and Accountability, Michigan Department of Education. (2009). Assessment integrity guide—Michigan standards for professional and ethical conduct in assessment administration and reporting. Retrieved October 13, 2010, from http://www.michigan.gov/documents/mde/Assessment_Integrity_Guide_291950_7.pdf

Orlando, M. & Thissen, D. (2000). Likelihood-based item fit indices for dichotomous item response theory models. *Applied Psychological Measurement*, *24*(1), 50–64.

Shanahan, T. (2005). *Review of ACT Coverage of Michigan Language Arts Standards*.

Spray, J. A.(1989). *Performance of Three Conditional DIF Statistics in Detecting Differential Item Functioning on Simulated Tests*. ACT Research Report No. 89–7, Iowa City, IA.

Stocking, M. L. & Lord, F. M. (1983). Developing a common metric in item response theory. *Applied Psychological Measurement*, *7*, 201–210.

Webb, N. L. (2005). *Alignment Analysis of Language Arts Standards and Assessment: Michigan Grades 9–12*.

Webb, N. L. (2005). *Alignment Analysis of Mathematics Standards and Assessments: Michigan High School*.

Webb, N. L. (2006). *Alignment Analysis of Mathematics Standards and Michigan Merit Examination*.

Webb, N. L. (2006). *Alignment Analysis of Reading and Language Arts Standards and Michigan Merit Examination*.

Webb, N. L. (2006). *Alignment Analysis of Science Standards and Michigan Merit Examination*.

Webb, N. L.(2011). *Alignment Analysis of Mathematics Standards and Two Forms of ACT, WorkKeys, and Augmented Assessments (Forms M1 and M2)*. An Independent Review Report Prepared for the Office of Educational Assessment and Accountability, Michigan Department of Education. Lansing, MI.

Webb, N. L. (2011). *Alignment Analysis of English Language Arts Standards and Two Forms of ACT/WorkKeys Reading Assessment and Two Forms of ACT English Assessment*. An Independent Review Report Prepared for the Office of Educational Assessment and Accountability, Michigan Department of Education. Lansing, MI.

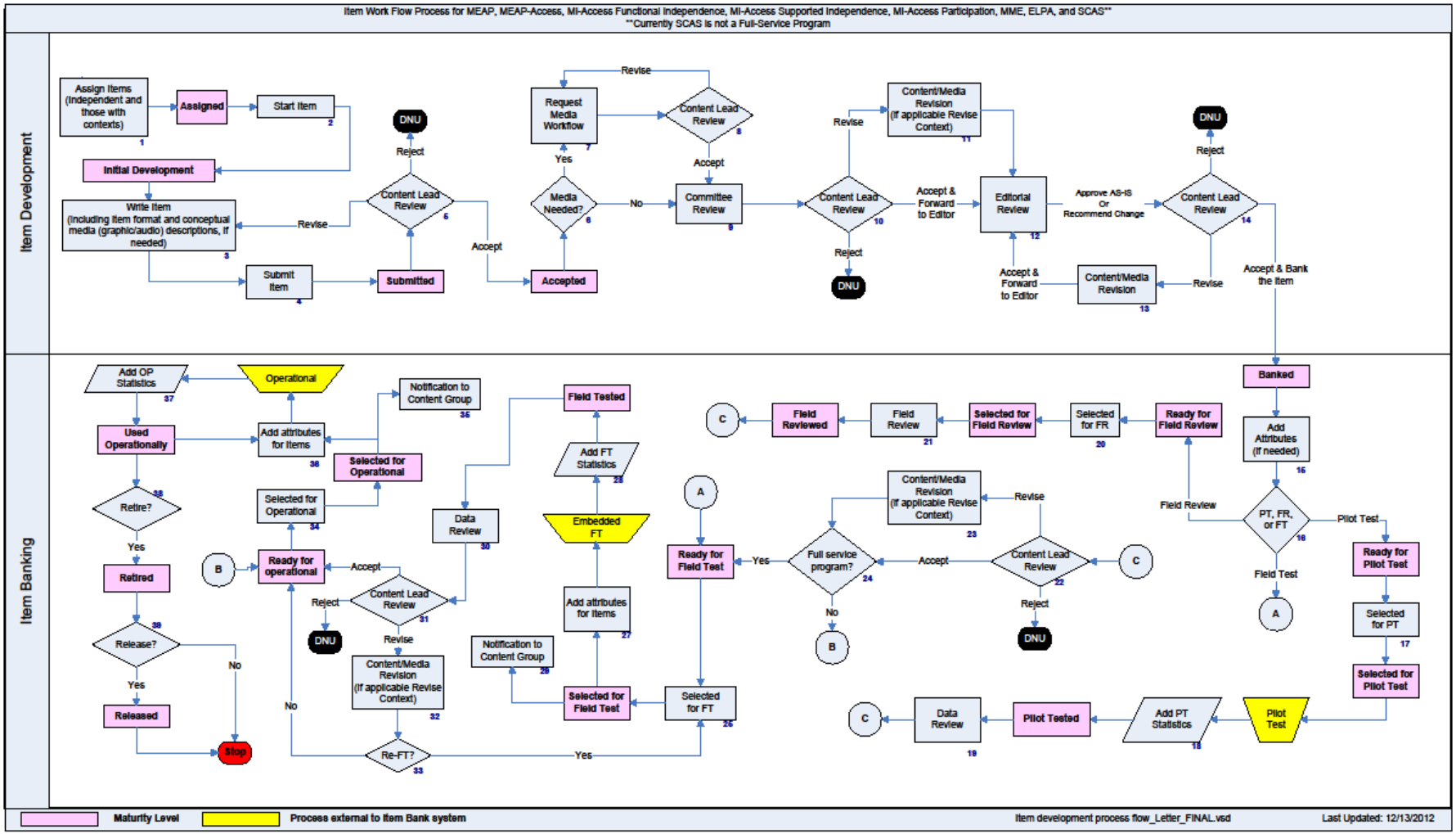
Webb, N. L. (2011). *Alignment Analysis of Science Standards and Two Assessment Forms of ACT and Michigan Items*. An Independent Review Report Prepared for the Office of Educational Assessment and Accountability, Michigan Department of Education. Lansing, MI.

White, E. M. (1994). *Teaching and assessing writing: Recent advances in understanding, evaluating, and improving student performance* (2nd ed.). Portland, Maine: Calendar Islands.

Yen, W. M. & Fitzpatrick, A. R. (2006). Item Response Theory. In R. L. Brennan (Ed.) *Educational Measurement* (4th edition, pp. 111–153). Westport, CT: Praeger.

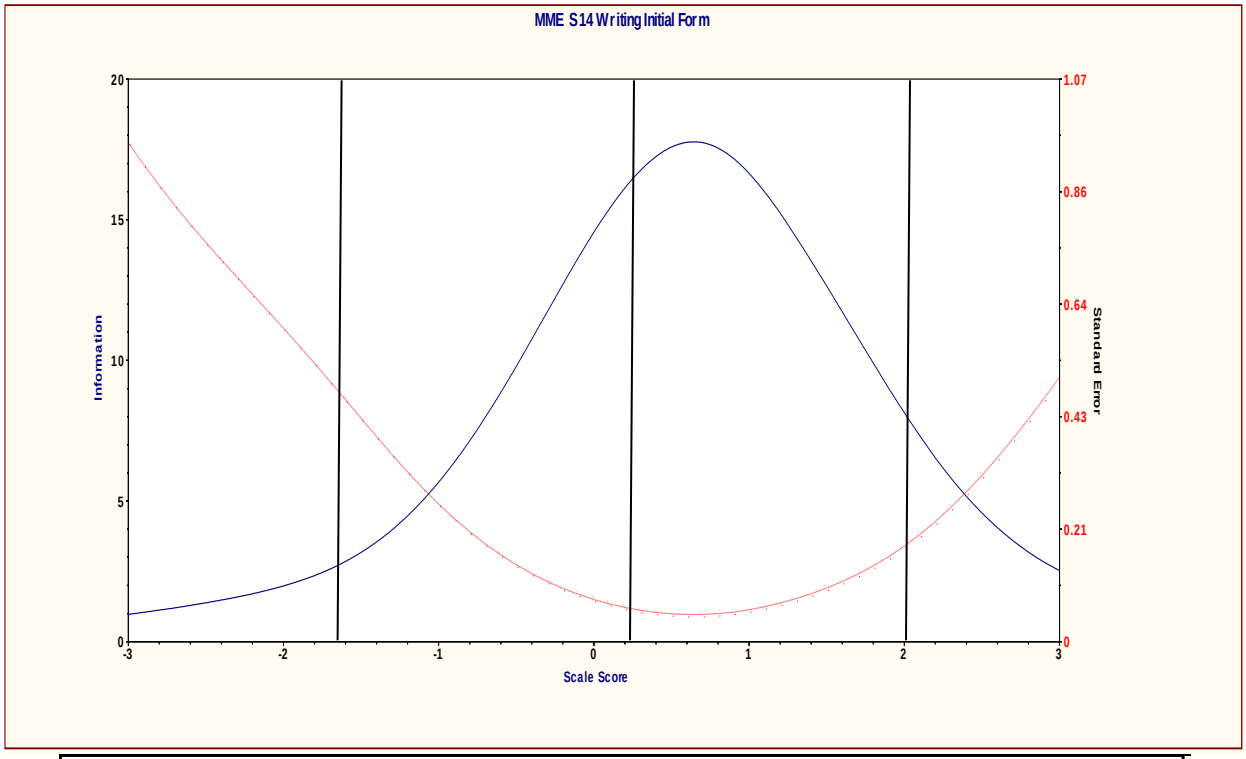
Appendices

Appendix A: Diagram of DAS Item Banking Process



Appendix B: Plots of MME Test Information Functions

Spring 2014 Writing Initial Form

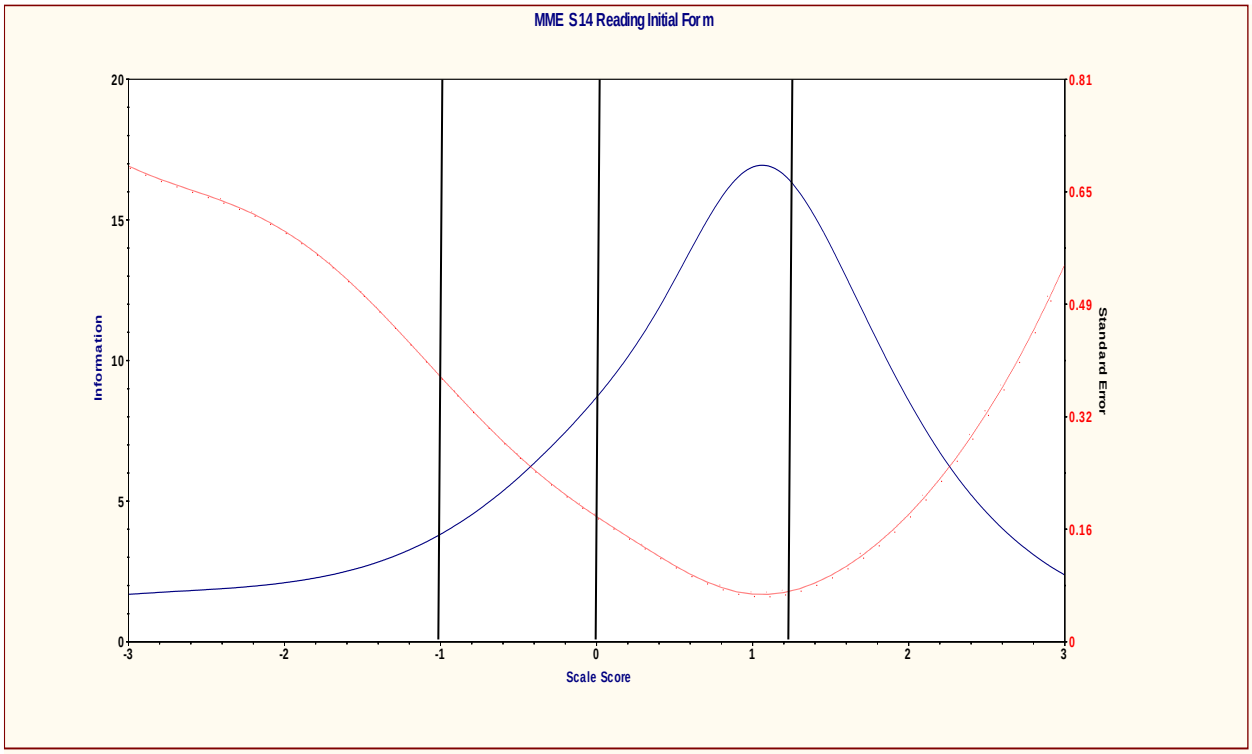


Test information curve: solid line **Standard error curve: dotted line**

The total test information for a specific scale score is read from the left vertical axis.

The standard error for a specific scale score is read from the right vertical axis.

Spring 2014 Reading Initial Form

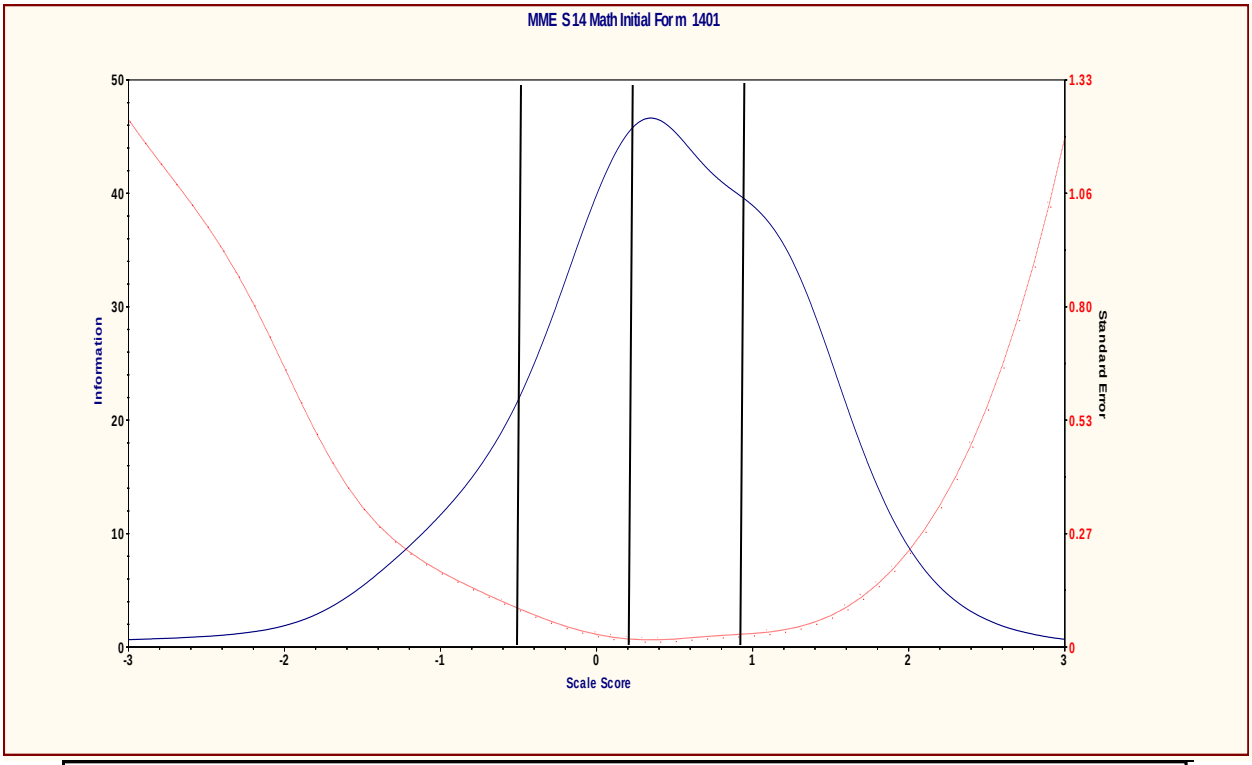


Test information curve: solid line **Standard error curve: dotted line**

The total test information for a specific scale score is read from the left vertical axis.

The standard error for a specific scale score is read from the right vertical axis.

Spring 2014 Mathematics Initial Form 1401

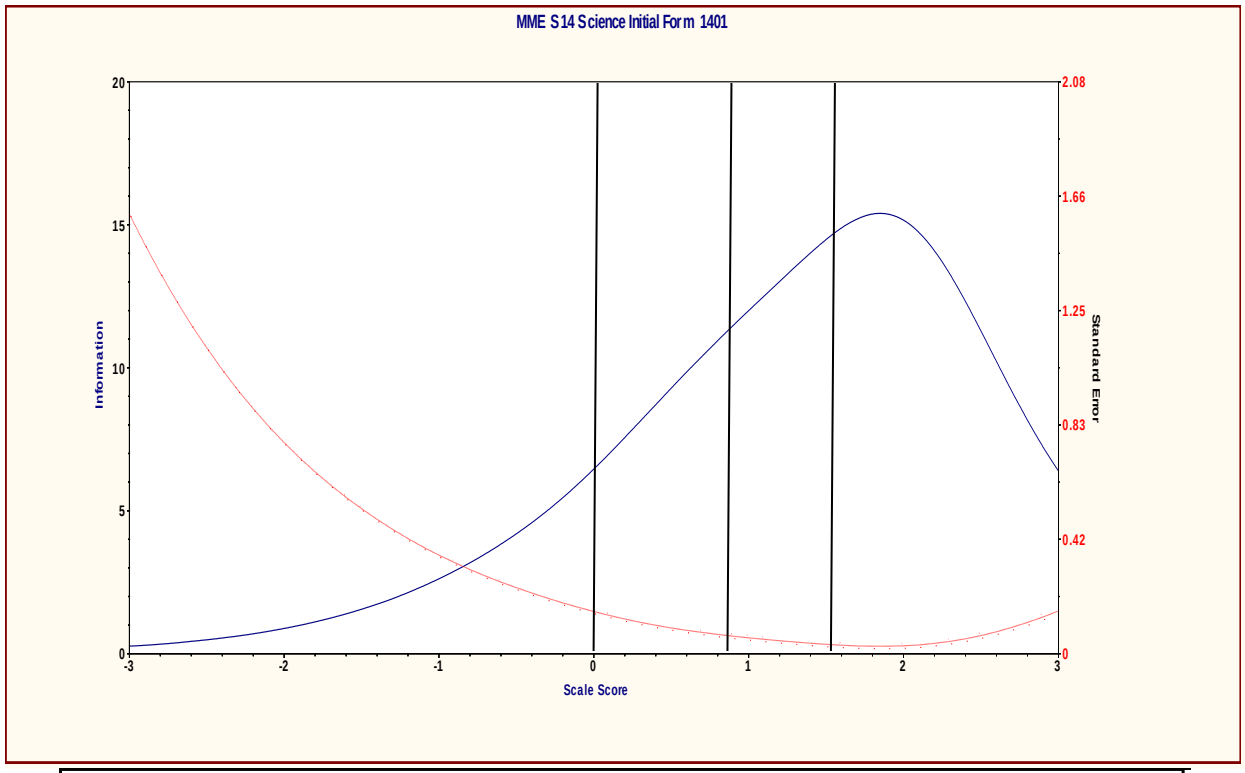


Test information curve: solid line **Standard error curve: dotted line**

The total test information for a specific scale score is read from the left vertical axis.

The standard error for a specific scale score is read from the right vertical axis.

Spring 2014 Science Initial Form 1401

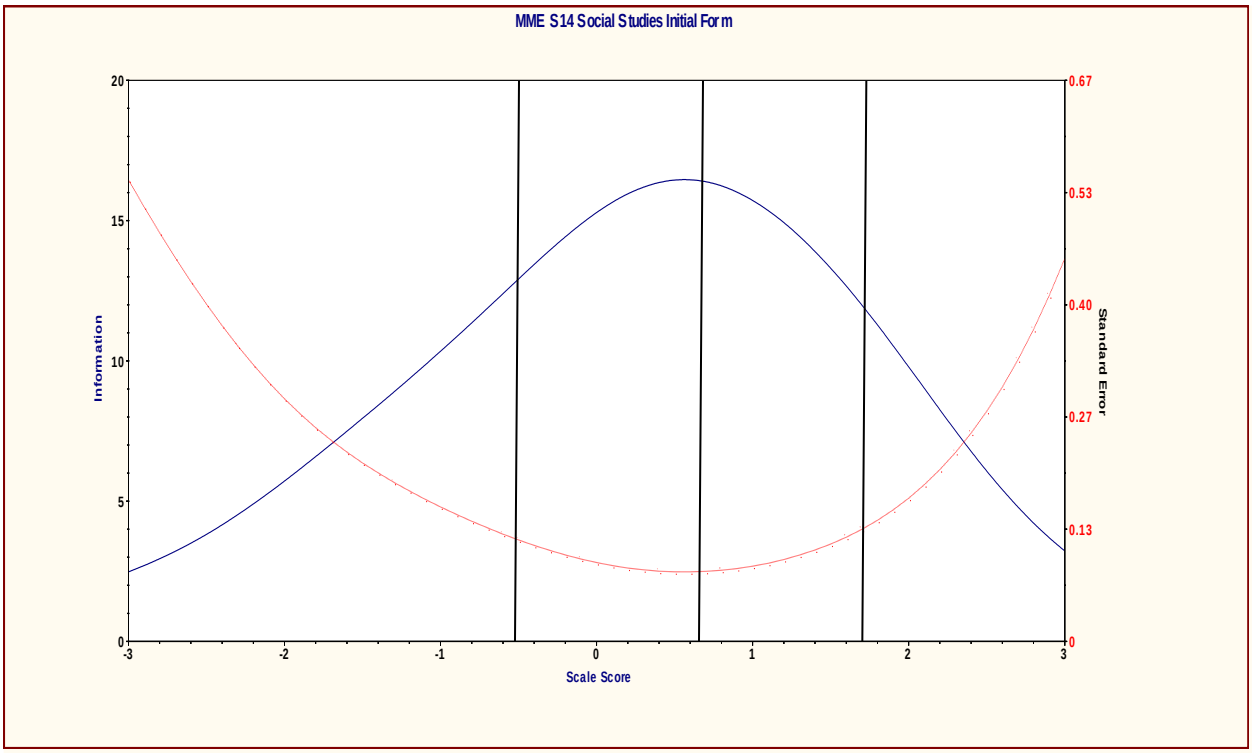


Test information curve: solid line **Standard error curve: dotted line**

The total test information for a specific scale score is read from the left vertical axis.

The standard error for a specific scale score is read from the right vertical axis.

Spring 2014 Social Studies Initial Form



Test information curve: solid line **Standard error curve: dotted line**

The total test information for a specific scale score is read from the left vertical axis.

The standard error for a specific scale score is read from the right vertical axis.

Appendix C: Data Created for Field Test Items

Field Description	Sample Values	Source	Mandatory (item bank use)	Ignore When pulling from Vendor data (Y/N)? (Item Bank use)	In MME Data	Note
Unique IBS defined ID for the Statistic row			Y	Y		
Unique IBS defined ID for the Item			Y	Y		
Unique IBS defined ID for the program			Y	Y		
Unique IBS defined ID for the Cycle			Y	Y		
BAA provided Cycle ID from Master Data	TestcycleID	Test map	Y		Y	
Unique IBS defined ID for the ContentArea			Y	Y		
Unique IBS defined ID for the Grade			Y	Y		
Unique IBS defined ID for the Administration Type			Y	Y		
Unique IBS defined ID for the blueprint			Y	Y		
Name of the administration cycle	Possible values: Fall 2010, Fall 2011, Spring 2012		Y	Y		
Administration Year	Possible values: 2010, 2011, 2012		Y	Y		
Indicator used in the Statistics upload into BAA and then into IBS tables	Possible values: Test map created, Data uploaded from vendor, Data Pulled by IBS		Y	Y		
MEAP Item ID (13 characters)		Test map	Y		Y	

Legacy CID/MEAP ID (both 7 and 12 digits used) from vendor system	CID/Itemcode	Test map	Y		Y	
Program Shortname/Long name in the IBS	MME		Y	Y	Y	
Subject (RE, WR, LI, MA, SC, SS)	**For MME: MA, SC, SS**. Possible values: Mathematics, Reading, Writing, Science, Social Studies, Content Area, English Language Arts, Science Listening, Speaking, Algebra I, Algebra II, Probability & Statistics, Pre-Calculus, English 9, English 10, English 11, English 12,Biology, Chemistry, Physics, Earth Science, US History + Geography, World History + Geography, Civics, Economics				Y	
Grade-Level of GLCE		Test map			Y	
Grade level the item will be tested in	11	Test map	Y	Y	Y	
Order for item processing	ACT variable that contains the item processing order within each subject				Y	
Name of the Blueprint			Y	Y		
Name of the Administration Type	Possible values: Standard (Initial), Emergency, Accommodated, Braille, Makeup			Y	Y	

Item Type (MC, CR, SR, AB)	for MME Day 3: MC only		Y	Y	Y	
Scenario Title/Passage type		Test map			Y	
Section of the test		Test map			Y	
Item Answer Key	Mandatory when item is MC, Possible values: A, B, C, D	Test map	Y	Y	Y	
Item Maximal Score points						
Unique IBS defined ID for the Primary Content standard of the item			Y	Y		
Primary Content Standard of the Item	Possible values: D.RE.02.01		Y	Y		
Level 1 of the Content Standard	Possible values: D		Y	Y		
Level 2 of the Content Standard	Possible values: D.RE		Y	Y		
Level 3 of the Content Standard	Possible values: D.RE.02.01		Y	Y		
If applicable						
Depth of Knowledge, EDOK, LDL			Y	Y		
Item reported standard		Test map			Y	
item reported domain		Test map			Y	
item reported benchmark		Test map			Y	
High School Content Expectation		Test map			Y	
Calculator (Y) or None		Test map			Y	

	OP, FT for MME. Possible values: Assigned,Initial Development, Submitted, Accepted, Banked, Ready for Pilot Test, Selected for Pilot Test, Pilot Tested, Ready for Field Review, Selected for Field Review, Field Reviewed, Ready for Field Test, Selected for Field Test, Field Tested, Selected for Operational, Ready for Operational, Used Operationally, Retired, Released, Do Not Use	Test map	Y	Y	Y	
Item Function in Current Administration	Possible Values: Equating, Common, Field Test and Matrix		Y	Y	Y	
Form the item appears on	For matrix items the first form	Test map	Y	Y	Y	
Number of Forms item appeared	Possible Values: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10	Test map	Y	Y	Y	
Forms in which the item appeared	Possible Values: 1101, 1102, 1110	Test map	Y	Y	Y	
Item position on the test form	for matrix items the first form	Test map			Y	
Test Positions in the forms used	Possible Values: 21, 23, 29, 36, 27	Test map	Y	Y	Y	
anchor item (0=No, 1=Yes); 1 Means "Use for pre-equating"	0, 1	Test map			Y	
	0.1	Test map			Y	
	Mandatory when item is CR, SR or AB		Y	Y		

	Mandatory when item is CR, SR or AB		Y	Y		
N-count		Total number of calibration students	Y	Y	Y	
Ncount Males		N-counts for bread-down groups	Y	Y	Y	
Ncount Females		N-counts for bread-down groups	Y	Y	Y	
Ncount White		N-counts for bread-down groups	Y	Y	Y	
Ncount Black		N-counts for bread-down groups	Y	Y	Y	
Ncount Hispanic		N-counts for bread-down groups	Y	Y		
Ncount Asian/Pacific Island		N-counts for bread-down groups	Y	Y		
Ncount Accommodated		N-counts for bread-down groups	Y	Y	Y	in a separate file
Ncount Non-accommodated		N-counts for bread-down groups	Y	Y		
Ncount Economically Disadvantaged		N-counts for bread-down groups	Y	Y		
Ncount Non-Economically		N-counts	Y	Y		

Disadvantaged		for bread-down groups				
Ncount English Language Learner		N-counts for bread-down groups	Y	Y		
Ncount Non-English Language Learner		N-counts for bread-down groups	Y	Y		
Ncount Disabled Learner						
Ncount NonDisabled Learner						
Percent for Comment Code 0			Y			
Percent for Comment Code 1			Y			
Percent for Comment Code 2			Y			
Percent for Comment Code 3			Y			
Percent for Comment Code 4			Y			
Percent for Comment Code 5			Y			
Percent for Comment Code 6			Y			
Percent for Comment Code 7			Y			
Percent for Comment Code 8			Y			
Percent for Comment Code 9			Y			
Percent for Comment Code 10 (not used yet)			Y			
Percent for Comment Code 11 (not used yet)			Y			
Percent for Comment Code 12 (not used yet)			Y			
Percent for Condition Code A						

Percent for Condition Code B						
Percent for Condition Code C						
Percent for Condition Code D						
Percent for Condition Code E						
Percent for Condition Code F (not used yet)						
Percent for Condition Code G (not used yet)						
Percent for Condition Code H (not used yet)						
Percent for Condition Code I (not used yet)						
Percent for Condition Code J (not used yet)						
Percent for Condition Code K (not used yet)						
Percent for Condition Code L (not used yet)						
Percent (option A)			Y		Y	
Percent (option B)			Y		Y	
Percent (option C)			Y		Y	
Percent (option D)			Y		Y	
Percent (option E)			Y			
Percent (mult. marks)			Y		Y	
Percent (Omits)			Y		Y	
Percent with (scorepoint 0)			Y			
Percent with (scorepoint 1)			Y			
Percent with (scorepoint 2)			Y			
Percent with (scorepoint 3)			Y			
Percent with (scorepoint 4)			Y			
Percent with (scorepoint 5)			Y			

Percent with (scorepoint 6)			Y			
Percent with (scorepoint 7)			Y			
Percent with (scorepoint 8)			Y			
Percent with (scorepoint 9)			Y			
Percent with (scorepoint 10)			Y			
Percent with (scorepoint 11)			Y			
Percent with (scorepoint 12)			Y			
Male Percent (A)			Y		Y	
Male Percent (B)			Y		Y	
Male Percent (C)			Y		Y	
Male Percent (D)			Y		Y	
Male Percent (E)			Y			
Male Percent (mult. marks)			Y		Y	
Male Percent (Omits)			Y		Y	
Male Percent (scorepoint 0)			Y			
Male Percent (scorepoint 1)			Y			
Male Percent (scorepoint 2)			Y			
Male Percent (scorepoint 3)			Y			
Male Percent (scorepoint 4)			Y			
Male Percent (scorepoint 5)			Y			
Male Percent (scorepoint 6)			Y			
Male Percent (scorepoint 7)			Y			
Male Percent (scorepoint 8)			Y			

Male Percent (scorepoint 9)			Y			
Male Percent (scorepoint 10)			Y			
Male Percent (scorepoint 11)			Y			
Male Percent (scorepoint 12)			Y			
Female Percent (A)			Y		Y	
Female Percent (B)			Y		Y	
Female Percent (C)			Y		Y	
Female Percent (D)			Y		Y	
Female Percent (E)			Y			
Female Percent (mult. marks)			Y		Y	
Female Percent (Omits)			Y		Y	
Female Percent (scorepoint 0)			Y			
Female Percent (scorepoint 1)			Y			
Female Percent (scorepoint 2)			Y			
Female Percent (scorepoint 3)			Y			
Female Percent (scorepoint 4)			Y			
Female Percent (scorepoint 5)			Y			
Female Percent (scorepoint 6)			Y			
Female Percent (scorepoint 7)			Y			
Female Percent (scorepoint 8)			Y			
Female Percent (scorepoint 9)			Y			
Female Percent (scorepoint 10)			Y			
Female Percent (scorepoint 11)			Y			

Female Percent (scorepoint 12)			Y			
White Percent (A)			Y		Y	
White Percent (B)			Y		Y	
White Percent (C)			Y		Y	
White Percent (D)			Y		Y	
White Percent (E)			Y			
White Percent (mult. marks)			Y		Y	
White Percent (Omits)			Y		Y	
White Percent (scorepoint 0)			Y			
White Percent (scorepoint 1)			Y			
White Percent (scorepoint 2)			Y			
White Percent (scorepoint 3)			Y			
White Percent (scorepoint 4)			Y			
White Percent (scorepoint 5)			Y			
White Percent (scorepoint 6)			Y			
White Percent (scorepoint 7)			Y			
White Percent (scorepoint 8)			Y			
White Percent (scorepoint 9)			Y			
White Percent (scorepoint 10)			Y			
White Percent (scorepoint 11)			Y			
White Percent (scorepoint 12)			Y			
Black Percent (A)			Y		Y	
Black Percent (B)			Y		Y	
Black Percent (C)			Y		Y	
Black Percent (D)			Y		Y	
Black Percent (E)			Y			

Black Percent (mult. marks)			Y		Y	
Black Percent (Omits)			Y		Y	
Black Percent (scorepoint 0)			Y			
Black Percent (scorepoint 1)			Y			
Black Percent (scorepoint 2)			Y			
Black Percent (scorepoint 3)			Y			
Black Percent (scorepoint 4)			Y			
Black Percent (scorepoint 5)			Y			
Black Percent (scorepoint 6)			Y			
Black Percent (scorepoint 7)			Y			
Black Percent (scorepoint 8)			Y			
Black Percent (scorepoint 9)			Y			
Black Percent (scorepoint 10)			Y			
Black Percent (scorepoint 11)			Y			
Black Percent (scorepoint 12)			Y			
Hispanic Percent (A)						
Hispanic Percent (B)						
Hispanic Percent (C)						
Hispanic Percent (D)						
Hispanic Percent (E)						
Hispanic Percent (mult. marks)						
Hispanic Percent (Omits)						
Hispanic Percent (scorepoint 0)						
Hispanic Percent (scorepoint 1)						

Hispanic Percent (scorepoint 2)						
Hispanic Percent (scorepoint 3)						
Hispanic Percent (scorepoint 4)						
Hispanic Percent (scorepoint 5)						
Hispanic Percent (scorepoint 6)						
Hispanic Percent (scorepoint 7)						
Hispanic Percent (scorepoint 8)						
Hispanic Percent (scorepoint 9)						
Hispanic Percent (scorepoint 10)						
Hispanic Percent (scorepoint 11)						
Hispanic Percent (scorepoint 12)						
Asian/Pacific Islander Percent (A)						
Asian/Pacific Islander Percent (B)						
Asian/Pacific Islander Percent (C)						
Asian/Pacific Islander Percent (D)						
Asian/Pacific Islander Percent (E)						
Asian/Pacific Islander Percent (mult. marks)						
Asian/Pacific Islander Percent (Omits)						
Asian/Pacific Islander Percent (scorepoint 0)						
Asian/Pacific Islander Percent (scorepoint 1)						

Asian/Pacific Islander Percent (scorepoint 2)						
Asian/Pacific Islander Percent (scorepoint 3)						
Asian/Pacific Islander Percent (scorepoint 4)						
Asian/Pacific Islander Percent (scorepoint 5)						
Asian/Pacific Islander Percent (scorepoint 6)						
Asian/Pacific Islander Percent (scorepoint 7)						
Asian/Pacific Islander Percent (scorepoint 8)						
Asian/Pacific Islander Percent (scorepoint 9)						
Asian/Pacific Islander Percent (scorepoint 10)						
Asian/Pacific Islander Percent (scorepoint 11)						
Asian/Pacific Islander Percent (scorepoint 12)						
Accommodated Percent (A)			Y		Y	In a separate analysis data file
Accommodated Percent (B)			Y		Y	In a separate analysis data file
Accommodated Percent (C)			Y		Y	In a separate analysis data file
Accommodated Percent (D)			Y		Y	In a separate analysis data file
Accommodated Percent (E)			Y			
Accommodated Percent (mult. marks)			Y		Y	In a separate analysis data file
Accommodated Percent (Omits)			Y		Y	In a separate analysis data file

Accommodated Percent (scorepoint 0)			Y			
Accommodated Percent (scorepoint 1)			Y			
Accommodated Percent (scorepoint 2)			Y			
Accommodated Percent (scorepoint 3)			Y			
Accommodated Percent (scorepoint 4)			Y			
Accommodated Percent (scorepoint 5)			Y			
Accommodated Percent (scorepoint 6)			Y			
Accommodated Percent (scorepoint 7)			Y			
Accommodated Percent (scorepoint 8)			Y			
Accommodated Percent (scorepoint 9)			Y			
Accommodated Percent (scorepoint 10)			Y			
Accommodated Percent (scorepoint 11)			Y			
Accommodated Percent (scorepoint 12)			Y			
Non-Accommodated Percent (A)			Y			
Non-Accommodated Percent (B)			Y			
Non-Accommodated Percent (C)			Y			
Non-Accommodated Percent (D)			Y			
Non-Accommodated Percent (E)			Y			
Non-Accommodated Percent (mult. marks)			Y			
Non-Accommodated Percent (Omits)			Y			

Non-Accommodated Percent (scorepoint 0)			Y			
Non-Accommodated Percent (scorepoint 1)			Y			
Non-Accommodated Percent (scorepoint 2)			Y			
Non-Accommodated Percent (scorepoint 3)			Y			
Non-Accommodated Percent (scorepoint 4)			Y			
Non-Accommodated Percent (scorepoint 5)			Y			
Non-Accommodated Percent (scorepoint 6)			Y			
Non-Accommodated Percent (scorepoint 7)			Y			
Non-Accommodated Percent (scorepoint 8)			Y			
Non-Accommodated Percent (scorepoint 9)			Y			
Non-Accommodated Percent (scorepoint 10)			Y			
Non-Accommodated Percent (scorepoint 11)			Y			
Non-Accommodated Percent (scorepoint 12)			Y			
Economically Disadvantaged Percent (A)			Y			
Economically Disadvantaged Percent (B)			Y			
Economically Disadvantaged Percent (C)			Y			
Economically Disadvantaged Percent (D)			Y			
Economically Disadvantaged Percent (E)			Y			

Economically Disadvantaged Percent (mult. marks)			Y			
Economically Disadvantaged Percent (Omits)			Y			
Economically Disadvantaged Percent (scorepoint 0)			Y			
Economically Disadvantaged Percent (scorepoint 1)			Y			
Economically Disadvantaged Percent (scorepoint 2)			Y			
Economically Disadvantaged Percent (scorepoint 3)			Y			
Economically Disadvantaged Percent (scorepoint 4)			Y			
Economically Disadvantaged Percent (scorepoint 5)			Y			
Economically Disadvantaged Percent (scorepoint 6)			Y			
Economically Disadvantaged Percent (scorepoint 7)			Y			
Economically Disadvantaged Percent (scorepoint 8)			Y			
Economically Disadvantaged Percent (scorepoint 9)			Y			
Economically Disadvantaged Percent (scorepoint 10)			Y			
Economically Disadvantaged Percent (scorepoint 11)			Y			

Economically Disadvantaged Percent (scorepoint 12)			Y			
Non Economically Disadvantaged Percent (A)			Y			
Non Economically Disadvantaged Percent (B)			Y			
Non Economically Disadvantaged Percent (C)			Y			
Non Economically Disadvantaged Percent (D)			Y			
Non Economically Disadvantaged Percent (E)			Y			
Non Economically Disadvantaged Percent (mult. marks)			Y			
Non Economically Disadvantaged Percent (Omits)			Y			
Non Economically Disadvantaged Percent (scorepoint 0)			Y			
Non Economically Disadvantaged Percent (scorepoint 1)			Y			
Non Economically Disadvantaged Percent (scorepoint 2)			Y			
Non Economically Disadvantaged Percent (scorepoint 3)			Y			
Non Economically Disadvantaged Percent (scorepoint 4)			Y			
Non Economically Disadvantaged Percent (scorepoint 5)			Y			

Non Economically Disadvantaged Percent (scorepoint 6)			Y			
Non Economically Disadvantaged Percent (scorepoint 7)			Y			
Non Economically Disadvantaged Percent (scorepoint 8)			Y			
Non Economically Disadvantaged Percent (scorepoint 9)			Y			
Non Economically Disadvantaged Percent (scorepoint 10)			Y			
Non Economically Disadvantaged Percent (scorepoint 11)			Y			
Non Economically Disadvantaged Percent (scorepoint 12)			Y			
English Language Learner Percent (A)			Y			
English Language Learner Percent (B)			Y			
English Language Learner Percent (C)			Y			
English Language Learner Percent (D)			Y			
English Language Learner Percent (E)			Y			
English Language Learner Percent (mult. marks)			Y			
English Language Learner Percent (Omits)			Y			
English Language Learner Percent (scorepoint 0)			Y			

English Language Learner Percent (scorepoint 1)			Y			
English Language Learner Percent (scorepoint 2)			Y			
English Language Learner Percent (scorepoint 3)			Y			
English Language Learner Percent (scorepoint 4)			Y			
English Language Learner Percent (scorepoint 5)			Y			
English Language Learner Percent (scorepoint 6)			Y			
English Language Learner Percent (scorepoint 7)			Y			
English Language Learner Percent (scorepoint 8)			Y			
English Language Learner Percent (scorepoint 9)			Y			
English Language Learner Percent (scorepoint 10)			Y			
English Language Learner Percent (scorepoint 11)			Y			
English Language Learner Percent (scorepoint 12)			Y			
Non-English Language Learner Percent (A)			Y			
Non-English Language Learner Percent (B)			Y			
Non-English Language Learner Percent (C)			Y			

Non-English Language Learner Percent (D)			Y			
Non-English Language Learner Percent (E)			Y			
Non-English Language Learner Percent (mult. marks)			Y			
Non-English Language Learner Percent (Omits)			Y			
Non-English Language Learner Percent (scorepoint 0)			Y			
Non-English Language Learner Percent (scorepoint 1)			Y			
Non-English Language Learner Percent (scorepoint 2)			Y			
Non-English Language Learner Percent (scorepoint 3)			Y			
Non-English Language Learner Percent (scorepoint 4)			Y			
Non-English Language Learner Percent (scorepoint 5)			Y			
Non-English Language Learner Percent (scorepoint 6)			Y			
Non-English Language Learner Percent (scorepoint 7)			Y			
Non-English Language Learner Percent (scorepoint 8)			Y			
Non-English Language Learner Percent (scorepoint 9)			Y			
Non-English Language Learner Percent (scorepoint 10)			Y			

Non-English Language Learner Percent (scorepoint 11)			Y			
Non-English Language Learner Percent (scorepoint 12)			Y			
Disabled Learner Percent (A)			Y			
Disabled Learner Percent (B)			Y			
Disabled Learner Percent (C)			Y			
Disabled Learner Percent (D)			Y			
Disabled Learner Percent (E)			Y			
Disabled Learner Percent (mult. marks)			Y			
Disabled Learner Percent (Omits)			Y			
Disabled Learner Percent (scorepoint 0)			Y			
Disabled Learner Percent (scorepoint 1)			Y			
Disabled Learner Percent (scorepoint 2)			Y			
Disabled Learner Percent (scorepoint 3)			Y			
Disabled Learner Percent (scorepoint 4)			Y			
Disabled Learner Percent (scorepoint 5)			Y			
Disabled Learner Percent (scorepoint 6)			Y			
Disabled Learner Percent (scorepoint 7)			Y			
Disabled Learner Percent (scorepoint 8)			Y			
Disabled Learner Percent (scorepoint 9)			Y			

Disabled Learner Percent (scorepoint 10)			Y			
Disabled Learner Percent (scorepoint 11)			Y			
Disabled Learner Percent (scorepoint 12)			Y			
Non-Disabled Learner Percent (A)			Y			
Non-Disabled Learner Percent (B)			Y			
Non-Disabled Learner Percent (C)			Y			
Non-Disabled Learner Percent (D)			Y			
Non-Disabled Learner Percent (E)			Y			
Non-Disabled Learner Percent (mult. marks)			Y			
Non-Disabled Learner Percent (Omits)			Y			
Non-Disabled Learner Percent (scorepoint 0)			Y			
Non-Disabled Learner Percent (scorepoint 1)			Y			
Non-Disabled Learner Percent (scorepoint 2)			Y			
Non-Disabled Learner Percent (scorepoint 3)			Y			
Non-Disabled Learner Percent (scorepoint 4)			Y			
Non-Disabled Learner Percent (scorepoint 5)			Y			
Non-Disabled Learner Percent (scorepoint 6)			Y			
Non-Disabled Learner Percent (scorepoint 7)			Y			
Non-Disabled Learner Percent (scorepoint 8)			Y			
Non-Disabled Learner Percent (scorepoint 9)			Y			

Non-Disabled Learner Percent (scorepoint 10)			Y			
Non-Disabled Learner Percent (scorepoint 11)			Y			
Non-Disabled Learner Percent (scorepoint 12)			Y			
P-value or Item Mean			Y		Y	
P-value or Item Mean for Male			Y		Y	
P-value or Item Mean for Female			Y		Y	
P-value or Item Mean for White			Y		Y	
P-value or Item Mean for Black			Y		Y	
P-value or Item Mean for Hispanic			Y			
P-value or Item Mean for Asian/Pacific Islander			Y			
P-value or Item Mean for Accommodated			Y		Y	In a separate analysis data file
P-value or Item Mean for Non-Accommodated			Y			
P-value or Item Mean for Economically Disadvantage			Y			
P-value or Item Mean for Non-Economically Disadvantage			Y			
P-value or Item Mean for English Language Learner			Y			
P-value or Item Mean for Non-English Language Learner			Y			
P-value or Item Mean for Disabled Leaner						
P-value or Item Mean for Non-Disabled Leaner						
Adjusted P-value	same as p-value for MC items		Y		Y	
Adjusted P-value for Male			Y		Y	

Adjusted P-value for Female			Y		Y	
Adjusted P-value for White			Y		Y	
Adjusted P-value for Black			Y		Y	
Adjusted P-value for Hispanic			Y			
Adjusted P-value for Asian/Pacific Islander			Y			
Adjusted P-value for Accommodated			Y		Y	In a separate data file
Adjusted P-value for Non-Accommodated			Y			
Adjusted P-value for Economically Disadvantage			Y			
Adjusted P-value for Non-Economically Disadvantage			Y			
Adjusted P-value for English Language Learner			Y			
Adjusted P-value for Non-English Language Learner			Y			
Adjusted P-value for Disabled Learner						
Adjusted P-value for Non-Disabled Learner						
Difficulty flag			Y		Y	
Item Standard Deviation			Y		Y	
Item-Total Correlation			Y		Y	
Biserial/Polyserial Correlation			Y		Y	
Point-Biserial Correlation (corrected)			Y		Y	
Item-Total correlation flag			Y		Y	
P-b correlation for option A			Y		Y	
P-b correlation for option B			Y		Y	

P-b correlation for option C			Y		Y	
P-b correlation for option D			Y		Y	
P-b correlation for option E			Y			
P-b correlation for Omits			Y		Y	
P-b correlation for option A-Male			Y			
P-b correlation for option B-Male			Y			
P-b correlation for option C-Male			Y			
P-b correlation for option D-Male			Y			
P-b correlation for option E-Male			Y			
P-b correlation for Omits-Male			Y			
P-b correlation for option A-Female			Y			
P-b correlation for option B-Female			Y			
P-b correlation for option C-Female			Y			
P-b correlation for option D-Female			Y			
P-b correlation for option E-Female			Y			
P-b correlation for Omits-Female			Y			
P-b correlation for option A-White			Y			
P-b correlation for option B--White			Y			
P-b correlation for option C-White			Y			
P-b correlation for option D-White			Y			
P-b correlation for option E-White			Y			

P-b correlation for Omits O-White			Y			
P-b correlation for option A-Black			Y			
P-b correlation for option B-Black			Y			
P-b correlation for option C-Black			Y			
P-b correlation for option D-Black			Y			
P-b correlation for option E-Black			Y			
P-b correlation for Omits O-Black			Y			
P-b correlation for option A_HIS						
P-b correlation for option B_HIS						
P-b correlation for option C_HIS						
P-b correlation for option D_HIS						
P-b correlation for option E_HIS						
P-b correlation for Omits_HIS						
P-b correlation for option A_API						
P-b correlation for option B_API						
P-b correlation for option C_API						
P-b correlation for option D_API						
P-b correlation for option E_API						
P-b correlation for Omits_API						
P-b correlation for option A-ACCOM			Y		Y	in a separate file
P-b correlation for option B-ACCOM			Y		Y	in a separate file
P-b correlation for option C-ACCOM			Y		Y	in a separate file
P-b correlation for option D-ACCOM			Y		Y	in a separate file
P-b correlation for option E-ACCOM			Y			
P-b correlation for Omits O-ACCOM			Y		Y	in a separate file
P-b correlation for option A-NACCOM			Y			

P-b correlation for option B-NACCOM			Y			
P-b correlation for option C-NACCOM			Y			
P-b correlation for option D-NACCOM			Y			
P-b correlation for option E-NACCOM			Y			
P-b correlation for Omits O-NACCOM			Y			
P-b correlation for option A_ED			Y			
P-b correlation for option B-ED			Y			
P-b correlation for option C-ED			Y			
P-b correlation for option D-ED			Y			
P-b correlation for option E-ED			Y			
P-b correlation for Omits O-ED			Y			
P-b correlation for option A-NED			Y			
P-b correlation for option B-NED			Y			
P-b correlation for option C-NED			Y			
P-b correlation for option D-NED			Y			
P-b correlation for option E-NED			Y			
P-b correlation for Omits-NED			Y			
P-b correlation for option A-ELL			Y			
P-b correlation for option B-ELL			Y			
P-b correlation for option C-ELL			Y			

P-b correlation for option D-ELL			Y			
P-b correlation for option E-ELL			Y			
P-b correlation for Omits O-ELL			Y			
P-b correlation for option A-NELL			Y			
P-b correlation for option B-NELL			Y			
P-b correlation for option C-NELL			Y			
P-b correlation for option D-NELL			Y			
P-b correlation for option E-NELL			Y			
P-b correlation for Omits O-NELL			Y			
P-b correlation for option A-DIS			Y			
P-b correlation for option B-DIS			Y			
P-b correlation for option C-DIS			Y			
P-b correlation for option D-DIS			Y			
P-b correlation for option E-DIS			Y			
P-b correlation for Omits O-DIS			Y			
P-b correlation for option A-NDIS			Y			
P-b correlation for option B-NDIS			Y			
P-b correlation for option C-NDIS			Y			
P-b correlation for option D-NDIS			Y			
P-b correlation for option E-NDIS			Y			

P-b correlation for Omits O-NDIS			Y			
Flag for potential miskeying. Values can be: H, L, P, O, N, B					Y	
Mantel CHSQ Male-Female					Y	
Lower limit of 95% CI					Y	
Mantel-Haenszel Delta Male-Female					Y	
Upper limit of 95% CI					Y	
Mantel CHSQ White-Black					Y	
Lower limit of 95% CI					Y	
Mantel-Haenszel Delta White-Black					Y	
Upper limit of 95% CI					Y	
Mantel CHSQ White to Hispanic						
Mantel-Haenszel Delta White to Hispanic						
Mantel CHSQ White to Asian/Pacific Island						
Mantel-Haenszel Delta White to Asian/Pacific Island						
Mantel CHSQ Accommodated to Non-Accommodated						
Mantel-Haenszel Delta Accommodated to Non-Accommodated						
Mantel CHSQ Economically Disadvantage Non-Economically Disadvantage						
Mantel-Haenszel Delta Economically Disadvantage Non-Economically Disadvantage						

Mantel CHSQ English Language Learner to Non-English Language Learner						
Mantel-Haenszel Delta English Language Learner to Non-English Language Learner						
Mantel CHSQ Disabled Learner to Non-Disabled Learner						
Mantel-Haenszel Delta Disabled Learner to Non-Disabled Learner						
SMD M-F						
SMD W-B						
SMDS W to HIS						
SMDS W to API						
SMDS ACC to NACC						
SMDS ED to NED						
SMDS ELL to NELL						
SMDS DIS to NDIS						
DIF category for M–F (A, B, C, AA, BB, CC)			Y		Y	
DIF category for W–B (A, B, C, AA, BB, CC)			Y		Y	
DIF category for White to HIS (A, B, C, AA, BB, CC)						
DIF category for White to API (A, B, C, AA, BB, CC)						
DIF category for ACC to NACC (A, B, C, AA, BB, CC)			Y			
DIF category for ED to NED(A, B, C, AA, BB, CC)			Y			
DIF Category for ELL to NELL (A, B, C, AA, BB, CC)			Y			
DIF Category for DIS to NDis (A, B, C, AA, BB, CC)						

Favored group for M–F (Male, Female)					Y	
Favored group for W-B (White, Black)					Y	
Favored group for White to Hispanic						
Favored group for White to Asian/Pacific Island)						
Favored group for (Accommodated, Non-Accommodated)						
Favored group for (Economically Disadvantage, Non-Economically Disadvantage)						
Favored group for (English Language Learner , Non–English Language Learner)						
Favored group for (Disabled Learner, Non–Disabled Learner)						
A parameter (scaled)			Y		Y	
SE for A parameter (scaled)			Y		Y	
B parameter (scaled)			Y		Y	
SE for B parameter (scaled)			Y		Y	
C parameter (scaled)			Y		Y	
SE for C parameter (scaled)			Y		Y	
D1 category parameter (scaled)						
SE for D1 category parameter (scaled)						
D2 category parameter (scaled)						
SE for D2 category parameter (scaled)						

D3 category parameter (scaled)						
SE for D3 category parameter (scaled)						
D4 category parameter (scaled)						
SE for D4 category parameter (scaled)						
D5 category parameter (scaled)						
SE for D5 category parameter (scaled)						
D6 category parameter (scaled)						
SE for D6 category parameter (scaled)						
D7 category parameter (scaled)						
SE for D7 category parameter (scaled)						
D8 category parameter (scaled)						
SE for D8 category parameter (scaled)						
D9 category parameter (scaled)						
SE for D9 category parameter (scaled)						
D10 category parameter (scaled)						
SE for D10 category parameter (scaled)						
D11 category parameter (scaled)						
SE for D11 category parameter (scaled)						
D12 category parameter (scaled)						
SE for D12 category parameter (scaled)						
ZQ1 fit index			Y			

Fit Flag based on ZQ1 (blank, F)			Y			
Mean-square infit			Y		Y	
Mean-square infit flag (blank, F, FF)			Y			
Mean-square outfit			Y		Y	
Mean-square fit flag (blank, MM, MH, TP)			Y			
Mean-square outfit			Y		Y	
Fit level (0, 1, 2)			Y		Y	
Chi-Square statistics for 3PL and GPC fit index computed by PARSCALE					Y	
Degrees of freedom associated with the Chi-square fit index computed					Y	
P-value associated with the Chi-square fit index computed					Y	
IRT fit statistics for PARSCALE calibrated					Y	
Degrees of freedom associated with the sx2					Y	
P-value associated with the sx2					Y	
Fit flag based on sx2 statistics					Y	
(Theta cut for Basic)					Y	
(Theta cut for MET)					Y	
(Theta cut for EXCEED)					Y	
(ICC at cut for Basic)					Y	
(ICC at cut for MET)					Y	
(ICC at cut for Exceed)					Y	
Item information at PL cut point 1					Y	
Item information at PL cut point 2					Y	
Item information at PL cut point 3					Y	
Theta point 1			Y		Y	

Theta point 2			Y		Y	
Theta point 3			Y		Y	
Theta point 4			Y		Y	
Theta point 5			Y		Y	
Theta point 6			Y		Y	
Theta point 7			Y		Y	
Theta point 8			Y		Y	
Theta point 9			Y		Y	
Theta point 10			Y		Y	
Conditional Item Mean for Decile 1			Y		Y	
Conditional Item Mean for Decile 2			Y		Y	
Conditional Item Mean for Decile 3			Y		Y	
Conditional Item Mean for Decile 4			Y		Y	
Conditional Item Mean for Decile 5			Y		Y	
Conditional Item Mean for Decile 6			Y		Y	
Conditional Item Mean for Decile 7			Y		Y	
Conditional Item Mean for Decile 8			Y		Y	
Conditional Item Mean for Decile 9			Y		Y	
Conditional Item Mean for Decile 10			Y		Y	
Conditional Item Mean for Decile 1			Y		Y	
Conditional Item Mean for Decile 2			Y		Y	
Conditional Item Mean for Decile 3			Y		Y	
Conditional Item Mean for Decile 4			Y		Y	
Conditional Item Mean for Decile 5			Y		Y	
Conditional Item Mean for Decile 6			Y		Y	

Conditional Item Mean for Decile 7			Y		Y	
Conditional Item Mean for Decile 8			Y		Y	
Conditional Item Mean for Decile 9			Y		Y	
Conditional Item Mean for Decile 10			Y		Y	
Conditional Item Mean for Decile 1			Y		Y	
Conditional Item Mean for Decile 2			Y		Y	
Conditional Item Mean for Decile 3			Y		Y	
Conditional Item Mean for Decile 4			Y		Y	
Conditional Item Mean for Decile 5			Y		Y	
Conditional Item Mean for Decile 6			Y		Y	
Conditional Item Mean for Decile 7			Y		Y	
Conditional Item Mean for Decile 8			Y		Y	
Conditional Item Mean for Decile 9			Y		Y	
Conditional Item Mean for Decile 10			Y		Y	
Conditional Item Mean for Decile 1			Y		Y	
Conditional Item Mean for Decile 2			Y		Y	
Conditional Item Mean for Decile 3			Y		Y	
Conditional Item Mean for Decile 4			Y		Y	
Conditional Item Mean for Decile 5			Y		Y	
Conditional Item Mean for Decile 6			Y		Y	

Conditional Item Mean for Decile 7			Y		Y	
Conditional Item Mean for Decile 8			Y		Y	
Conditional Item Mean for Decile 9			Y		Y	
Conditional Item Mean for Decile 10			Y		Y	
Conditional Item Mean for Decile 1			Y		Y	
Conditional Item Mean for Decile 2			Y		Y	
Conditional Item Mean for Decile 3			Y		Y	
Conditional Item Mean for Decile 4			Y		Y	
Conditional Item Mean for Decile 5			Y		Y	
Conditional Item Mean for Decile 6			Y		Y	
Conditional Item Mean for Decile 7			Y		Y	
Conditional Item Mean for Decile 8			Y		Y	
Conditional Item Mean for Decile 9			Y		Y	
Conditional Item Mean for Decile 10			Y		Y	
Conditional Item Mean for Decile 1						
Conditional Item Mean for Decile 2						
Conditional Item Mean for Decile 3						
Conditional Item Mean for Decile 4						
Conditional Item Mean for Decile 5						
Conditional Item Mean for Decile 6						
Conditional Item Mean for Decile 7						
Conditional Item Mean for Decile 8						
Conditional Item Mean for Decile 9						
Conditional Item Mean for Decile 10						
Conditional Item Mean for Decile 1						
Conditional Item Mean for Decile 2						

Conditional Item Mean for Decile 3						
Conditional Item Mean for Decile 4						
Conditional Item Mean for Decile 5						
Conditional Item Mean for Decile 6						
Conditional Item Mean for Decile 7						
Conditional Item Mean for Decile 8						
Conditional Item Mean for Decile 9						
Conditional Item Mean for Decile 10						
Conditional Item Mean for Decile 1			Y		Y	In a separate file
Conditional Item Mean for Decile 2			Y		Y	In a separate file
Conditional Item Mean for Decile 3			Y		Y	In a separate file
Conditional Item Mean for Decile 4			Y		Y	In a separate file
Conditional Item Mean for Decile 5			Y		Y	In a separate file
Conditional Item Mean for Decile 6			Y		Y	In a separate file
Conditional Item Mean for Decile 7			Y		Y	In a separate file
Conditional Item Mean for Decile 8			Y		Y	In a separate file
Conditional Item Mean for Decile 9			Y		Y	In a separate file
Conditional Item Mean for Decile 10			Y		Y	In a separate file
Conditional Item Mean for Decile 1			Y			
Conditional Item Mean for Decile 2			Y			
Conditional Item Mean for Decile 3			Y			
Conditional Item Mean for Decile 4			Y			
Conditional Item Mean for Decile 5			Y			
Conditional Item Mean for Decile 6			Y			

Conditional Item Mean for Decile 7			Y			
Conditional Item Mean for Decile 8			Y			
Conditional Item Mean for Decile 9			Y			
Conditional Item Mean for Decile 10			Y			
Conditional Item Mean for Decile 1			Y			
Conditional Item Mean for Decile 2			Y			
Conditional Item Mean for Decile 3			Y			
Conditional Item Mean for Decile 4			Y			
Conditional Item Mean for Decile 5			Y			
Conditional Item Mean for Decile 6			Y			
Conditional Item Mean for Decile 7			Y			
Conditional Item Mean for Decile 8			Y			
Conditional Item Mean for Decile 9			Y			
Conditional Item Mean for Decile 10			Y			
Conditional Item Mean for Decile 1			Y			
Conditional Item Mean for Decile 2			Y			
Conditional Item Mean for Decile 3			Y			
Conditional Item Mean for Decile 4			Y			
Conditional Item Mean for Decile 5			Y			
Conditional Item Mean for Decile 6			Y			

Conditional Item Mean for Decile 7			Y			
Conditional Item Mean for Decile 8			Y			
Conditional Item Mean for Decile 9			Y			
Conditional Item Mean for Decile 10			Y			
Conditional Item Mean for Decile 1			Y			
Conditional Item Mean for Decile 2			Y			
Conditional Item Mean for Decile 3			Y			
Conditional Item Mean for Decile 4			Y			
Conditional Item Mean for Decile 5			Y			
Conditional Item Mean for Decile 6			Y			
Conditional Item Mean for Decile 7			Y			
Conditional Item Mean for Decile 8			Y			
Conditional Item Mean for Decile 9			Y			
Conditional Item Mean for Decile 10			Y			
Conditional Item Mean for Decile 1			Y			
Conditional Item Mean for Decile 2			Y			
Conditional Item Mean for Decile 3			Y			
Conditional Item Mean for Decile 4			Y			
Conditional Item Mean for Decile 5			Y			
Conditional Item Mean for Decile 6			Y			

Conditional Item Mean for Decile 7			Y			
Conditional Item Mean for Decile 8			Y			
Conditional Item Mean for Decile 9			Y			
Conditional Item Mean for Decile 10			Y			
Conditional Item Mean for Decile 1			Y			
Conditional Item Mean for Decile 2			Y			
Conditional Item Mean for Decile 3			Y			
Conditional Item Mean for Decile 4			Y			
Conditional Item Mean for Decile 5			Y			
Conditional Item Mean for Decile 6			Y			
Conditional Item Mean for Decile 7			Y			
Conditional Item Mean for Decile 8			Y			
Conditional Item Mean for Decile 9			Y			
Conditional Item Mean for Decile 10			Y			
Conditional Item Mean for Decile 1			Y			
Conditional Item Mean for Decile 2			Y			
Conditional Item Mean for Decile 3			Y			
Conditional Item Mean for Decile 4			Y			
Conditional Item Mean for Decile 5			Y			
Conditional Item Mean for Decile 6			Y			

Conditional Item Mean for Decile 7			Y			
Conditional Item Mean for Decile 8			Y			
Conditional Item Mean for Decile 9			Y			
Conditional Item Mean for Decile 10			Y			
95th percentile	Box & whisker plot: All	Option A			Y	95th percentile of theta for all students for Option A
75th percentile					Y	75th percentile of theta for all students for Option A
50th percentile					Y	50th percentile of theta for all students for Option A
25th percentile					Y	25th percentile of theta for all students for Option A
5th percentile					Y	5th percentile of theta for all students for Option A
95th percentile	Box & whisker plot: Males				Y	95th percentile of theta for male students for Option A
75th percentile					Y	75th percentile of theta for male students for Option A
50th percentile					Y	50th percentile of theta for male students for Option A
25th percentile					Y	25th percentile of theta for male students

						for Option A
5th percentile					Y	5th percentile of theta for male students for Option A
95th percentile	Box & whisker plot: Females				Y	95th percentile of theta for female students for Option A
75th percentile					Y	75th percentile of theta for female students for Option A
50th percentile					Y	50th percentile of theta for female students for Option A
25th percentile					Y	25th percentile of theta for female students for Option A
5th percentile					Y	5th percentile of theta for female students for Option A
95th percentile	Box & whisker plot: Whites				Y	95th percentile of theta for white students for Option A
75th percentile					Y	75th percentile of theta for white students for Option A
50th percentile					Y	50th percentile of theta for white students for Option A
25th percentile					Y	25th percentile of theta for white students for Option A

5th percentile					Y	5th percentile of theta for white students for Option A
95th percentile	Box & whisker plot: Blacks				Y	95th percentile of theta for black students for Option A
75th percentile					Y	75th percentile of theta for black students for Option A
50th percentile					Y	50th percentile of theta for black students for Option A
25th percentile					Y	25th percentile of theta for black students for Option A
5th percentile					Y	5th percentile of theta for black students for Option A
95th percentile	Box & whisker plot: All	Option B			Y	95th percentile of theta for all students for Option B
75th percentile					Y	75th percentile of theta for all students for Option B
50th percentile					Y	50th percentile of theta for all students for Option B
25th percentile					Y	25th percentile of theta for all students for Option B
5th percentile					Y	5th percentile of theta for all students for Option B

95th percentile	Box & whisker plot: Males				Y	95th percentile of theta for male students for Option B
75th percentile					Y	75th percentile of theta for male students for Option B
50th percentile					Y	50th percentile of theta for male students for Option B
25th percentile					Y	25th percentile of theta for male students for Option B
5th percentile					Y	5th percentile of theta for male students for Option B
95th percentile	Box & whisker plot: Females				Y	95th percentile of theta for female students for Option B
75th percentile					Y	75th percentile of theta for female students for Option B
50th percentile					Y	50th percentile of theta for female students for Option B
25th percentile					Y	25th percentile of theta for female students for Option B
5th percentile					Y	5th percentile of theta for female students for Option B
95th percentile	Box & whisker plot: Whites				Y	95th percentile of theta for white students for Option B

75th percentile					Y	75th percentile of theta for white students for Option B
50th percentile					Y	50th percentile of theta for white students for Option B
25th percentile					Y	25th percentile of theta for white students for Option B
5th percentile					Y	5th percentile of theta for white students for Option B
95th percentile	Box & whisker plot: Blacks				Y	95th percentile of theta for black students for Option B
75th percentile					Y	75th percentile of theta for black students for Option B
50th percentile					Y	50th percentile of theta for black students for Option B
25th percentile					Y	25th percentile of theta for black students for Option B
5th percentile					Y	5th percentile of theta for black students for Option B
95th percentile	Box & whisker plot: All	Option C			Y	95th percentile of theta for all students for Option C
75th percentile					Y	75th percentile of theta for all students for Option C

50th percentile					Y	50th percentile of theta for all students for Option C
25th percentile					Y	25th percentile of theta for all students for Option C
5th percentile					Y	5th percentile of theta for all students for Option C
95th percentile	Box & whisker plot: Males				Y	95th percentile of theta for male students for Option C
75th percentile					Y	75th percentile of theta for male students for Option C
50th percentile					Y	50th percentile of theta for male students for Option C
25th percentile					Y	25th percentile of theta for male students for Option C
5th percentile					Y	5th percentile of theta for male students for Option C
95th percentile	Box & whisker plot: Females				Y	95th percentile of theta for female students for Option C
75th percentile					Y	75th percentile of theta for female students for Option C
50th percentile					Y	50th percentile of theta for female students for Option C

25th percentile					Y	25th percentile of theta for female students for Option C
5th percentile					Y	5th percentile of theta for female students for Option C
95th percentile	Box & whisker plot: Whites				Y	95th percentile of theta for white students for Option C
75th percentile					Y	75th percentile of theta for white students for Option C
50th percentile					Y	50th percentile of theta for white students for Option C
25th percentile					Y	25th percentile of theta for white students for Option C
5th percentile					Y	5th percentile of theta for white students for Option C
95th percentile	Box & whisker plot: Blacks				Y	95th percentile of theta for black students for Option C
75th percentile					Y	75th percentile of theta for black students for Option C
50th percentile					Y	50th percentile of theta for black students for Option C
25th percentile					Y	25th percentile of theta for black students for Option C

5th percentile					Y	5th percentile of theta for black students for Option C
95th percentile	Box & whisker plot: All	Option D			Y	95th percentile of theta for all students for Option D
75th percentile					Y	75th percentile of theta for all students for Option D
50th percentile					Y	50th percentile of theta for all students for Option D
25th percentile					Y	25th percentile of theta for all students for Option D
5th percentile					Y	5th percentile of theta for all students for Option D
95th percentile	Box & whisker plot: Males				Y	95th percentile of theta for male students for Option D
75th percentile					Y	75th percentile of theta for male students for Option D
50th percentile					Y	50th percentile of theta for male students for Option D
25th percentile					Y	25th percentile of theta for male students for Option D
5th percentile					Y	5th percentile of theta for male students for Option D

95th percentile	Box & whisker plot: Females				Y	95th percentile of theta for female students for Option D
75th percentile					Y	75th percentile of theta for female students for Option D
50th percentile					Y	50th percentile of theta for female students for Option D
25th percentile					Y	25th percentile of theta for female students for Option D
5th percentile					Y	5th percentile of theta for female students for Option D
95th percentile	Box & whisker plot: Whites				Y	95th percentile of theta for white students for Option D
75th percentile					Y	75th percentile of theta for white students for Option D
50th percentile					Y	50th percentile of theta for white students for Option D
25th percentile					Y	25th percentile of theta for white students for Option D
5th percentile					Y	5th percentile of theta for white students for Option D
95th percentile	Box & whisker plot: Blacks				Y	95th percentile of theta for black students for Option D

75th percentile					Y	75th percentile of theta for black students for Option D
50th percentile					Y	50th percentile of theta for black students for Option D
25th percentile					Y	25th percentile of theta for black students for Option D
5th percentile					Y	5th percentile of theta for black students for Option D
95th percentile	Box & whisker plot: All	Omits			Y	95th percentile of theta for all students for omits
75th percentile					Y	75th percentile of theta for all students for omits
50th percentile					Y	50th percentile of theta for all students for omits
25th percentile					Y	25th percentile of theta for all students for omits
5th percentile					Y	5th percentile of theta for all students for omits
95th percentile	Box & whisker plot: Males				Y	95th percentile of theta for male students for omits
75th percentile					Y	75th percentile of theta for male students for omits

50th percentile					Y	50th percentile of theta for male students for omits
25th percentile					Y	25th percentile of theta for male students for omits
5th percentile					Y	5th percentile of theta for male students for omits
95th percentile	Box & whisker plot: Females				Y	95th percentile of theta for female students for omits
75th percentile					Y	75th percentile of theta for female students for omits
50th percentile					Y	50th percentile of theta for female students for omits
25th percentile					Y	25th percentile of theta for female students for omits
5th percentile					Y	5th percentile of theta for female students for omits
95th percentile	Box & whisker plot: Whites				Y	95th percentile of theta for white students for omits
75th percentile					Y	75th percentile of theta for white students for omits
50th percentile					Y	50th percentile of theta for white students for omits

25th percentile					Y	25th percentile of theta for white students for omits
5th percentile					Y	5th percentile of theta for white students for omits
95th percentile	Box & whisker plot: Blacks				Y	95th percentile of theta for black students for omits
75th percentile					Y	75th percentile of theta for black students for omits
50th percentile					Y	50th percentile of theta for black students for omits
25th percentile					Y	25th percentile of theta for black students for omits
5th percentile					Y	5th percentile of theta for black students for omits

Appendix D: Statistics and Terms Used for Item Review Committees

ItemID DAS item bank unique item identification number.

Maturity Function of the reviewed item.

Form Form numbers that contain the reviewed item.

Position Position numbers in the test for the reviewed item (given for each form that the item appears on).

Type Item type: MC—multiple-choice item, CR—constructed-response item, WR—writing.

Key The correct answer for an MC item.

Max The maximum score point for a, MC, CR or a writing item.

P-value The percent of students who answered the item correctly. Its theoretical range is 0-1. It indicates item difficulty. Items with high p-values, such as .90, are relatively easy items. Those with p-values below .50 are relatively difficult items. P-values depend on the group of examinees who take the test.

Adj. **P-value** Item mean divided by the difference between minimum and maximum score points. It is equivalent to the p-value for the MC items when the score point is awarded either 1 or 0.

N-count The number of tested students who were administered the item.

Rasch/IRT Difficulty The usual range of Rasch/IRT difficulties can be from -3 to +3 with mean of 0 and standard deviation of 1.0 means medium difficulty. Positive values mean difficult items. Negative values mean easy items.

PB Correlation Point-biserial correlation shows the relationship between a student's performance on the item and performance on the test as a whole. A high point-biserial correlation (e.g., above .50) indicates that students who answered the item correctly on the item achieved higher total scores on the test than those who answered the item incorrectly on the item. Values less than .25 may indicate a weaker than desired relationship. Note that extremely difficult or extremely easy items may have point-biserial correlation artificially reduced.

Item-Total Corr. Item-total correlation shows the relationship between a student's performance on the item and performance on the test as a whole. A high item-total correlation (e.g., above .50) indicates that students who earned more points on the item achieved higher total scores on the test than those who earned fewer points on the item. Values less than .25 may indicate a weaker than desired relationship. Note that extremely difficult or extremely easy items may have item-total correlation artificially reduced.

FIT Flag This flag indicates that two fit indices are out of the desired range. It means the Item may have not misfit or overfit the measurement model specified for the test analysis.

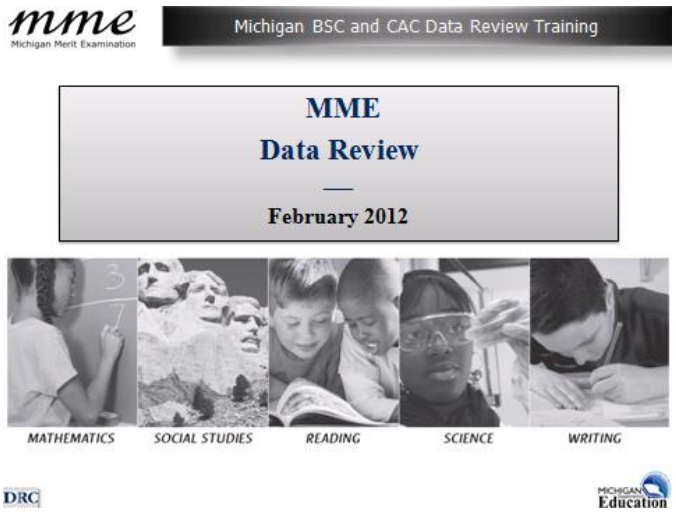
Difficulty This flag indicates that P-value, or adjusted p-value, or Rasch/IRT difficulty is

Flag	out of the desired range.
PB Correlation Flag	This flag indicates that a MC item point-biserial correlation is smaller than the desired range of larger than 0.25.
Item-Total Corr. Flag	This flag indicates that a CR or a Writing item point-biserial correlation is smaller than the desired range of larger than 0.25.
Miskey/Option Quality Flag	This flag indicates that a MC item may have a key problem. It could be that the key is not correct or it was miskeyed in scoring.
Score Point Dist. Flag	This flag indicates that a CR or a Writing item may have a scoring rubric problem. It could be the sample answer for each score point was not correctly identified
Option Analysis	Percent of examinees who selected options A, B, C, and D, or did not choose any option (Omit) for all students and for subgroups by gender and ethnicity.
Score Point Distribution	Percent of examinees who earned each valid score point and who did not answer the CR or writing item for all students and for subgroups by gender and ethnicity.
Option PB Correlation	Point-biserial correlation for each of a MC item options. The key option point-biserial correlation should be positive and high. The non-keyed option point-biserial should be negative and low.
Omit PB Correlation	Point-biserial correlation for omit of a CR or Writing item. The omit point-biserial correlation should be negative.
Invalid Codes	The codes for invalid responses for a CR or a writing item.
DIF	Differential Item Functioning index. It indicates whether the reviewed item favors a particular subgroup of the student population; thus that group of students may have a higher chance of answering the item correctly or earn higher score point than the contrasted group. The focused group is often the minority group such as female in the gender group comparison, and black in the ethnic group comparison. The reference group is often the majority group which is male in the gender group comparison, and white in the ethnic group comparison.

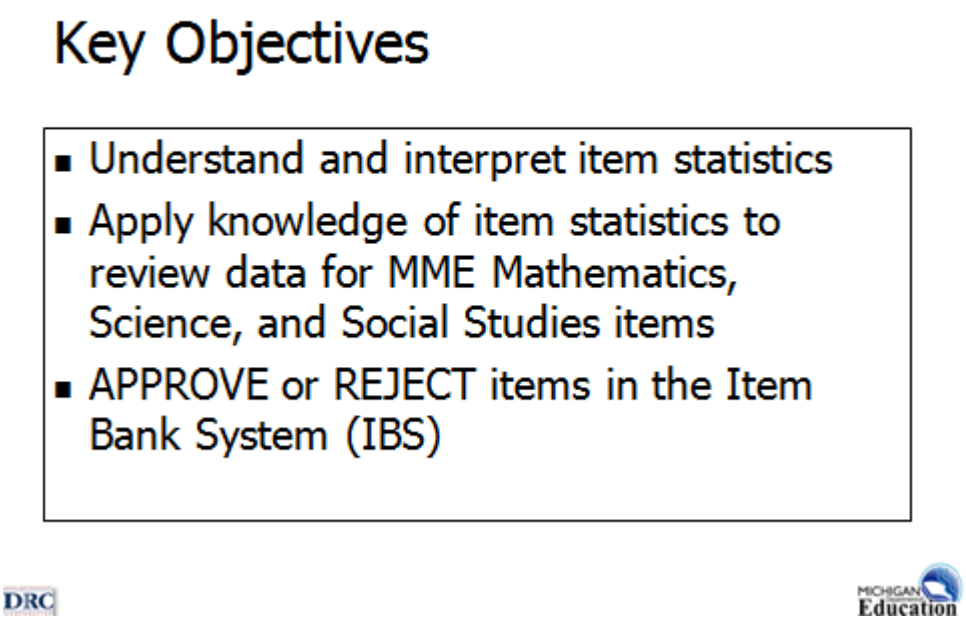
Appendix E: Guidelines for Content and Bias Review of Field Test Item Data

(Selected PowerPoint Slides from the MME Field Test Item Data Review Training Sessions by DRC and MDE)

Slide 1



Slide 2



Slide 3

Data Review Items

- Created by Item Writing Team members (Teachers)
- Reviewed by BSC and CAC members during Initial Reviews
- Field Tested

Slide 4

Item Statistics

Difficulty

"P-Value"

Discrimination

"Item Total Correlation"

DIF

Differential Item Functioning (DIF)

Slide 5

Difficulty

"P-Value"

- Proportion of students who answered a test item correctly
- Ranges from 0.0 to 1.0

Slide 6

Discrimination

"Item Total Correlation"

- Measures item's ability to **differentiate** between **high** and **low** achievers
- Ranges from -1.0 to +1.0
- High positive—high achievers outperformed low achievers
- High negative—low achievers outperformed high achievers

Slide 7

ITEM DISCRIMINATION: Item Total Correlation

STUDENT	ITEM NUMBER 1	2	3	4	5	6	7	TOTAL
Jodi	1	1	1	1	1	1	1	7
Adi	0	1	1	1	1	1	1	6
Ira	0	0	1	1	1	1	1	5
Natsumi	0	0	0	1	1	1	1	4
Kyoungwon	0	0	0	0	1	1	1	3
Jorge	0	0	0	0	0	1	1	2
Xavier	0	0	0	0	0	0	1	1
Bobbie	0	0	0	0	0	0	0	0
P-Value	0.13	0.25	0.38	0.50	0.63	0.75	0.88	
I-T Corr	0.58	0.76	0.85	0.87	0.85	0.76	0.58	

For Item 1, it is the correlation of the values in the first data column and the last data column (the two columns highlighted in green)

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Slide 8

Item Discrimination: Item Total Correlation

Range

- Ranges from -1 to +1

-1 = "perfect" **negative** relationship

- Straight line **downward** slope

0 = no linear relationship

+1 = "perfect" **positive** relationship

- Straight line **upward** slope

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Slide 9

Item Discrimination: Item Total Correlation

Guideline

- **MC: at or above 0.25**
  - Smaller is okay, depending on difficulty
  - Items with **negative** or around **0.0** item total correlations are **very poor** items that should be reviewed carefully.

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Slide 10

Item Discrimination: Item Total Correlation

Guideline Questions

- Why is this item less able to differentiate high and low achievers?
- Is the low discrimination associated with extreme low or high P-Values (item difficulty)?
- Should I **ACCEPT** this item so there are enough items to assess the corresponding content standard and/or assess students at different performance levels?
- Is there any other reason other than item discrimination to support my decision on ACCEPTING or REJECTING this item?

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Slide 11

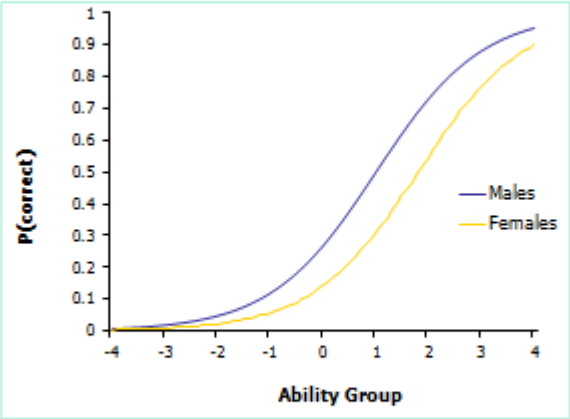
DIF ANALYSIS

Procedure

- Compares "focal" vs. "reference" groups
- **Reference** groups: **Males, Whites**
- **Focal** groups: **Females, Blacks**

Slide 12

DIF ANALYSIS



Slide 13

DIF Index

Flag	Amount of DIF	Meaning
A	Little or No DIF	Indicates no statistically significant difference in performance on the item of the different groups with same abilities
B	Moderate DIF	Indicates a moderate difference
C	Severe DIF	Indicates a large difference

Slide 14

DIF ANALYSIS

Guideline

- Each item is assigned a bias code of A, B, or C; only items with B or C DIF require review
- **"FG"** indicates the **Favored Group**
- Items with B or C DIF may be acceptable if no potential bias causes the differential item functioning

Guideline Question

- Is there anything in the content or format of the item that may interfere with, or advantage, one group of students over another based on:
  - Gender?
  - Ethnicity?

Slide 15

DIF VS. BIAS

An item may show DIF but not be biased. It is only when the performance difference is caused by **construct-irrelevant factors** that DIF can be viewed as bias. That is, the item measures something else in addition to the one it is supposed to measure.

All Biased Items should show DIF.
Not all DIF items will be Biased.

To **reject** an item based solely on DIF, you **must** be able to **posit a reason** for the DIF (i.e., why is the item biased?).

In a great majority of cases it will probably be difficult to do this (because item writer training and prior item reviews prevent most bias).

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Slide 16

What else might the item be measuring?

- Does the item contain content that is different or unfamiliar to the focal group?
- Will members of the focal group get the item correct or incorrect for the wrong reason?
- Does the content of the item reflect information and/or skills that may not be expected to be within the educational background of all examinees?
- Does the item contain words that have different or unfamiliar meanings for the focal group?
- Is the item free of group specific language, vocabulary, or reference pronouns?
- Are clues included in the item that would facilitate the performance of one group over another?
- Are there any inadequacies or ambiguities in the test instructions, item stem, keyed response, or distractors?
- Does the explanation concerning the nature of the task required to successfully complete the item tend to differentially confuse members of the focal group?

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Slide 17

Focus of CAC Groups

"P-Value"

Difficulty
- Items below .30 and above .90

Discrimination

"Item Total Correlation"
- Items below .25

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Focus of BSC Groups

Slide 18

DIF

Differential Item Functioning (DIF)
- Items with B or C DIF

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